林業特刊第二十二號

自然文化景觀調查研究計畫成果提要集(二)

Summary of Reports on Studies and Investigation of Nature/Culture and Landscapes (2)

(1989)

行政院農業委員會印行
中華民國七十八年六月

Preface

Soon after taking over the management of part of nature conservation along with its formal inauguration in January 1985, the Council of Agriculture set up within itself a committee for screening and financing projects concerned with nature conservation. All projects are implemented following approval by this committee.

After more than four years, which is regarded as an appropriate length for projects of a research nature to be carefully reviewed, the project managers were requested to present reports on their studies, which make up the present collection of 21 summaries in both Chinese and English.

In addition to an introduction to the status of nature conservation work, there are four summaries on the land-locked Formosa salmon, four on bird studies and protection, three on animal resources and ecological studies, five on landscapes and nature reserve studies, management and environmental impact assessment, and five on nature conservation education and publication.

The publication of the collection is aimed at publicizing some of the important efforts this country has made in the interests of nature conservation and in furtherance of international exchanges of research findings.

Meanwhile a workshop has been scheduled for June 13, 1989, on the findings of the research projects. The project managers and other experts will have a thorough exchange of views on subjects of common interest so that better endeavors may be made to advance the cause of nature conservation in this country.

Special thanks are due to all the project managers and all my colleagues involved in the compilation of the present collection.

Chin-chao Koh
Vice chairman, Council of Agriculture
Convenor, COA Nature Conservation
Committee
June 13, 1989

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自然保育工作概況

行政院農業委員會[1]

壹、現階段自然文化景觀及野生動植物保育綱領實施方案

一、目標

在本會與省(市)、縣(市)政府之協調、監督下，全面落實推動自然文化景觀及野生動植物保育工作，選擇具有前瞻性、綜合性及可行性高之項目，共同致力於本省自然資源之保育以及維護生態系之穩定平衡與合理利用。

二、內容與重點工作

㈠基本政策

1.調查建立自然文化景觀及野生動植物資料系統。

2.保護本土特有珍稀野生動植物及獨特地形景觀。

3.加強海岸及海洋資源保育，以及淡水漁類資源保育利用。

4.加強自然保育人才之培育與訓練。

5.積極宣導及推廣自然保育教育及知識。

6.研擬或修訂統一有關自然保育之法令。

7.加強國際聯繫，參加國際保育組織，促進國際合作。

㈡配合措施

1.加強保育林業及山坡地資源，防止超限使用。

2.積極推動調查研究有關農業污染公害防治，以改善農業生產環境。

3.長期全面推行綠化工作。

㈢重點工作及分配

本方案內之重點工作，係選擇具體可行事項列於左表，劃分主辦及協辦機關分別推動執行，並由本會負責協調推動，使方案得以落實及有效推行。

[1]台北市 10728 南海路 37 號

重　點　工　作	主辦機關	協　辦　機　關
一、建立自然文化景觀及野生動植物資料系統		
㈠調查國內自然文化景觀及野生動植物現況並建立其資料庫	農　委　會	國內各有關學術研究機構、大專院校、民間組織等。
㈡調查國外進口野生動物飼養繁殖現況並建立其資料庫	農　委　會	國內各有關學術研究機構、大專院校、民間組織等。
㈢調查國內山產店、商業性野生動物資源利用現況並建立其資料庫	農　委　會	國內各有關學術研究機構、大專院校、民間組織等。
二、自然保留區之規劃、經營管理及維護		
㈠關渡自然保留區	台北市政府	農委會
㈡鴛鴦湖自然保留區	行政院國軍退除役官兵輔導委員會	農委會
㈢哈盆自然保留區	台灣省林業試驗所	農委會
㈣苗栗三義火炎山自然保留區	台灣省林務局	農委會
㈤大武事業區台灣穗花杉自然保留區	台灣省林務局	農委會
㈥台東紅葉村台灣蘇鐵自然保留區	台灣省林務局	農委會
㈦淡水河紅樹林自然保留區	台灣省林務局	農委會

㈧坪林台灣油杉自然保留區	台灣省林務局	農委會
㈨大武山自然保留區	台灣省林務局	農委會
㈩加強保育各生態保留區、自然保留區、珍貴稀有動植物保護區、森林遊樂區等之環境品質	各管理機關	農委會
㈠各生態保留區、自然保留區、珍貴稀有動植保護區、森林遊樂區等之各項工程應避免對生態之改變或破壞	各管理機關	農委會
㈡各生態保留區、自然保留區、珍貴稀有動植物保護區、森林遊樂區等各項工程施工前應詳加規劃改進施工方式，取土區、棄土區，並於完工後應予植生綠化	各管理機關	農委會
三、保護本土特有珍稀野生動植物及獨特地形景觀		
㈠調查台灣地區珍稀野生動植物及獨特地形景觀，必要時依文化資產保存法加以指定公告予以保護	農委會	國內各有關學術研究機構、大專院校、民間組織等
㈡加強保存飼養或人工繁殖台灣地區瀕臨絕種之野生動植物，以防止物種之絕滅	農委會	國內各有關學術研究機構、大專院校、民間組織等
㈢加強研究野生動植物及森林溪流淡水魚之生態、習性、族群分布，並建立長期監測資料	農委會	國內各有關學術研究機構、大專院校、民間組織等

㈣本土特有動植物基因保存及特殊地質地形景觀保護之執行	省(市)政府	縣(市)政府
㈤管制國內外珍稀或瀕臨絕滅動植物及其標本或製品(包括全部或部分)之進出口	農委會	縣(市)政府
㈥加強國外進口珍稀或瀕臨絕滅動植物檢疫之追踪監測	縣(市)政府	農委會 省(市)政府
㈦加強取締濫墾、濫伐、狩獵、毒魚、炸魚、電魚等非法行爲	縣(市)政府	省(市)政府
㈧加強敏感地區及特殊地質地形景觀之生態環境研究	農委會	省(市)政府
㈨研擬自然生態及野生動植物保育相關法規	農委會	省(市)縣(市)政府及民間組織
㈩研擬省(市)自然生態及野生動植物保育相關之單行法規	省(市)政府	農委會
四、人才培育		
㈠不定期邀請國內外學者專家舉辦自然保育研討會	農委會	國內各有關學術研究機構、大專院校、民間組織、省(市)縣(市)政府
㈡遴選(派)業務相關人員出國考察或研習	農委會	國內各有關學術研究機構、大院校、省(市)、縣(市)政府
㈢訓練、觀摩各級政府業務相關人員保育觀念	農委會 省(市)政府	
㈣籌劃建立自然保育圖書資料中心	農委會	

五、教育宣導		
㈠協助有關機關及民間團體從事自然保育活動	農委會 省(市)政府	國內各有關學術研究機構、大專院校、縣(市)政府
㈡協助有關機關及民間團體編印自然保育書刊、摺頁等教育宣導資料	農委會 省(市)政府	國內各有關學術研究機構、大專院校、縣(市)政府
㈢利用傳播媒體廣爲宣導自然生態保育觀念	農委會 省(市)政府	國內各有關學術研究機構、大專院校、縣(市)政府
㈣加強各生態保育區、自然保留區、珍貴稀有動植物保護區、森林遊樂區之解說教育工作	各管理機關	農委會 省(市)政府
六、加強國際聯繫促進國際合作		
㈠加強與國際進行調查研究技術之合作與交流，並適機申請加入國際有關自然生態及野生動植物保育組織	農委會	國內各有關學術研究機構、大專院校、民間組織
㈡積極參與國際有關自然生態及野生動植物保育會議，並邀請國際保育組織官員來華指導或訪問，以了解我國推動自然保育情形，提昇我國際聲譽	農委會	國內各有關學術研究機構、大專院校
㈢積極爭取有關自然生態及野生動植物保育國際會議在我國舉行	農委會	國內各有關學術研究機構、大專院校、省(市)、縣(市)政府

三、經費籌措

㈠所需經費由本會、省(市)、縣(市)政府逐年編列預算支應，並由本會會同省(市)政府統籌研擬詳細年度細部計畫執行。

㈡利用狩獵證照費、獵物之費用或民間捐獻等來源，設置保育基金，由政府與民間共同來維護自然資源。

貳、行政院農業委員會七十八年度自然文化景觀有關計畫一覽表

	計畫名稱	執行機關
一	**櫻花鈎吻鮭保育**	
一.1	櫻花鈎吻鮭棲息地巡邏保護	武陵農場
一.2	櫻花鈎吻鮭生殖生態研究	臺灣大學
一.3	有勝溪固有種魚類和溪流藻類之生態關係研究	師範大學
一.4	七家灣溪櫻花鈎吻鮭保育區水域中之農藥監視	臺灣省農業藥物毒物試驗所
一.5	櫻花鈎吻鮭保護區規劃案	臺灣大學
一.6	七十八年度調查臺灣北部香魚棲息資料作爲將來是否在七家灣溪興建櫻花鈎吻鮭魚梯之依據計畫	財團法人臺灣漁業技術顧問社
一.7	拍攝櫻花鈎鮭生態後續紀錄片	鉅棚傳播事業有限公司
二	**珍稀動植物及地理景觀調查**	
二.1	東亞國際候鳥繫放先驅計畫(北)	臺北市野鳥學會
二.2	蓮華池地區自然資源保育計畫	臺灣省林業試驗所蓮華池分所
二.3	蝴蝶資源之調查和珠光鳳蝶復育工作	臺北市成功高中
二.4	臺灣山羌之生態及行爲研究	師範大學
二.5	臺灣獼猴之生態與行爲研究	臺灣大學
二.6	臺灣地區稀有及危機植物之保育評估研究	東海大學
二.7	澎湖柱狀玄武岩地景保留區調查	臺灣大學
二.8	臺南縣境內新化丘陵區之化石地質景觀及基礎地質調查	成功大學
二.9	蘭嶼角鴞之生態研究及經營管理	中央研究院動物研究所
二.10	桶后溪魚類資源之生態調查	臺灣大學
二.11	東亞國際候鳥繫放先驅計畫(中、南)	中華民國保護動物學會
三	**自然保留區研究及管理**	
三.1	關渡自然保留區管理維護計畫	臺北市政府建設局三科
三.2	哈盆自然保留區管理及規劃之研究	臺灣省林業試驗所

三.3	淡水河口紅樹林自然保留區管理維護計畫	林務局文山林區管理處
三.4	坪林臺灣油杉自然保留區管理維護計畫	林務局文山林區管理處
三.5	鴛鴦湖自然保留區管理維護計畫	行政院退輔會森林管理處
三.6	苗栗三義火炎山自然保留區管理維護計畫	林務局竹東林區管理處
三.7	臺東紅葉村臺灣蘇鐵自然保留區管理維護計畫	林務局關山林區管理處
三.8	大武事業區臺灣穗花杉自然保留區管理維護計畫	林務局關山林區管理處
三.9	大武山自然保留區緩衝區管理維護計畫	林務局森林遊樂組
三.10	恒春自然生態保護區之經營研究	臺灣省林業試驗所恒春分所
三.11	紅樹林保育推廣示範	中興大學
三.12	公告自然保留區之植被調查	臺灣省林業試驗所
三.13	自然保護區生態基準資料庫之建立	臺灣大學
三.14	大武山區自然資源之調查	台灣大學、省林試所、輔仁大學、師範大學、中央研究院
三.15	臺灣地區自然保留區宣導紀錄片製作計畫	
四	**自然保育宣導**	
四.1	自然文化景觀宣揚工作計畫	中華民國自然生態保育協會
四.2	認識自然系列展覽活動	臺灣省立博物館
四.3	中小學自然生態保育教育宣導之調查研究	屏東農專
四.4	全臺灣地區校園環境美化之研究	屏東農專
四.5	森林生態教育宣導示範先驅計畫	臺大實驗林管理處
四.6	七十八年度自然生態保育技術改進計畫	臺灣省政府農林廳技術室
四.7	製播'錦繡大地'廣播節目宣導自然文化景觀保育	幼獅廣播電臺
四.8	自然保育圖書資料中心	中華民國自然生態保育協會
四.9	全國各大專院校加強推動生態保育活動計畫	救國團學校青年服務組
四.10	七十八年寒暑假期青年自強活動生態保育環境維護研習會	救國團青年育樂活動組
四.11	溪頭自然生態研習活動計畫	臺大實驗林管理處
四.12	拍攝臺灣野生動物的保育記錄宣導片	

五	**野生動物資源調查及評估**	
五.1	臺灣地區商業性昆蟲資源利用之調查	臺灣大學
五.2	臺灣野生動物疾病防治計畫	臺灣養豬科學研究所
五.3	臺灣地區鷺鷥鳥資源的現況及其對水產養殖資源影響之研究	師範大學、國立自然科學博物館、屏東農專、臺灣大學、中山大學
五.4	臺灣地區山地鄉對野生動物資源利用的調查	師範大學
五.5	臺灣地區野生動物資料庫(一)兩棲類	師範大學
五.6	臺灣獼猴野外供餌之研究	臺灣大學、林務局蘭陽林管處
六	**生態保育國際合作及人才培育**	
六.1	野生動物保育研討會	中央研究院、臺灣大學、林試所
六.2	第一次野生動物疾病控制研討會	養豬科學研究所
七	**自然文化景觀生態保育業務推動計畫**	
七.1	自然文化景觀生態保育業務推動計畫	農委會林業處
八	**自然文化景觀及野生動物資源保育計畫(二)**	
八.1	森林溪流淡水魚類保育工作計畫	林務局
八.2	七十八年冬令青年自強活動鴛鴦湖自然生態保育研習營	救國團宜蘭縣團委會
八.3	泰雅族狩獵組織之研究－兼及其運作與野生動物間保育關係	臺灣大學
八.4	臺灣長鬃山羊之生態研究(三)－排遺之腐爛分解	師範大學
九	**研習自然保留區之規劃及經營管理**	省林試所
十	**自然文化景觀及野生動植物資源保育計畫**	
十.1	穿山甲之繁殖保存研究	省林試所
十.2	宜蘭縣舊金洋地區臺灣山羌棲息地之選擇及其植被分析	輔仁大學
十.3	清水溝溪魚保護	南投縣瑞峰國中
十.4	臺灣野生茶樹種源保存及利用	省茶改場
十.5	水青岡生態調查保護	省林試所
十.6	桃園池沼稀有水生植物之移植復育	省林試所

參、行政院農業委員會七十八年度自然保育大事記

(77.7～78.6)

77年

7. 9　(六)　本會及多位學者專家於本會313會議室舉行〝研商森林溪流淡水魚類資源保育工作計畫及推行事項〞會議。

8.22　(一)　本會與經濟部會銜公告指定台灣穗花杉、台灣油杉、紅星杜鵑、烏來杜鵑、南湖柳葉菜、台灣水韮、台灣蘇鐵、台灣水青岡、蘭嶼羅漢松、清水圓柏、鐘萼木等十一種爲珍貴稀有植物。

8.30　(二)　本會於林試所四樓會議室舉行全國農業會議第一次籌備會議，討論〝如何加強保護自然文化景觀，維護生態平衡，促進自然資源之永續利用。〞並獲得初步結論。

9.10　(六)　世界魚類及野生動物協會(IAFWA)年會在加拿大多倫多舉行，中央研究院動物研究所副研究員劉小如博士代表我國參加。

9.22　(四)　行政院核定現階段自然文化景觀及野生動植物保育綱領。

10.14　(五)　本會自然文化景觀審議小組委員張崑雄及林曜松二位博士，代表我國前往日本札幌參加四年一度的〝世界鮭鱒魚保育研討會。〞

10.17　(一)　本會與師範大學生物系於台灣大學思亮館國際會議廳舉辦〝台灣梅花鹿復育研討會〞。

10.21　(五)　本會自然文化景觀審議小組暨技術組舉行第25次聯席會議。

11. 7　(三)　本會與養豬科學研究所，於台灣大學思亮館國際會議廳舉行〝第一次野生動物疾病控制研討會〞。動物專家劉錫光博士及美國野生動物園獸醫Dr. Emil Dolensek亦蒞會討論。

11.28　(一)　世界保育知名人士Mr. Tom Milliken來華訪問。

12. 5　(一)　本會余主任委員玉賢在中央聯合總理紀念週之紀念會上報告〝自然文化景觀及野生動植物保育工作之檢討與展望〞。

12. 6　(二)　日本野鳥會研究中心所長樋口廣芳博士(Dr. Hiroyoshi Higuchi)於林試所演講。

12.18　(日)　新竹ㄅㄆㄇ猴園自英國進口之一重200公斤，20歲的雌性金剛猩猩抵達。

12.19 (一) 本會自然文化景觀審議小組暨技術組於本會 401 會議室舉行第 26 次聯席會議。

12.21 (三) 本會與多位學者專家及錄影帶製作等單位於本會 401 會議室舉行"研商拍攝火炎山、關渡、淡水紅樹林及油杉等四個保留區紀錄片事宜會議。"

12.24 (六) 本會與中華民國自然生態保育協會及內政部營建署自 24 日起，一連三天假中央研究院國際學術活動中心，舉行"自然資源保育研討會"，WWF駐印尼助理Dr. C. Santiapillai及TRAFFIC-Japan助理Mr. H. Tokunaga亦蒞會演講，本研討會共計有 19 篇論文發表。

12.28 (三) 本會余主任委員玉賢於立法院報告貓熊申請進口案。

12.31 (六) 本會與多位專家學者研商"未來中美農業合作有關野生動物及淡水魚保育，森林遊樂等計畫之方向與原則"

78 年

1. 3 (二) 新竹ㄅㄆㄇ猴園目法國進口之一重 180 公斤，15 歲的雄性金剛猩猩抵達。

1.20 (五) 本會與國貿局及海關會商"遏止非法走私進口動物及其可行辦法"，對象牙、犀牛角及犀牛皮、鱷魚肉、麝香、珊瑚及活鳥等，均審愼研究管理對策。

1.23 (二) 本會爲落實地方野生動物保育工作，特召集各縣市政府有關單位舉行"協商台灣野生動物會議"。

1.30 (一) 本會與經濟部以文資法會銜公告指定台灣黑熊、雲豹、水獺、台灣狐蝠、朱鸝、蘭嶼角鴞、黃魚鴞、赫氏角鷹、林鵰、褐林鴞、灰林鴞、百步蛇、玳瑁、革龜、綠蠵龜、赤蠵龜、高身鏟頜魚、寬尾鳳蝶、大紫蛺蝶、珠光鳳蝶等 20 種爲珍貴稀有動物。

2. 4 (六) 宜蘭縣政府及警方人員進行山產店掃蕩工作，成效卓著。

2.14 (二) 本會去函各縣市政府，針對已公告的 34 種珍稀動植物，請配合辦理持有者的登記，希望在六月底前登記完畢。

2.21 (二) 第八屆國際熊類調查研究及經營管理研討會自 21 日起，一連 5 天在加拿大舉行，我國派師大生研所王副教授穎代表參加。

2.23 (四) 本會自然文化景觀審議小組暨技術組舉行第 27 次聯席會議

3.15 (四) 本會公告〝應予保育之野生動植物進出口同意文件審核要點〞及〝旅客攜帶或郵寄應予保育之野生動植物入出境須知〞。

3.23 (四) 本會邀請美國動物協會專家Dr. Alan Rabinowitz舉行〝大武山自然保留區規劃及經營管理方針座談會〞。

4. 1 (六) 本會與台北市立動物園於該園舉辦〝台灣動物地理淵源研討會〞。

4.11 (二) 本會與林務局自本日起一連二天於台灣大學應力館舉辦〝森林溪流研討會〞，並邀請美國溪流專家Dr. David Heller及日本專家蒞會演講。

4.13 (四) TRAFFIC-Japan代表Mr. Tom Milliken來華討論有關象牙貿易事宜。

5.12 (五) 本會與省林試所假台灣大學思亮館國際會議廳舉辦野生動物調查技術研討會，並於 13 日舉辦野外實習，美國森林署魚類及野生動物研究組加州研究站專家尼爾先生(Mr. Donald L. Neal)應邀蒞會指導利用無線電追踪野生動物之技術。

5.28 (日) 本會於劍潭海外青年活動中心大禮堂舉辦自然保育推廣教育義務工作者自然保育研習會，共計三百餘人參加。

6.13 (二) 本會於台大思亮館國際會議廳舉行第二屆自然文化景觀調查研究計畫成果研討會。

櫻花鈎吻鮭棲息巡邏保護

The protection of Land-locked Salmon (Oncorhynchus Masou) Habitats

張 民 善[1]
by
Ming-Shan Chang

前 言

櫻花鈎吻鮭爲冰河時期遺留之生物，也是台灣唯一倖存的寒帶魚類，其本爲降海性的迴游魚類。由於地質變遷，阻斷了牠的下游或上溯，僅大甲溪上游尚能維持平緩的地形及提供了其生存環境，而成爲陸封性的冷水魚類；其終生棲息於水溫攝氏十六度以下的高山溪流中，近年來由於森林植被的變化，導致了溪流水溫的升高，以及民衆毒、電、炸魚等過度漁獵行爲的氾濫，沿大甲溪兩岸土地的開發利用，影響溪流水質，以及賴以生存的水生昆蟲之存活，攔砂壩的築設亦分段阻隔牠的棲所，影響其生殖繁衍等，使其族群銳減而有瀕臨絕滅的危機；現今僅存於大甲溪上游支流之一的七家灣溪中，在有識之士的發起和政府單位重視之下積極展開復育工作，本文僅就七十三年至七十七年五年間執行巡邏保護計劃提出工作報告。

保護區域概況

七家灣溪中、上游及下游東岸全部爲天然與人工混合林相，植被相當良好，下游西岸少部份之平坦或緩坡地，爲民國五十二年政府政策性輔導安置國軍退除役官兵，經營高冷地落葉果樹及部份夏季蔬菜之農耕利用地，其餘仍皆爲林地，墾耕地與溪流間大部份有數十公尺至百公尺左右不等的河床雜木林帶相隔；沿溪西岸並有道路由武陵農場通往林務局武陵森林遊樂區，亦爲一供公衆遊憩的風景區，無法限制人員禁入本區域活動。

櫻花鈎吻鮭棲息河域經有關研究單位調查，分佈於七家灣溪隱蔽良好，河床平坦有溪水迴流深潭之各河段中，本溪流位德基水庫集水區上游，爲減少水庫淤砂，此段溪流中築有攔砂壩，其中主壩四座高一點六公尺至十公尺，寬七公尺至二十六公尺不等，副壩兩座分別爲高一公尺、寬七公尺及高四點三公尺、寬十四公尺，主壩下游落水處有深一公尺至三點五公尺不等的深潭。

執行依據

一櫻花鈎吻鮭列入自然生態保育先驅計劃：櫻花鈎吻鮭之復育工作，在台灣地區自

1.行政院國軍退除役官兵輔導委員會武陵農場
台中縣和平鄉 42408 武陵路 3 號

然生態保育方案於民國七十三年九月十八日核定之前，即由主管部門邀請有關學者專家於七十二年十二月十八日實施會勘商定：櫻花鈎吻鮭爲台灣瀕臨絕滅之珍稀動物中最迫切需要之保護品種，應請主管單位速依文化資產保存法之規定，指定爲珍貴稀有魚類加以保護，並研究規劃有關復育及保護措施，列爲國家級之工作計劃。隨即於73年元月31日由行政院令頒：將櫻花鈎吻鮭列入台灣地區自然生態保育先驅計劃，分行各有關機關辦理。

二櫻花鈎吻鮭列爲文化資產：經濟部于民國七十三年七月二十七日，依文化資產保存法第四十九條及施行細則第七十二條規定，指定並公告櫻花鈎吻鮭爲珍貴稀有動物，至此櫻花鈎吻鮭列爲文化資產之一。據文化資產保存法，對其生育地應劃定爲生態保育區，禁止改變或破壞其原有之自然狀態，對違反者處五年以下有期徒刑、拘役或科或併科三萬元以下罰金；對捕獵、網釣或破壞者可處三年以下有期徒刑、拘役或科或併科二萬元以下罰金。

執行方法

一劃分責任區：七十三年二月十六日接獲行政院頒將櫻花鈎吻鮭列入生態保育先驅計劃之後，即於同年二月二十六日頒布巡邏保護實施要點，將居住七家灣溪旁之國民賓館、果一區、果二區、果三區、果六區、菜一區、菜二區、親莊、民莊、大甲林區武陵山莊等十個單位，劃分責任保護範圍；並每半年召開協調會一次，請負責當地山胞宣導教育的和平鄉公所及本區警政單位、各專責區皆派員參加，加強協調配合連繫工作，檢討執行缺失。

二成立保護中心：七十三年九月十三日奉核定年度巡邏保護經費補助後，即於同年十月一日利用武陵農場原有果品檢查站成立巡邏保護中心，約僱兩名員工，並在輔導會協助下向警總軍犬訓練中心申請軍犬兩隻配屬該中心，負責巡邏與警戒及各責任區之督導工作；爲使人工繁殖與巡邏保護工作更爲落實，在農委會指示下，於七十六年元月一日起保護中心人員進駐繁養殖場，更名爲櫻花鈎吻鮭復育中心。

三宣導教育：對參觀旅遊機關、團體放映櫻花鈎吻鮭復育成果之紀錄片；印製「維護國寶啓事」張貼於本區人員進出處所或遊客住宿場所；本區遊客最多之暑假期間，僱請大專院校動物、生物相關科系學生，協助巡邏保護與現場解說，盡力作好宣導保護工作。

四水域管制：爲維護種魚安全，減少違規情事，於種魚聚集的湧泉池及武陵路通往溪邊小路處構築柵欄，製作告示牌，標明禁止事項，豎立道路邊或溪邊醒目處，禁止人員接近水域；凡參與本計劃之研究工作人員亦必須領取服務證後，方可接近水域進行調

查研究工作。

五防止溪流污染：對本區各住戶嚴禁亂丟垃圾，每週兩次定期清運；並禁止遊客在七家灣溪畔隨處露營，於下游劃定專區免費提供爲露營地，減少遊客所製造之污染源；尤其對營業場所、住戶家庭廢污水爲避免直接排入溪流中，由輔導會、省府林務局及農委會等籌款，由武陵山莊沿武陵路至七家灣溪下游，舖設長約六公里之污水收集管綫，至國民賓館附近設立污水處理場，已完成發包作業正施工中。

六農耕管理：勸導果菜農戶採用低毒性農藥，嚴格禁止使用禁藥，並與亞洲蔬菜研究發展中心合作試用生物防治法，減少農藥使用；且由台灣省農業藥物毒物試驗所，每半月分五站採溪水樣本化驗是否含農藥成分，並指導農藥使用方法；沿岸農耕蔬菜地，在農牧局協助下完成平台階段，果園則開闢山邊溝，全園栽種常綠性草種，全部採用草生栽培法加強水土保持工作。

執行成效

一由於透過各種傳播媒體的介紹與宣導，使大多數人們對此珍貴稀有櫻花鈎吻鮭的認識是保護牠，讓牠存活下去，而不是去破壞牠。

二利用果農、菜農駐地及工作區而劃分的責任區制度，及巡邏人員認眞負責的工作態度，使原本遼濶的區域，能形成相當大的監視網，執行以來對非法捕魚、毒、電、網釣的防止，成效良好。

三民國七十三年展開保護初期，僅湧泉池、武陵吊橋下及少數隱蔽水潭可見櫻花鈎吻鮭蹤跡，據專家調查僅存二百餘尾，至七十五年據林曜松教授等之調查，其族群數量約646尾，到民國七十六年夏，同一地區櫻花鈎吻鮭數量已增至2,000尾以上，且經常在鄰近武陵路邊的淺水處即可觀察到，尤其在每年10月繁殖季節更可見魚兒群現。

四爲增加櫻花鈎吻鮭之數量，由鹿港水產試驗分所所人工繁殖成功的魚兒，七十四年生22尾，七十五年生307尾，七十六年生154尾，於七十七年三月廿六日以其中七十五年生250尾，分別標記後放流於雪山溪及七家灣溪中，據專家之追蹤調查，適應性良好，對櫻花鈎吻鮭族群的增加有相當大的幫助。

結　論

一櫻花鈎吻鮭之復育工作，在行政院明確政策裁示下，列爲國家級的工作計劃，在文建會的先期經費支持，五年來農委會的後續不斷斥資與積極推動，專家學者的正確指導，以及所有工作同仁不求名利的奉獻精神，和各相關單位的協調合作共同努力下，才有今日小小的成果。

二目前七家灣溪東岸，除農耕地外亦爲遊憩活動區域，爲達到櫻花鈎吻鮭長期有效的保育工作，應就生態保育區的大小範圍處理原則，未來土地利用管制及經營管理方式，儘早研擬可行方案解決，俾可在有效保護櫻花鈎吻鮭棲息環境下，仍可由耕種者們繼續從事計劃性蔬菜、果樹之生產，以及容許觀光遊憩活動的推展。

三七家灣流域目前爲一公衆得出入之區域，在此遼濶的區域執行巡邏保護工作，絕非以目前兩位專責巡邏員卽可以勝任，應加強利用各種媒體廣爲宣導，務使全體國民對生態保育工作產生共識，方是今後吾們共同努力的目標。

七家灣溪櫻花鈎吻鮭保育區水域中農藥之調查與分析（75年2月～77年6月）

李國欽　李貽華　胡淑萍

一、前　言

鮭魚、鱒魚乃屬高品質之冷水性魚類，在我國台灣省大甲溪上游一武陵農場轄區內亦擁有此類魚種，即櫻花鈎吻鮭（*Oncorhynchus masou*），依現場之調查，櫻花鈎吻鮭最近已有年年減少之趨勢，若不善加保護，將有面臨絕種之可能，我國政府已於民國73年6月20日依文化資產法，將其列爲國寶，並開始積極進行櫻花鈎吻鮭之復育工作。

由興儀及中村氏（1938）之調查得知，櫻花鈎吻鮭分佈之河域主要在大甲溪主流及其支流之上游，包括合歡溪、南湖溪、有勝溪、七家灣溪及司界蘭溪一帶，由最近之報告得知，目前櫻花鈎吻鮭棲息之範圍僅宥限於武陵農場附近之七家灣溪及雪山溪一帶，而以七家灣溪較常見及魚踪。

鮭魚、鱒魚對生存條件的要求頗爲嚴格，包括：低水溫（16℃以下）、高濃氧（6 ppm 以上）、水量充沛無污染、覆蓋充分、食物充足（主要食物爲昆蟲）及底質適於產卵、孵化及護育等。武陵農場爲一極負盛名的觀光區，過去爲了進行農耕開發，溪流沿岸植被遭受破壞，影響溪流之遮蔽度，目前溪流兩岸種植高冷蔬菜及溫帶水果（梨、蘋果、水蜜桃等），蔬菜及水果之栽培期間不可避免的會使用到農藥，農藥施用後是否會隨著下雨或冲蝕而進入水域中，污染水質，進而影響櫻花鈎吻鮭之生存，目前尚無資料可循，因此，對水質之調查與研究極需早日進行。本研究之目的即在調查武陵農場農藥之使用情形，並追踪及監視七家灣溪流域水中農藥之殘留情形，以期保護櫻花鈎吻鮭之生態環境。

二、材料與方法

1.用藥調查：

台灣省農業藥物毒物試驗所

台中縣霧峰鄉41301中正路189號

武陵農場共分 9 個果區，面積約 175 公頃，農場內栽培有溫帶果樹及高冷蔬菜，果樹包括蘋果、梨及水蜜桃，蔬菜以高麗菜及菠菜爲主。這些作物病蟲害發生之種類有限，用藥之種類也有一定的範圍，場內各果區使用農藥皆由場本部統一購買再領用，而農場內之用藥皆有記錄可循，因此本試驗乃根據武陵農場之用藥記錄進而了解用藥之種類，並統計出每公頃之用藥量。

2.採樣地點：

七家灣溪是目前櫻花鈎吻鮭主要棲息區，現已規劃爲櫻花鈎吻鮭保育區，並於湧泉闢天然養殖場，水試所並建立繁殖場進行人工之孵育，以期魚體能快速成長、繁衍。

本計畫乃沿著七家灣溪選擇五處地區採樣，包括櫻花鈎吻鮭棲群較爲密集之武陵吊橋（桃山）、天然養殖場—湧泉、人工孵育區—養殖池、果三區、七家灣溪與有勝溪之會合處（櫻花鈎吻鮭由此處起則不見其棲息），見圖一。

河流中之農藥殘留量爲一動態之變化，與農藥使用時期、施用量、降雨量及坡地水土保持都有關係，須長期定時、定點分析方可知其實際之殘留情形，三月至十月是用藥較多之時期，其間之五月至九月雨量較多，因而由三月至十月爲密集採樣，每星期一次，十一月至二月是枯水期，農藥之使用亦較少，則每兩星期採樣一次，由 75年 2 月起至 76年 6 月共採 215 件水樣，見表一。76年 7 月起至 77年 6 月共採 150 件水樣，見表二。由櫻花鈎吻鮭保護站協助水樣之採集，採樣後立即貯存於武陵農場之冷凍庫（－10℃），再由本所定期至農場取回水樣分析。

3.分析農藥之種類：

分析農藥種類乃根據往年用藥調查選擇常用或魚毒性高之農藥十四種進行分析，其中包括五種殺菌劑（四氯丹、蓋普丹、貝芬替、五氯酚、甲基多保淨）、六種殺蟲劑（加保利、加保扶、陶斯松、納乃得、百滅寧、巴拉松）、二種殺蟎劑（大克蟎、克氯苯）及一種殺草劑（巴拉刈），見表三。

4.分析方法：

(A)貝芬替、納乃得及甲基多保淨之分析：

以Chloroform 抽取，利用液液層析儀檢測。

(B)陶斯松、大克蟎、克氯苯、百滅寧、蓋普丹、四氯丹、巴拉松之分析：

以Methylene Chloride 抽取，利用氣液層析儀附電子捕獲式檢出器檢測。

(c)加保利、加保扶之分析：

以Methylene Chloride 抽取，經ＴＦＡ反應後利用氣液層析儀附電子捕獲式檢出器檢測。

(D)五氯酚之分析：

以Methylene Chloride 抽取，經ＰＦＢ－Br 反應後，以 silica gel 淨化，利用氣液層析儀附電子捕獲式檢出器檢測。

(E)巴拉刈之分析：

以ＤＰ－1 淨化後加 Sodium hydrosulfite 顏色後以Vis-Spectrophotometer測定，波長爲 394 nm。

三、結果與討論

武陵農場栽培有溫常果樹及高冷蔬菜，果樹佔大部分，主要有蘋果、梨及水蜜桃，高冷蔬菜主要有高麗菜及菠菜，果樹病蟲害發生之種類有限，因而用藥之種類亦有一定之範圍，四月至十月爲果樹生長及結果期，病害發生較爲嚴重，常見之病害如桃樹之根朽病、縮葉病、炭疽病、細菌性穿孔病；梨樹之黑星病、黑斑病、輪紋病；蘋果之白粉病、黑星病、褐斑病等；依74年之用藥情形（表四），殺菌劑之使用量最多，佔全用藥量的百分之八十八，多數屬含氮雜環類化合物（ Heterocyclic nitrogen compounds ）（如四氯丹、蓋普丹、甲基多保淨、免賴得等），有機硫磺劑（如鋅錳乃浦），或有機銅劑（如快得寧等）。蟲害方面常見的有葉蟎、蚜蟲、介殼蟲等，可是與病害相比較下顯較不嚴重，因此殺蟲劑之使用量較少，約佔全用藥量之４％左右，常用的有：加保利、大滅松、納乃得、陶斯松等，75年之用藥情形見表五，使用量仍以殺菌劑居多，佔全用藥量之 78.6％，使用量最多之藥劑爲四氯丹，佔全用藥量之 22.8％，而71年、74年之用藥情形，亦以四氯丹使用最多，71年佔全用藥量之 26.3％，74年則佔 28.94％，76年之用藥情形見表六，使用量仍以殺菌劑居多，然殺蟲劑之使用量有逐漸增多之趨勢，此可能與高冷蔬菜栽培面積之增加有關，高冷蔬菜屬短期作物，其防治對象多屬害蟲，常見的有切根蟲、小菜蛾、斜紋夜盜蟲等。常用之殺蟲劑包括有百滅寧、亞素靈、托福松、美文松、陶斯松、加保扶、納乃得等，用藥情形有待繼續調則。

根據調查，武陵農場果樹之用藥次數依病蟲害發生之嚴重與否而有所增減，一般而言，每年平均約施藥12次至18次，施藥時間多在３－10月間，依每公頃使用之有效成份來看，76年之使用量爲每公頃 24.2公斤，75年之使用量爲每公頃 20.3 公斤 ，74年之使用量爲每公頃 29.0公斤，已有逐漸減少之趨勢，用藥種類亦由30幾種減爲20幾種，76年

爲17.種，可見武陵農場爲配合櫻花鈎吻鮭之保育，已接受本所之建議，對使用農藥之種類愼加選擇，使用量亦嚴加控制。

農藥的使用是否會進入水域環境，進而對水生生物造成爲害，尙無資料可循，國內有關農藥對水生生物影響的研究並不多，而武陵農場目前所使用這些藥劑對櫻花鈎吻鮭之毒性如何？因目前櫻花鈎吻鮭之數量不多，無法實際進行魚毒試驗來探討之。因而只能收集與鮭魚較同類之鱒魚的魚毒試驗資料參考，本研究乃選出魚毒性較強或使用量較多之藥劑作爲分析對象，以監測七家灣溪水域中農藥之殘留情形，共選14.種藥劑進行水中殘毒分析其魚毒性見表七。

由75年2月至77年6月間採集之365件水樣中皆未偵測到所分析之14.種農藥之殘留，本計畫中所採用之水中農藥殘量分析方法其偵測界限達ppb（part per billion），由初步結果判斷，農藥當不致對櫻花鈎吻鮭造成急性害，若欲進一步確實了解其安全性，則宜長期、定點、定時採樣分析。爲保護櫻花鈎吻鮭之棲息環境，則宜加強指導果農適時地正確地使用農藥，並避免使用高魚毒性之農藥，雨季時農藥之使用更須特別注意。

表一、櫻花鉤吻鮭保育區每月採樣樣品數

採樣時間	採樣樣品數					
	桃山	湧泉	繁殖場	果三區	賓館橋下	總計
75年2月	1	1	1	1	1	5
3月	4	4	4	4	4	20
6月	1	1	1	1	1	5
8月	5	5	5	5	5	25
9月	3	3	3	3	3	15
10月	5	5	5	5	5	25
11月	4	4	4	4	4	20
12月	2	2	2	2	2	10
76年2月	1	1	1	1	1	5
3月	4	4	4	4	4	20
4月	4	4	4	4	4	20
5月	4	4	4	4	4	20
6月	5	5	5	5	5	25
合計	43	43	43	43	43	215

表二、櫻花鈎吻鮭保育區每月採樣樣品數（77年度）

採樣地點	採樣樣品數					
	桃山	湧泉	繁殖場	果三區	賓館橋下	總計
76年7月	1	1	1	1	1	5
8月	4	4	4	4	4	20
9月	2	2	2	2	2	10
10月	4	4	4	4	4	20
11月	3	3	3	3	3	15
12月	3	3	3	3	3	15
77年1月	2	2	2	2	2	10
2月	1	1	1	1	1	5
3月	1	1	1	1	1	5
4月	3	3	3	3	3	15
5月	3	3	3	3	3	15
6月	3	3	3	3	3	15
合計	30	30	30	30	30	150

表三、分析農藥之普通名稱、用途及化學名稱

普通名稱 英文	普通名稱 中文	用途	化學名稱
Captafol	四氯丹	殺菌劑	cis-N-((1,1,2,2-tetrachloroethyl)thiol)-4-cyclohexene-1,2-dicarboximide.
Captan	蓋普丹	殺菌劑	cis-N-((tricholromethyl)thiol)-4-cyclohexene-1,2-dicarboximide.
Carbaryl	加保利	殺蟲劑	1-Naphthyl N-methylcarbamate.
Carbendazim	貝芬替	殺菌劑	2-(methoxycarbonyiamino)-benzimidazole.
Carbofuran	加保扶	殺蟲劑	2,3-Dihydro-2,2-dimethyl-7-benzofurangl methylcarbamate.
Chlorobenzilate	克氯苯	殺蟎劑	Ethyl 4,4′-dichlorobenzilate.
Chlorpyrifos	陶斯松	殺蟲劑	O,O-Diethyl O-(3,5,6-trichloro-2-pyridyl)-phosphorothioate.
Dicofol	大克蟎	殺蟎劑	4,4-Dichloro-aipha-trichloro-methylbenzhy.
Methomyl	納乃得	殺蟲劑	S-Methyl-N-((methyl-cabamoyl)oxy)-thioacetimidate.
Paraquat	巴拉刈	殺草劑	1,1′-Dimethyl-4,4′-bipyridinium ion, present as the dichloride salt (ICI/Chevron) or dimethyl sulfate salt.
Parathion	巴拉松	殺蟲劑	O,O-diethyl O-4-nitrophenyl phosphorothioate.
PCP-Na	五氯酚鈉	殺菌劑	Sodium pentachlorophenol.
Permethrin	百滅寧	殺蟲劑	3-(phenoxyphenyl)methyl (I)-cis, trans-3-(2,2-dichloroethenyl)-2,2-dimethyl cyclopropane-carpoxylate.
Thiophanate-methyl	甲基多保淨	殺菌劑	Dimethyl (1,2-phenylene) bis-(iminocarbonothioyl) bis-carbamate.

表四、74年武陵農場用藥情形

農藥種類	成份及劑型	用途	使用量 (Kg AI/ha)	使用百分率 (%)	使用月份
四氯丹	80% 可濕性粉劑	殺菌劑	8.392	28.94	3-9
多寧	65% 可濕性粉劑	殺菌劑	6.121	21.11	3-9
巴拉刈	24% 溶液	殺草劑	6.000	20.69	12,3,5
鋅錳乃浦	80% 可濕性粉劑	殺菌劑	2.047	7.06	3,5,8
快得寧	40% 可濕性粉劑	殺菌劑	1.282	4.42	5-9
蓋普丹	50% 可濕性粉劑	殺菌劑	1.141	3.93	3-9
五氯酚	86% 可濕性粉劑	殺菌劑	0.922	3.18	2
錫蟎丹	50% 可濕性粉劑	殺蟎劑	0.485	1.67	5-6
加保利	85% 可濕性粉劑	殺蟲劑	0.456	1.57	3,5,7
甲基多保淨	75% 可濕性粉劑	殺菌劑	0.411	1.42	3
大滅松	44% 乳劑	殺蟲劑	0.342	1.18	2,3,6-8
依普同	50% 可濕性粉劑	殺菌劑	0.250	0.86	3-6,8,9
納乃得	90% 可濕性粉劑	殺蟲劑	0.218	0.75	8
歐殺松	75% 可濕性粉劑	殺蟲劑	0.161	0.56	6-8
免賴得	50% 可濕性粉劑	殺菌劑	0.158	0.54	4-7
陶斯松	40.8% 乳劑	殺蟲劑	0.130	0.45	5-8
嘉磷塞	41% 溶液	殺草劑	0.115	0.40	12
加保扶	85% 可濕性粉劑	殺蟲劑	0.087	0.30	9
亞素靈	55% 溶液	殺蟲劑	0.053	0.18	9-10
賽達松	50% 乳劑	殺蟲劑	0.041	0.14	9
硫敵克	75% 可濕性粉劑	殺蟲劑	0.036	0.13	9
達馬松	50% 溶液	殺蟲劑	0.034	0.12	6-7
芬瑞莫	12.27%乳劑	殺菌劑	0.032	0.11	3-6
美文松	25.3% 乳劑	殺蟲劑	0.029	0.10	9
克氯苯	25.5% 乳劑	殺蟎劑	0.017	0.06	3
百滅寧	10% 乳劑	殺蟲劑	0.016	0.05	3
三氯松	95% 可溶性粉劑	殺蟲劑	0.014	0.05	6
托福松	10% 粒劑	殺蟲劑	0.009	0.03	7

表五、75年武陵農場用藥情形

農藥種類	成份及劑型	用途	使用量 (kg／ha)	使用百分率 (%)	使用月份
四氯丹	80%可濕性粉劑	殺菌劑	4.625	22.8	2-10
免賴得	50%可濕性粉劑	殺菌劑	3.788	18.7	5,6,8
鋅錳乃浦	80%可濕性粉劑	殺菌劑	3.138	15.5	4-10
蓋普丹	75%可濕性粉劑	殺菌劑	2.578	12.7	1,3-9
快得寧	40%可濕性粉劑	殺菌劑	0.970	4.8	4-9
多寧	65%可濕性粉劑	殺菌劑	0.824	4.1	4,5,11
加保利	85%可濕性粉劑	殺蟲劑	0.811	4.0	6-9
亞素靈	55%溶液	殺蟲劑	0.630	3.1	5-8,10
托福松	10%粒劑	殺蟲劑	0.459	2.3	4-6,8,9
美文松	25.3%乳劑	殺蟲劑	0.425	2.1	4-10
陶斯松	25%可濕性粉劑	殺蟲劑	0.418	2.1	3-8
加保扶	85%可濕性粉劑	殺蟲劑	0.381	1.9	4-6
納乃得	90%可濕性粉劑	殺蟲劑	0.365	1.8	5-8
大滅松	44%乳劑	殺蟲劑	0.333	1.6	4,5,11
安殺番	35%乳劑	殺蟲劑	0.267	1.3	5,6
錫蟎丹	50%可濕性粉劑	殺蟎劑	0.208	1.0	4-6
芬化利	20%可濕性粉劑	殺蟲劑	0.024	0.1	8
百滅寧	10%乳劑	殺蟲劑	0.022	0.1	10

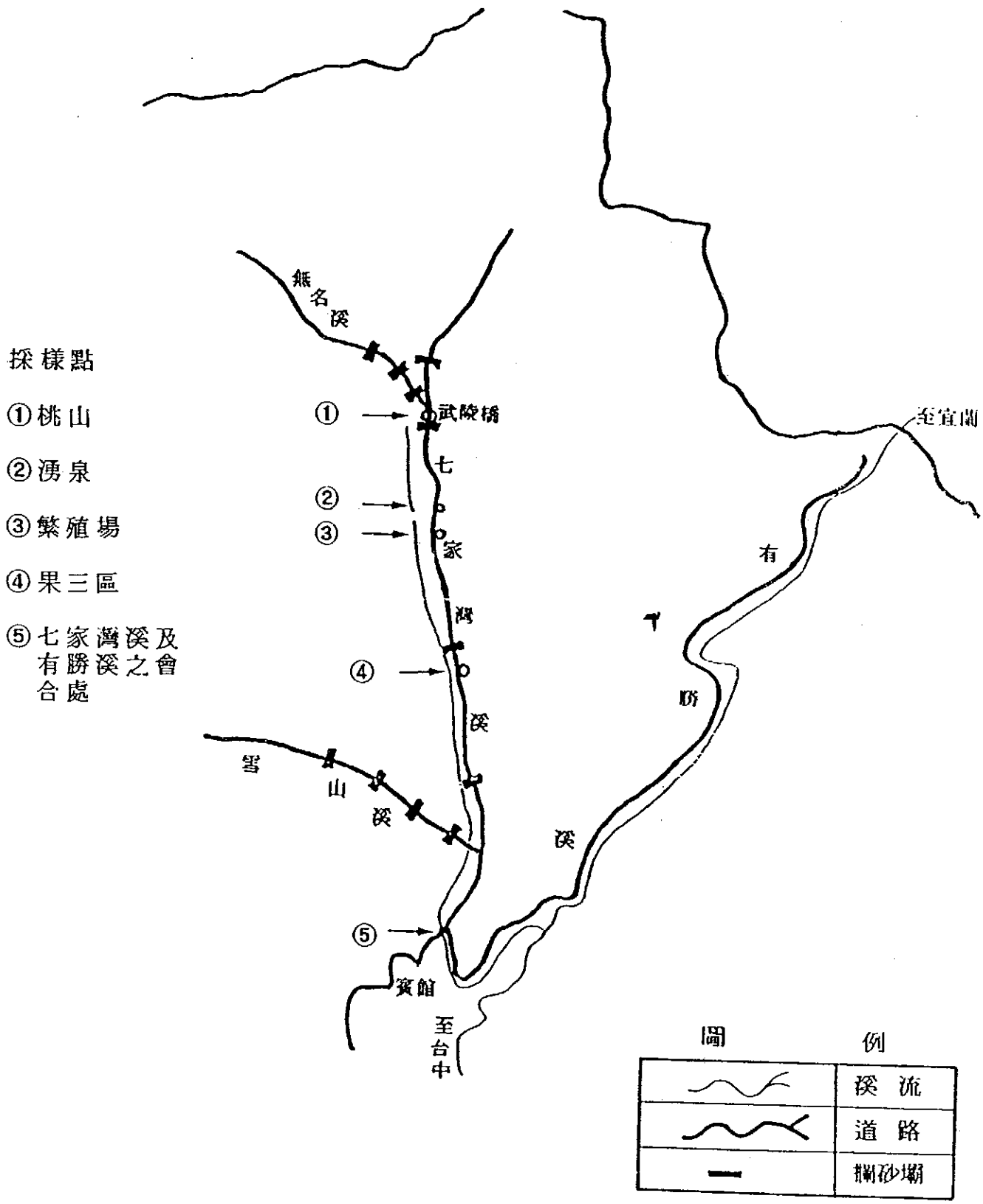
表六、76年梨山地區農藥使用情形

農藥種類	用途	劑型	使用量（kg／ha）	佔用藥量百分率（%）	使用月份
鋅錳乃浦	殺菌劑	80% 可濕性	5.483	22.88	3-10
托福松	殺蟲劑	25% 乳劑& 10% 粒劑	4.599	19.19	2-5,9
四氯丹	殺菌劑	80% 可濕性粉劑	3.937	16.42	2-6,8-10
蓋普丹	殺菌劑	75% 可濕性粉劑	2.081	8.68	4-6
快得寧	殺菌劑	40% 可濕性粉劑	1.856	2.18	4-6
美文松	殺蟲劑	25.3% 乳劑	1.513	6.31	3-9
百滅寧	殺蟲劑	10% 乳劑	1.444	6.03	3-4
多寧	殺菌劑	65% 可濕性粉劑	0.720	3.00	6-7
達馬松	殺蟲劑	55% 溶液	0.588	2.45	4-8
免賴得	殺菌劑	50% 可濕性粉劑	0.403	1.68	3-4
氫氧化銅	殺菌劑	83%（銅 54%）可濕性粉劑	0.330	1.38	6-7,10
賽洛寧	殺蟲劑	2.8% 乳劑	0.314	1.31	5-6,9
錫蟎丹	殺蟎劑	50% 可濕性粉劑	0.301	1.26	3-5,8
芬化利	殺蟲劑	20% 可濕性粉劑	0.241	1.01	9
依普同	殺菌劑	50% 可濕性粉劑	0.201	0.84	3,9
歐殺松	殺菌劑	75% 可溶性粉劑	0.100	0.41	4
依得利	殺菌劑	50%，25%乳劑	0.051	0.21	8-9

表七、分析農藥之魚毒性

農藥種類	魚毒性 LC 50 (ppm)	
	虹鱒 *	其他
四氯丹	0.5	2.8 (bulegill)
蓋普丹	—	0.3 (harlequin)
加保扶	0.28	1.4 (carp)
加保利	3.8	5.6 (mosquits fish)
貝芬替	2.4	261 (carp)
克氯苯	—	1.5 (carp)
陶斯松	—	0.18 (gold fish)
大克蟎	—	0.36
納乃得	3.4	0.80 (bluegill)
巴拉刈	—	7.2 (carp)
巴拉松	1.5	—
五氯酚	—	0.1 — 0.23
百滅寧	0.005	0.002(bluegill)
甲基多保淨	13.4	75 (carp)

* 虹鱒：rainbow trout (Salmo gairdneri)



圖一、櫻花鈎吻鮭保育區水質農藥監視採樣地點

櫻花鈎吻鮭之細菌、黴菌和病毒之研究(二)

徐亞莉[1]、程沛文[1]、楊崇楠[1,2]、吳金洌[1]、周延鑫[1]、張崑雄[1]

摘　要

台灣大甲溪上游，現武陵農場轄區內擁有陸封性鮭魚(landlocked salmon)—亦即櫻花鈎吻鮭(Oncorhynnchus masou Brevoort)，但目前已臨絶種邊緣，故政府于民國七十三年，將其列爲國寶魚，並于民國七十四年建櫻花鈎吻鮭復育保護中心，加強復育工作。並請台灣水試所鹿港分所支援人工孵化工作。歷年來孵化率由74年的37.24%，至75年的67.90%，至76年的72.32%，顯示孵化率提高很多。但死亡率仍然很高，如74年的94.31%，75年的89.6%，76年的95%，問題嚴重，多在魚苗時期死亡，茲爲研究爲何有如此高的死亡率，遂由魚病方面着手，期從細菌、黴菌及病毒之寄生情形調查研究，早期發現疾病，及時治療以減少因疾病而致死的機率，進而達到復育成功的目的。

此次復育自76年10月28日至76年11月2日，共捕獲種魚174尾，採得7139粒受精卵，因是國寶魚，不得活體採樣，至76年12月10日，共計孵出5162尾魚苗。但死亡率却高達95%。茲將未孵化卵、死亡之魚苗、稚魚及成魚先冷凍，再拿回南港病毒的分離和鑑定，冬天當魚體表面有白色菌絲出現時，將菌絲取出，放在愛默生培養基(Emerson's YpSs agar)上生長，再將菌絲挑出，接種在亞麻種子液培養于16℃，經觀察其形態和生活史，鑑定爲細囊水生菌，這種低溫水黴發生不變，早期可用藥浴，據Chien 報告，也認爲不致造成大量死亡。細菌分離需活體採樣，茲將體表潰爛之病魚內臟作細菌分離，培養後作十種生化檢驗，經鑑定知細菌有Aeromonas sobria, Plesinmonas shigelloides, Citrobactium freundii, E. coli,和 Enterobacterium cleacae 等五種，都不是致病性細菌。致於病毒方面，除作普通病毒分離培養外，並針對鮭鱒魚的剋星—傳染性胰臟壞死病毒作免疫點墨法檢驗。民國七十六年曾由一尾魚分離到一株水產呼腸孤病毒，稱之爲陸封性鮭魚病毒LSV(Landlocked Salomon Virus)。今年未再分離到任何水產呼腸孤病

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毒，或其他病毒。但由未孵化卵，死亡之魚苗，成魚內臟之組織均質所作的IPNV的免疫點墨法即利用病毒和其抗體結合的原理，發現約有0.62%的IPNV感染亦不是造成大量死亡原因。

綜上所觀，水黴菌感染很少，細菌亦是腸內菌，都不是造成死亡原因，而病毒分離，未曾發現正結果，亦表示去年的LSV病毒可能有其他地方鱒魚帶入，因只有一尾魚發現，今年未發現，亦不會造成死亡。而IPNV的感染率很低，亦不是造成魚苗大批死亡之故（因），當然病毒病材是冰凍過的，力價會下降很多，致使IPNV無法分離到，而免疫點墨法可測到一些。這使病毒分離率下降很多，但死亡之魚苗多爲瘦弱型，未潰爛，可能和孵化後的魚苗經一個月後，臍囊消失，需攝取食物而生，但無適當餌料供應，人工餌料不能適應，應培養一些浮游生物作爲過渡時期，訓餌時的食物。此外缺乏人手，加上遇大雨，溪水變混濁，挾帶之大量汚泥常覆蓋魚苗之鰓絲，無法呼吸而致死，應當設法改進。

大甲溪上游浮游生物相及水質之調查

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一、研 究 目 的

大甲溪上游水域向爲櫻花鈎吻鮭之棲息地；惟近年來由於兩岸山坡地之開墾，破壞水土保持，再加果園農場所使用之大量無機和有機肥料被雨水冲刷入溪流，使溪水中之植物營養塩增加而造成優養化，以及大量農藥流入水中而改變生物相與破壞棲息環境，導致櫻花鈎吻鮭頻臨絕跡。政府有鑑於此，特將櫻花鈎吻鮭列爲自然文化資產之一，並着手進行其生態調查及復育工作。爲了瞭解大甲溪上游櫻花鈎吻鮭之棲息環境，乃以自武陵至德基水庫大壩間之大甲溪爲調查區域。選擇6個採樣點定期採取水樣及浮游生物樣品以分析水質及浮游生物相；期能獲得有關大甲溪上游水域之水質及浮游生物相（種類組成和族群現存量），其時空變化及與水質變化關係之基本資料，以供評估該水域優養化程度及生態保育之參考。

二、研究材料及方法

自民國75年10月至76年6月，每隔2星期前往大甲溪上游之德基水庫大壩（第一站），宇能（第二站），松茂（第三站），中興路口（第四站），平等（第五站）及武陵（第六站）等6個採樣站採樣一次。除了中興路口及松茂兩站因坍方分別共採8及12次外，其餘4站皆分別共採13次。水質分析用之水樣乃利用塑膠製採水器自採樣點採取，除了部份當場用以測定水溫、pH、溶氧量及導電度外，其餘則裝入塑膠瓶中，並加以冷凍後，攜回實驗室以供測定分析硬度、總鹼度、濁度、氨氮、亞硝酸氮、硝酸氮、正磷酸磷、硫化物及其他水質因子。水質之分析方法乃採用陳（1982）所著之「水質分析」及Franson（1981）所編之「Standard methods」中所列之方法。

動物性浮游生物之樣品乃利用塑膠製採水器自採樣點採取30公升之水倒入網目爲

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55 μm之浮游生物採集網加以濃縮；再把濃縮之動物性浮游生物倒入預裝10ml 商業用福馬林液之100ml 容量塑膠瓶中，加水稀釋成100ml。植物性浮游生物樣品利用量筒自採樣點採取原水倒入裝2.5ml Lugol's solution之250 ml容量塑膠瓶中，使水量剛好爲250 ml。採得之浮游生物標本攜回實驗室加以鑑定種類及計數，以分析種類組成、豐度及種歧異度。

三、研 究 結 果

於全調查期由6 採樣站所測得之水質因子範圍爲：水溫4.0～20.0°C ，溶氧量2.17～12.21 ppm，pH 7.8～9.5，導電度150～560 μmhos/cm，總硬度 70～440 ppm，鈣13.6～96.0 ppm，總鹼度5.28～88.79 ppm，化學需氧量0.08～17.60 ppm，懸浮固體1.0～438.0 ppm，濁度ND～38.85 NTU，氨態氮ND～0.399ppm，亞硝酸態氨ND～0.013 ppm，硝酸態氮0.167～1.191 ppm，正磷酸磷0.001～0.374 ppm，總磷0.004～1.181 ppm，硫化物ND～0.043 ppm，矽酸ND～3.51 ppm，葉綠素甲ND～242.11 mg/m^3。

於全調查期由6 採樣站共發現24 種（21 屬）之植物性浮游生物（綠藻植物門8 種，黃色藻植物門15 種及褐色鞭毛藻植物門1 種）。各站所出現之植物性浮游生物大多屬優養化水域種，而其總種類數之大小依序爲松茂（21種）＞德基大壩（20 種）＞宇能（19種）＞中興路口（17 種）＞平等（15種）＞武陵（14 種）。各站各次採到之植物性浮游生物種類大致上以黃色藻植物門爲最多；其量大致上，在德基大壩與宇能兩站以綠藻植物門佔優勢，而在其他站則以黃色藻植物門佔優勢。各站植物性浮游生物之總豐度（No./L）平均以宇能站者（116,295 ）最高，平等站者（29,985 ）最低；其種歧異度指數介於0.43 與3.13之間，各站全調查期之平均值則介於 1.51 與2.59 之間。

於全調查期由6 採樣站共發現54 種（38 屬）之動物性浮游生物（原生動物10種，輪蟲動物38種及甲殼類動物6 種）。各站所出現動物性浮游生物總種類數之大小依序爲宇能（38種）＞松茂（33種）＞德基大壩（31種）＞平等（18 種）＞中興路口（15種）＞武陵（13種）。德基大壩、宇能及松茂等三站各次所採得之動物性浮游生物種類平均以輪蟲動物爲最多，而中興路口、平等及武陵等三站則以原生動物爲最多。又各站各次所採得動物性浮游生物之量，平均以原生動物所佔之比例爲最高；而原生動物中則平均以 *Peridinium* sp. 佔最優勢。各站動物性浮游生物之總豐度，平均以松茂站者（455,039）最高，平等站者（64）最低；其種歧異度指數介於0與1.76之間，各站全調查

期之平均值則介於 0.49 與 0.92 之間。

植物性浮游生物豐度與水溫、pH、濁度及亞硝酸態氮成正相關；動物性浮游生物豐度則與植物性浮游生物豐度、水溫、導電度、總鹼度、化學需氧量、懸浮固體、濁度、氨態氮、亞硝酸態氮、正磷酸磷、總磷、矽酸及葉綠素甲成正相關，而與溶氧量成負相關。

四、結論與建議

㈠大甲溪上游 6 站全調查期之平均總磷及總氮值分別爲 108.4 及 516.4 ppb，若根據 OECD 水域營養狀態之分類標準，其水質屬中營養性而偏優營養性。又，若根據 Carson（1977）所發展出之水域營養狀態指數（TSI）值來判斷，則因各站之 TSI 值皆大於 40（介於 62 與 79 之間），大甲溪上游之水質可歸屬優營養化水域。

㈡本調查所發現之植物性浮游生物，除了 *Characium*, *Staurastrum*, *Tetraedron*, *Eunotia* 及 *Rhizosolenia* 等 5 屬外，其他各屬皆在 Palmer（1969）根據以往 165 位研究者所發表之報告所歸納出對有機污染具有忍受性之頭 52 個藻屬中。*Scenedesmus*, *Nitzschia*, *Navicula*, *Synedra*, *Melosira*, *Gomphonema* 及 *Cyclotella* 則在頭 15 個屬中；由此可見大甲溪上游受有機污染程度之一般。

㈢大甲溪上游之水質根據各站植物性浮游生物之平均種歧異度指數（1.51 ～ 2.59）判斷屬中度污染，但若根據動物性浮游生物之平均種歧異度指數判斷則屬嚴重污染。

㈣動物性浮游生物以原生動物之 *Peridinium* 佔優勢；*Peridinium* 量與導電度、總鹼度及 COD 呈正相關，表示其喜愛高導電度、高鹼度及高有機物量之環境。又此動物量與氨態氮、亞硝酸態氮、正磷酸態磷及矽酸等量呈正相關，表示這些營養塩之多寡會控制其量之高低。

㈤大甲溪上游水域之溶解性總氮濃度爲 0.19 ～ 1.228 ppm（平均，0.516 ± 0.218）高出形成 *Peridinium* 紅潮所需之最低溶解性氮濃度（0.02 ～ 0.05 ppm）很多。溶解性磷濃度爲 0.01 ～ 0.374ppm（平均，0.024 ± 0.050）接近於形成 *Peridinium* 紅潮所需之最低溶解性磷濃度（0.02 ～ 0.1 ppm）。

㈥大甲溪上游水域之有機質量高（COD 濃度 0.08 ～ 17.60 ppm；平均 3.68 ± 4.35）流入德基水庫，經異營性細菌之利用，可能形成大量之 B 族維他命，以促進 *Peridinium* 之大量增殖。

㈦總而言之，大甲溪上游 *Peridinium* 之增殖受許多物理、化學及生物性環境因子所

影響，各種環境因子並非單獨作用，而是以錯綜複雜之交互作用產生影響；因此，要瞭解其異常增殖之發生機制，必須藉野外物理、化學與生物性因子之長期調查，配合室內培養試驗與生物檢定，做整體性的探討。又，爲了瞭解大甲溪上游水域之優養化程度及其演變過程，也必須對該水域之水質與生物相之變化做長期追踪監視。

蘭嶼角鴞之生物學研究及經營管理

劉 小 如*

蘭嶼角鴞是蘭嶼特有亞種，台灣本島並無分佈。本計劃調查此種鳥之數量、分佈、及其自然史，以爲經營管理之依據，研究方法包括文獻整理、定期訪問地方居民、及在野外蒐集有關此種鳥之生態、行爲、及生殖等方面之資料。

蘭嶼島上僅存150至230隻角鴞，近三年來族群尚稱穩定。角鴞爲食蟲性貓頭鷹，主要生存在有巨大老樹的成熟林中，但這種棲息環境近年來已大爲減少。雖然角鴞也會利用已被人工大量改變的環境，但此種棲地每處頂多只能容納2至4隻角鴞，同時亦不允許成熟林中角鴞所有的社會關係，而社會關係在此種鳥之生存上可能很重要，故改變過的棲地不是適於此種鴞長期生存之重要環境。

部份角鴞全年使用同一棲地，有些會在生殖季結束後移往他處，另有些會在生殖季初期求偶期在特殊地點出現，但一、二個月後即移到他處去生殖。此種移動現象仍有待進一步瞭解。一對角鴞全年使用同一棲地時，活動領域約是6公頃。

成熟林中之角鴞密度很高，個體活動範圍有極大之重疊，雖然數隻會在附近覓食或休息，却從未見展示敵對行爲。成熟林中之高密度，不知是因棲地減少造成之現象，還是有特殊社會行爲上之意義。

蘭嶼角鴞成對繁殖，全年均不維持任何領域。生蛋前雌雄會重覆交配多次。雄鴞會携帶食物來餵雌鴞，交配前會以鳴叫互相應合，交配時也會發出交配叫聲。配偶關係可能會維持數年。巢多設在天然樹洞中，但也有少數幾巢據說築在椰子樹之葉柄集中部位。同一樹洞可能會重覆使用，尤其在樹洞少巢位有限之地區更是如此。

角鴞每巢生2至3個蛋，二個蛋之間推測可能間隔二天。若生殖季初期巢被毀，雌鳥會再生一窩蛋。孵卵僅由雌鳥負責，幼鳥可能約30天後孵出，其後雙親共同覓食照顧，32天後幼鳥可離巢，親鳥會繼續照顧至少24天。幼鴞孵出時全身有白色茸毛，9天時羽鞘開始出現，20天時幼鳥之羽毛已覆蓋全身。幼鳥離巢時體重高於成鳥，脚長在二星期時已與成鳥相同，但喙長則生長較慢，直到離巢時仍比成鳥短小。

離巢幼鳥會在巢邊停留數天至三個多星期，移走後均不知下落，也沒有一隻在第二年生殖季時出現過。故角鴞性成熟的年齡仍待進一步研究。

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角鴞之繁殖成功率受築巢地點及人類捕捉干擾的影響，尤其當地駐軍無聊時會捕鳥取樂。因角鴞族群小，捕捉幾十隻會有嚴重的影響。75年繫放之鳥中，僅有36.7%仍存活著，76年的鳥中，有71.4%仍活著，但77年之鳥僅39.6%仍在，故角鴞之死亡率可能很高。因此若現有棲地進一步減少，角鴞族群必會很快地降低。

根據以上狀況，對農委會提出的經營管理建議包括下列數項：

1.切實保護現存棲息環境，除雅美人傳統用途外，禁止砍伐樹木。

2.勸阻蘭嶼駐軍不再以捕捉角鴞爲消遣，而可以把時間用來賞鳥或參與研究工作。

3.對蘭嶼特有或瀕臨絕種之生物，嚴禁捕捉、買賣、或運出運入蘭嶼。

4.建立蘭嶼角鴞保護區，並派員巡邏及經營管理此保護區。

5.推動社會教育計劃，協助民衆瞭解蘭嶼角鴞爲何需要保護。

大肚溪口鳥類保護區之研究

陳 炳 煌

一研究目的：

1.研究大肚溪口主要鳥類族群（鸛鷺類、雁鴨類及鷸鴴類）之棲息地使用情形及活動模式。

2.依據前列研究結果劃定“大肚溪口鳥類保護區”之範圍。

3.調查現有及計劃中之土地利用方式，並評估其對於主要鳥類族群之影響。

二研究方法：

1.鳥類研究——收集台中鳥會、台灣大學及東海大學已有之觀察記錄，以分析鳥類之種屬結構，相對豐度及季節性變化。鳥類分佈、棲息地及移動模式則以八倍之雙筒及二十倍之單筒望遠鏡在現場實地觀察以取得資料。

2.土地利用——以現場觀察及訪問土地使用人瞭解土地使用現況，以向有關單位諮詢的方式瞭解未來可能土地利用方式。

3.保護區之初步規劃----分別分析鳥類資源、棲息地土地利用及環境因素之後，再綜合評估，確定進行設立保護區之可行性後，先劃定保護區範圍，建立管理方式和保護措施，以座談會之方式徵詢有關機構及專家學者之意見後，修訂原來構想而成爲初步規劃案。

三研究結果：

私立東海大學　　台中市台中港路

1.主要鳥群之棲息地使用及活動模式：

①鷺科鳥類：

河流區是鷺科鳥類最重要的分佈據點，張玉姑廟旁防風林有一處鷺鷥營巢處。春夏之間，小白鷺、牛背鷺和夜鷺在此繁殖。覓食時，小白鷺的鳥群近乎均勻地分佈在河流區、潮間帶及新生地的淺水地帶。大白鷺和中白鷺和蒼鷺也以河流區爲主要活動範圍。牛背鷺和紫鷺則多出現在新生地的低草的地方。在新生地生活的小白鷺未見受到潮水漲退的影響；在潮間帶和河流區活動的鷺群則明顯隨潮水而進退。春夏繁殖期間，小白鷺、牛背鷺和夜鷺在張玉姑廟的樹林和水域間來來往往，捕捉小動物以餵食幼鷺。繁殖期後，則白鷺和夜鷺形成明顯的日夜輪班制在營巢區棲息。

②雁鴨科鳥類：

秋季移棲高峯時，大批水鴨聚集在離岸較遠（約2公里）之潮間帶，冬季較多水鴨分布於河流區，只有較小的鴨群出現在新生地的水域和草地中。一般的觀察看不出鴨群受潮汐的影響。在潮間帶和河流邊的水鴨，退潮時鴨群佇立泥潮或沙灘上，滿潮時則浮游水面上。部份水鴨在夜晚飛向上游覓食，而於清晨飛回河口休息。

③鷸科和鴴科鳥類：

大部份種類只在潮間帶和新生區出現。潮間帶的覓食者與潮水的漲退亦步亦趨地移動，當漲潮而使大片潮間帶淹沒於水中時，則鳥群紛紛飛向內陸暫時休息，等退潮時再重返潮間帶。唯有些種類如稚鷸、田鷸和鷹斑鷸等則只在新生地覓食而不受潮汐的影響。

2.保護區範圍之劃定：

理想之保護區應包括水鳥覓食之潮間帶海域約1,600公頃，大肚溪下游感潮區河段10公里約500公頃及海埔新生地約160公頃，總面積約2,260公頃。

3.土地利用及其對鳥群之影響：

①彰濱工業區：彰濱工業區之開發，若依原計畫足額開發，則鳥類棲息地將破壞殆盡。所幸該計畫已經暫停並將修正。伸港區的工業用地解除是保護區的先決要件。線西區的部份解除則相當有利於保護區的發展。

②台中火力發電廠：台中火力發電廠的建設將造成河口北岸鳥類棲息地的損失，當然會影響鳥類的種類與數量。尤其是每年在此過冬的大酌鷸必然首當其衝。

③煤灰堆置場：若火力發電廠將其大量煤灰棄置於伸港區水域，則由於重要覓食區之消失，極可能使大肚溪口之鳥類資源產生毀滅性影響。若煤灰場置於線西區，則應保留北端約160公頃，作爲高潮期水鳥的蔽護所。

④其他土地利用計畫：台灣海岸地區土地利用之需求甚爲緊迫，大肚溪口已經國際保育界肯定，具有開發成爲世界級鳥類保護區之潛力，但只有早日完成法定程序，並經營管理。否則實難逃終遭破壞之命運。

四結論與建議

1.世界級的自然文化景觀：

大肚溪口位於台灣中西部，特殊的河口生態環境使數以萬千計的鳥類在此聚集。這些以移棲性水鳥爲主的鳥類族群所形成之自然文化景觀，已受到國內外鳥類學家及保育界領導人士之肯定。發展大肚溪口使其成爲鳥類保護區已成爲育界的共同願望。

2.土地國家所有，必須由工業區轉爲保護區：

大肚溪口鳥類保護區預定地屬於國家所有，因此不必徵收私人土地。這是設立保護區極爲有利之條件。目前之土地歸類爲工業區用地，必須經由政府政策性之考量才能轉化做爲保護區之使用。由於保護區北面即是台中火力發電廠，保護區南面是面積廣大的彰濱工業區，因此將此河口地區轉化爲保護區，對於工業污染之過份密集具有緩衝和預警效果。

3.開發與保育齊頭並進，保護區代表國家發展新的里程碑：

大肚溪口鳥類保護區原來之最大難題乃爲台中火力發電廠棄灰之計劃之土地利用的衝突。然居於開發與保育並重，水鳥與工業共存之考量，台灣電力公司已經在火力發電廠的環境影響評估完成後承諾重新計劃棄灰計劃，以保持鳥類保護區之完整。此項改變實爲我國保育史上之新的里程碑。但若鳥類保護區的計劃不幸失敗，則台電爲資源保育而付出之心力及經費反成爲資源的浪費。

4.保護區範圍包括海域、河流和海埔新生地，面積約2,260公頃：

河口海域廣大之潮間帶是主要鳥群覓食之地，潮水上漲後，鳥群移入河流區及海埔新生地，因此完整之鳥類保護區應包括海域、河流和海埔新生地三大部份。

5.海埔新生地必須分區進行環境經營：

爲提高保護區之生態負荷能力，並使其發揮學術研究，環境教育和國民遊憩之多邊效應。海埔新生地應依資源特性和環境條件，分區進行環境經營。此項工程包括造林，草生地演替控制，水位調節，水池面積重整和池岸環境之設計等。

6. 應盡速完成法定程序，選定管理機關：

爲使保護區之理想與目標能早日落實，應盡速完成保護區之法定程序，並選定管理機關以進行後續之研究工作與實質規劃。基於機關之業務功能，人力資源及地緣關係之考慮，建議國立自然科學博物館爲大肚溪口鳥類保護區之法定管理機關。

澎湖貓嶼海鳥保護區之可行性研究

王穎　陳翠蘭

前　言

貓嶼位於澎湖群島西南方，島上有衆多的燕鷗在此棲息，是台灣典型而少有的海鳥繁殖地，亦是許多賞鳥人士嚮往的聖地。然多年來，由於各種人爲因素的干擾，嚴重影響島上族群的變化，經各界賞鳥人士共識貓嶼爲我們寶貴的鳥類資源區，有加強保護的必要。本研究乃以二年時間，針對貓嶼生態環境、鳥類動態及漁民對該島和其附近海域的利用，做一初步訪查，並就其是否適宜劃爲保護區作一初步探討。

研究方法

自民國 75 年 7 月至 77 年 8 月間，於繁殖季節（ 3 － 9 月），每月 2 次，每次 3 － 7 天，而於非繁殖季節（10－ 2 月），每月 1 次，每次 1 － 2 天，前往貓嶼及鄰近島嶼調查。資料收集方式爲野外實地調查和漁民訪問；內容包括該區鳥種分布、族群數量及海鳥活動情形，並對該區漁業資源，漁民和訪客對該區的利用情形，做一了解。所得資料則參考保護區設立應考慮條件（ Roome, 1981；Killingbeck , 1984；Usher , 1986 ）分項探討，以對貓嶼劃爲保護區之可行性作一評估。

結　果

1.海鳥資源：

兩年內，共發現 23 科 44 種鳥，其中白眉燕鷗（ *Sterna anaethetus* ）、玄燕鷗（ *Anous stolidus* ）等 7 種鳥在此繁殖，餘多爲過境的候鳥，其中包括稀有鳥類如大水薙鳥（ *Calonectric leucomelas* ）、黑脚信天翁（ *Diomedea nigripes* ）、白腹鰹鳥（ *Sula leucogaster* ）等。於繁殖季節時，平均每月可見到 11.4 種鳥（ SD＝ 5.90 ），全島以玄和白眉燕鷗爲主，在繁殖高峯期，島上可見到配對的燕鷗和成群的海鳥在島四周活動，數量可高達萬隻以上。附近各島植相單純，除花嶼外，各島地質構造相似，然就燕鷗的數量和種類而言，則遠遜於貓嶼。

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2.干擾及利用：

島上除曾見玄鼠（*Rattus rattus*）在島上活動外，並未見其它任何天敵，其主要的干擾多來自人對該島及其附近資源的利用。貓嶼附近海域有20種以上漁產，全年皆吸引漁民前往作業，二年內共記錄有32艘不同的船在貓嶼附近（1公里海域內）作業或休息，這些船分屬於花嶼、望安、七美等7個離島，此外，大陸的漁船亦曾在此出現。若就出現頻率最多的3個島（花嶼、七美、望安）來此作業的25艘船的出海狀況作一分析，每船計1－3人，在繁殖季節時，平均造訪天數爲17.62天，而於非繁殖季節，平均爲14.08天；島上盛產螺、蟹、及紫菜等爲漁民採收的對象，故一年四季亦可見漁民在島上及四周海域活動。除漁民對本島資源的利用外，在繁殖季節，大批海鳥聚集時，亦吸引遊客對此地的造訪，平均每月1.87船次（SD＝1.64），每船人數3－50人不等。此外，本島曾爲國軍的炸射目標，雖目前已停止，然附近海域仍爲國軍炸射的範圍。

結論與建議

就貓嶼適合設立保護區的條件而言，貓嶼鳥種數在鄰近各島可算是最高的，而亦有稀有鳥在此停留；若就面積大小與出現種類比較，貓嶼鳥種和數量密度，亦爲附近各離島之冠；而島上繁殖族群在千隻以上，具有相當代表性，對種源保存及科學研究亦有相當的價值；故就種之歧異性、稀有性、區域面積大小與種出現頻度、代表性及自然性、種源保存等觀點而言，貓嶼是符合設立保護區的。然本地所具有豐富的海鳥和其它動物資源，成爲大衆前往觀賞遊憩的地點，其所提供的教育和遊憩價值亦高；而國軍和漁民對此利用亦對海鳥造成相當大的干擾；此外附近海域是良好的漁場，亦造成相當高頻率的經濟活動；故就貓嶼之高經濟性、受人爲干擾程度及所提供的觀光、遊憩性而言，都是不利於設置保護區的條件。故考慮貓嶼及其附近受利用情形而言，建議以經營國家公園的方式和理念，對貓嶼及其鄰近海域做分區性的規劃，從事季節性的資源利用，以達到保護和利用共存的目的。

東亞國際候鳥繫放先驅計劃

郭達仁[1]，曾美麗[1]，莊永泓[1]，曹美華[1]

摘　要

本計劃主要目的，是建立完整且可信度高之候鳥遷移調查記錄檔案，做爲進一步生態科學研究及保育工作之基礎。另一方面是與國際間其他國家合作，互相交換研究成果，俾對全世界生態研究貢獻力量。

本計劃爲一長期性研究，目前已進入第三年，自民國七十五年十一月起迄今，每個週六下午至週日上午，在關渡地區進行繫放調查一次。執行本項研究的人員包括本會會員、台大及淡大野鳥社之社員。鳥類的捕捉採用霧網方式，所捕捉到的鳥類，經過上環、測量、記錄之後放飛。

自民國七十五年十一月起至七十八年二月止，共作業九十五次，捕獲57種3,400隻次候鳥。其中回收150隻次，隔年回收43隻。在本計劃中最重要的收獲，是捕獲到一隻日本繫放的反嘴鷸（*Xenus cinereus*）及一隻澳洲繫放的黃足鷸（*Tringa brevipes*），對於這兩隻鳥的資料，已分別透過相關組織與原繫放單位取得聯繫，確實達到國際候鳥繫放合作之目的。另外經由繫放調查，我們鑑別了蘆鵐（*Emberiza schoeniclus*）、小濱鷸（*Calidris minuta*）、西濱鷸（*Calidris mauri*）等野外新記錄種；同時也捕獲到稀有記錄種秋小鶯（*Ixobrychus eurhythmus*）及灰沙燕（*Riparia riparia*），增進我們對台灣野生鳥類生態之認識。

本計劃中，針對所繫放候鳥的資料進行分析，我們有以下發現：

1. 有關候鳥成幼鳥之判斷，我們以在關渡地區渡冬的濱鷸（*Calidris alpina*）爲主要的研究對象，由捕獲1,143隻次，回收67隻次，隔年回收23隻次的濱鷸資料顯示，成幼鳥的判斷可依：飛羽的形狀。羽毛磨損的程度。覆羽的色澤或紋路。等三項主要特徵判讀。
2. 有關各種候鳥換羽的問題，我們發現各個鳥種有其特定順序及時間表。水鳥初級飛羽換羽，除一般由內往外漸續替換外，有些成鳥在遷移期，會暫時停止換羽狀

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態，等到飛抵渡冬區後，再繼續未完成替換的部分；另外有些幼鳥在二月份前後，有替換外側部分飛羽之情形。即使是同一種鳥種，有時不同族群間的換羽情形，也會有所差異。我們正在收集更多的資料，希望能增進對在台灣候鳥換羽情形，能有更充分的了解。

3. 有關候鳥遷移過境的問題，我們發現關渡地區爲許多候鳥遷移時的中繼補給站。以黃足鷸（*Tringa brevipes*）爲例，每年春季過境期，在六週內可捕獲130隻以上，並且經再捕獲及統計資料發現，黃足鷸在此作二至三週停留，並且補充能量，體重可從一隻二週回收（109公克至145公克）知道增加近50％。由此可見關渡地區對於遷移性候鳥的重要性。

根據三年來的工作經驗，我們有下列建議事項：

1. 希望經由協調，仿照英、美及日本等國，成立具權威性的繫放中心，負責國內相關研究、訓練、協調、推廣，以及與國外聯絡、締盟、技術交流等事物性工作，以促使本項工作能夠達到統一，持續與廣泛化之目標。
2. 推廣繫放工作的對象及方法；台灣位處亞澳遷移路線之中點，而同處遷移線的日本，目前對於遷移陸鳥的繫放已行之有年，其繫放的相關組織已數度邀請我們與其合作陸鳥的繫放工作，因此建議在水鳥繫放的基礎上，增加陸鳥的繫放工作。另外對於本地留鳥的研究，目前所作的研究也很少，應以適當的方式逐步增加這方面的研究。而方法方面，除了上環外，希望能增加色標的方式，便利於日後之追蹤調查。
3. 繫放研究，應配合定期鳥口普查，尤其是濕地水鳥調查，彼此相輔相成，以便得到更完整的鳥類生態資料。

台灣地區山產店對野生動物資源利用的調查

王　穎　　陳瑾瑛　　林文昌

前　言

台灣地區地形複雜、氣候多變，形成各種生態環境，野生動物資源豐富。近年來由於人爲的大量獵捕及棲息地的破壞，致使野生動物資源銳減。本研究乃針對 18 種中、大型哺乳動物進行調查，以期了解動物的生存概況及被利用情形，以做爲日後管理的依據。

研究方法

本研究自 74 年7月，至 77 年6月，以三年時間對全省各地的山產中間商，以親訪、問卷、電訪方式進行野生動物買賣數量、價格等調查，並訪問山胞、林業工作人員對野生動物族羣變化之看法，此外，並以問卷調查消費者對動物之利用狀況。

結果與討論

1.山產店之分佈與經營型態

三年共發現全省經營野生動物買賣者計127家，其中以南部（ 54 家）及東部（51家）爲主，合佔全省 83 %。除部分（ 44.9 %）專營外，餘多兼營餐飲或雜貨等他種行業。店齡平均在 15 年左右（ n＝54）。其動物來源，絕大多數由獵人直接供應，尤以東部爲最；其餘來源則爲中間商互相調貨，少部分由養殖場供應。

2.經銷數量

從訪問山產中間商各種動物的交易情形，可依交易量將動物分爲三類：(1)主要動物：包括山羌、野兔、白鼻心、野豬、山羊和飛鼠等6種。各中間商一年交易量最高者可達 500 ～ 2000隻，平均每家的交易量由近 100（ 87.1 ）到 400 之間，是山產店動物買賣中最常見的種類。(2)普通動物：包括獼猴、鼬獾、食蟹獴、穿山甲和筆貓等5種。各中間商一年交易量最高者可達100 隻以上，平均每家的交易量在 10～ 50間；其中獼猴的交易量有增加的趨勢，76年度的平均交易量達 100隻以上（ n ＝ 6 ）。(3)稀有動物：包括黃鼠狼、水鹿、石虎、黑熊、黃喉貂和水獺等 6 種。各中間商一年交易量最高者

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可達 50 隻，平均每家交易量在 5 隻以下；其中水獺三年來只發現 1 隻，雲豹則無發現。

3.交易價格

在普遍爲人食用的7 種動物（山羌、野兔、野豬、山羊、白鼻心、穿山甲、水鹿）中，以穿山甲（ 1000 元／斤）和白鼻心（ 830元／斤）單價最高。其餘動物價格在250～370元間。若以活體售價來看，體型最大的台灣黑熊價格最高，每隻在 60,000～100,000 元之間；次爲野生水鹿，和捕獲量極少的石虎、黃喉貂、水獺，約在 12,000～40,000元間；其餘動物除飛鼠、野兔和鼬獾單價在數百之內外，多在1,000～10,000 元間。若從同種動物的成體和幼體比較，幼體價格往往不比成體低，以獼猴、白鼻心、山豬最爲明顯。

4.野生動物的利用情況

由消費者回答（ n = 540 ）得知，50%以上的人對調查的動物曾見過活體，以山豬（ 98.9 %）、野兔（ 97.5 %）、黑熊（ 96.0 %）最廣爲人知。食用方面，除雲豹、石虎、水獺未曾有食用記錄外，其餘動物以山羌、野兔、飛鼠等7 種（ 11 %～ 32%）較常被人食用；熊（ 3%）和穿山甲（ 8%）因價高，吃的人數較少；猴子、黃喉貂及略帶臭味的食蟹獴、筆貓、鼬獾、黃鼠狼，極少被拿來羹食。食用原因以好奇居多（56.9%)。動物的其他部分，如血、骨膠、鹿茸、熊胆、各動物鞭等，常被人拿來進補或治病。動物的頭頸、角和皮毛等，可製成標本或皮革。此外體型較小可當寵物者，如野兔、獼猴、白鼻心、飛鼠等，常被人飼養。

5.野生動物的族羣變化

從訪問山胞、林業人員對野生動物族羣多寡的看法，可將動物分成三類：主要動物包括飛鼠、獼猴、野豬、山羊、山羌、白鼻心及野兔；普通動物包括鼬獾、黃鼠狼；稀有動物包括水獺、石虎等 8種動物。若從野外族羣的增減來看，除飛鼠、獼猴、黃鼠狼族羣維持一定或有略增現象外，其餘動物都有減少的趨勢，而售價較高的黑熊、穿山甲和水鹿，更有大量減少的危機。

結　　語

綜合山產中間商、山胞、林業工作人員等意見，可將動物依其現存數量及所受獵捕壓力大小分爲四類：(1)受極大威脅者：水鹿、穿山甲、黑熊、水獺4 種；(2)受重大威脅者：山羌、山羊 2 種；(3)受威脅者：食蟹獴、白鼻心、野豬、野兔 4 種；(4)不受威脅者：黃鼠狼、石虎、筆貓、鼬獾、飛鼠、黃喉貂和獼猴7 種。

蘭嶼蝶相及珠光鳳蝶復育方法之研究

陳　維　壽[1]

1.研究目的

蘭嶼曾是聞名的蝴蝶盛產地。但近年來已成爲蝶類貧產地。另一方面至今尚無完整的有關蝴蝶研究報告。本項研究目的是：

(1)探討蘭嶼之獨特蝶相及有關蝶類之基本資料。

(2)探討珠光鳳蝶及其他蘭嶼產蝶類族群衰退原因，擬出保育計畫，對面臨絕種的珠光鳳蝶則一方面進行緊急種源之確保工作，一方面進行復育實驗，研擬可行之復育方法。

(3)研究如何在蘭嶼蝶類保育工作奏效後，將蝴蝶開發爲教育及觀光資源。

2.研究方法

(1)蘭嶼蝶相、分佈、生態、生活史等基本資料以傳統之方法進行調查。

(2)蝴蝶族群規模及消長則在可運用之人力及經營範圍內設計適合蘭嶼現況之生物調查和統計方法。

(3)復育方法：在台灣本島曾進行過之復育方法爲基礎，再考慮目標蝶種及食草之特質研擬方法，並實際進行實驗。根據實驗成果再修正並提出復育計畫。

3.研究結果

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(1)在蘭嶼共擁有 8 科 119 種蝶類。每 1 仟平方公里所產的蝶類種類相對系數爲 2578，爲世界罕見的「蝶種超高密度分佈區」。所產蝶種以菲律賓系統爲主之熱帶性蝶類。其中19種不在台灣分佈，另10種僅分佈在鵝鑾鼻半島。

(2)雖然所產蝶種繁多，但是蝴蝶族群規模很小。這種蝴蝶族群衰退之主要原因爲：①商人大量採捉蝴蝶，掘挖幼蟲食草。②最適合蝴蝶繁衍的沿海環狀帶形之沖積平原及河階幾乎被人開墾爲村落、農耕地、造林地及道路。

這些開墾如不再禁止，蝴蝶族群將會繼續衰退。珠光鳳蝶必將絕種。（蘭嶼中央山區雖然完整地保留了大片原始森林。但這種形態之密林，不適合蝴蝶繁衍）。

(3)珠光鳳蝶復育工作成敗之關鍵在幼蟲食草之復育工作，經過研擬方法並做可行性研究結果74年族群規模爲72隻，75年爲 217 隻，76年爲 531 隻。顯明地恢復族群生機並增加數量。可證明擬定之復育計畫可行性，同時也可以宣佈珠光鳳蝶暫時脫離了絕種危機。

(4)76年至77年之後續研究中發現，如復育工作停止時，珠光鳳蝶族群可維持數年安康，但其後乃然會逐暫衰退。因此必須正式進行大規模之復育工作。本項工作如成立蘭嶼國家公園當無問題，否則則必須僱用 1 名專業保育人員長駐現場進行復育工作，只少 5 年，使珠光鳳蝶族群擁有 5000 隻以上爲止。

(5)以珠光鳳蝶爲主體的蘭嶼蝶類保育工作一旦成功，再次使衆多蝴蝶飛舞於山野時，蝴蝶將會成爲蘭嶼風光的特色。如果於東靖舊苗葡附近再籌設蝴蝶園及小型蝴蝶博物館，蘭嶼的蝴蝶將可以轉爲觀光及教育資源。

4.結論及建議

(1)蘭嶼擁有以菲律賓系統爲主之衆多蝴蝶，但蝴蝶族群則很小。是世界少見的「超高蝶種分佈地區」，却是「蝴蝶貧產區」的奇異島嶼。

(2)蘭嶼島蝴蝶激減之主因是商人的大量採捉和開墾。如果不再進行現存生態環境之保育，蘭嶼蝶類會繼續衰退，珠光鳳蝶必然會絕種。

(3)珠光鳳蝶復育方法，經實驗證明可保成功。目前珠光鳳蝶暫時免除絕種危機。但必須正式進行大規模復育工作，直到族群規模擴大到 5000 隻以上爲止。

(4)復育工作一旦成功，蝴蝶將會成爲蘭嶼風光的特色。如再籌設蝴蝶園並附小型博物館，蝴蝶將可開發爲教育及觀光資源。

楠梓仙溪林道台灣獼猴猴群分佈與棲地利用

林曜松　　盧堅富　　李玲玲

摘　要

本研究在玉山國家公園境內的楠溪林道第 11.6 至 33.4 K處，調查台灣獼猴的族群數量、分佈、猴群組成、活動位、食物及行爲等，並探討猴群分佈、活動與林道旁植被之關係。

研究期間共發現 140 群次台灣獼猴，估計在林道上猴群之密度爲 2.01 群／ km^2 ，主要出現在 18.8 K至 26.4 K 處，該段林道所出現之猴群佔全部觀察猴群之69.8％。猴群大小由 1 至 14 隻不等，其中以 1 ～ 5 隻爲一群者最多，其次爲 6 ～ 10 隻一群者，大於 10 隻以上者最少。根據 10 群計數完整之猴群，猴群平均大小爲 7.8 隻，其中成猴 3.7 隻，幼猴 4.1 隻，成猴之性別比例爲 2.2 ： 1 。

楠溪林道上的植被以原始濶葉林居多，佔 40.2 ％，次生林次之佔 34 ％，原始針葉林與人造林最少，分別佔 13.5 及 11.0 ％。台灣獼猴在上述植被型之分佈，並非逢機。猴群密度在原始針葉林却爲最高，爲 3.2 群／ km^2 ，次生林次之（ 3.0 群／ km^2 ），其次爲人造林（ 2.66 群／ km^2 ），而以原始濶葉林最低，只有 0.75 群／ km^2 。原始濶葉林中因樹林茂密，不易觀察到全部猴群，其猴群密度有可能低估；而採收愛玉子人士及一些在當地工作的工人常在濶葉林中走動或兼捕猴群，也可能是猴群密度偏低的原因之一。相反的，原始針葉林中雲杉林及雲杉濶葉樹混生林，及次生林中赤楊林及赤楊二葉松混生林，猴群出現機率極高。這些植被型除了能提供高大的喬木，如雲杉、赤楊、二葉松，作爲休息與躲避敵害之用途，並有豐富的食物，如赤楊嫩莖髓及一些濶葉樹種的葉子、果實，因此有較高的猴群出現機率。

台灣獼猴活動會隨時段不同而活躍於森林之不同位置。早上 5 、 6 點，只會在樹上覓食， 7 、 8 點後猴群除覓食外，開始休息理毛與移動，此時常在地面出現， 9 點～12 點陽光轉烈，獼猴常在樹木上層的主幹附近枝條休息。下午 3 、 4 點以後，獼猴的活動漸漸以休息與理毛等社會行爲爲主，攝食活動減少，而移動機會增加。此時仍以樹上活動爲主。台灣獼猴食性隨季節之不同而改變，食物種類主要爲赤楊、山菊、高山芒草與水麻，所攝食之部位以果實所佔比例最高（ 46.7 ％），葉子次之（ 33.3 ％）。

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高雄縣境內鐘乳石石灰岩景觀調查

鍾廣吉

研究目的、材料及方法

石灰岩體由於其特殊的地質條件，容易形成特殊的地形景觀，依地景美學的觀點予以評估，其值得予以重視，因之在提升高雄地區居民的生活品質的需求之下，有必要將其特殊的地形景觀予以調查清楚，經詳細的野外踏察及訪問，對萬壽山臺泥礦區的石灰岩洞穴和大崗山地區配合航空照片的分析，將此二區的基礎地質、地形及其與特殊的地形景觀之關係予以調查。

研究結果及結論

大崗山的石灰岩體厚約40公尺左右，其上部爲紅土礫石和風化之石灰岩，此段之下才爲眞正的石灰岩體，下伏層爲砂泥質泥岩，石灰岩體之石灰岩大致有四類，即粗粒砂質石灰岩，砂土質石灰岩、塊狀石灰岩和緻密堅硬石灰岩。粗粒砂質石灰岩由小礫石、砂、小化石及貝類的較小碎屑組成，外觀看似粗粒砂岩，其新鮮面呈略爲疏鬆的膠結狀態，其表面則由於溶解後再膠結，略硬些，肉眼可以看到保存尙可辨認的貝類化石及一些底棲性有孔蟲化石。砂土質石灰岩爲風化產生的砂土質覆於石灰岩的表面者，表面的砂土有時也散佈著石灰岩的碎塊。塊狀碎屑石灰岩之表面被部份風化土壤所覆蓋，下部有局部爲整體塊狀者，大部份呈碎塊凌散分佈。緻密堅硬石灰岩呈塊狀完整，並呈層狀，由許多種類的生物碎屑膠結而成，尙可明顯地辨認出生物的類別如珊瑚、海綿、苔蘚蟲、海胆、有孔蟲及一些節肢動物的碎屑。

壽山的石灰岩體厚達500公尺左右，下部亦爲砂泥質泥岩，就上部的石灰岩體而言，亦屬礁質石灰岩，均由生物遺體或碎屑所組成，大致爲較下部以貝類、石灰藻、海綿、苔蘚蟲、海胆和有孔蟲等之遺骸或其碎屑組成，中間偶夾有少量之群體珊瑚或其碎屑，較上部始可發現較多的群體珊瑚或其碎屑，而這些生物碎屑大部份皆膠結得緻密堅硬，有的甚至已再結晶比原來之生物碎屑更堅硬。

壽山與大崗山似相同地受有來自東南方向的應力作用，而形成大致東北—西南向的

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構造線形排列趨勢，其節理、斷層或褶皺大致呈東北一西南走向，此趨勢的線性特性即形成特殊景觀的主要地質條件。

在這些地質條件下經詳細調查分類，特殊地形景觀計有洞穴景觀、斷崖景觀、峽谷景觀、化石景觀及鐘乳石景觀，茲就地景特性、地景視覺要素和地景形成的地質作用分別予以敍述：

洞穴景觀具有封閉景觀、頂蓋景觀、焦點景觀和小景觀的特徵，並具有無固定形貌、直線、曲線及不規則線形，原本單調的色彩，可因不同的灯光而有不同的色彩之視覺要素，其形成的地質作用爲內營力地質作用的斷層作用與外營力地質作用的溶蝕作用的結果。

斷崖景觀具有全景景觀和小景觀的特徵，並具有直立平面形貌、直線形，由岩石和植生決定的色彩之視覺要素，其形成的地質作用爲內營力地質作用的斷層作用的結果。

峽岩景觀具有封閉景觀和小景觀的特徵，並具有多變化形貌、直線、曲線和斷線線形及陽光照射與植生組成的色彩之視覺要素，其形成的地質作用爲內營力地質作用的斷層作用與外營力地質作用的溶蝕作用的結果。

化石景觀具有主題景觀和小景觀的特徵，並具有多樣性形貌與線形之視覺要素，其形成的地質作用爲外營力地質作用的侵蝕作用、搬運作用和堆積作用的結果。

鐘乳石景觀具有主題景觀、小景觀和短暫景觀的特徵，並具有石桃、石簾、石藤、人像之多樣性形貌，直線、曲線、斷線的線形，富於變化色彩的視覺要素，其形成的地質作用爲外營力地質作用的侵蝕作用、搬運作用和堆積作用的結果。

建　議

石灰岩體具有特殊的地形景觀，這些景觀有其特殊的觀景及學術價值，應予以保持維護，防止破壞，一方面也應停止在如此接近聚落地區的石灰岩體繼續開採石灰岩礦，需設法將此些石灰岩體保留下來，並予以擴大調查，將所有特殊的景觀全部調查出來。

關渡自然公園規劃暨自然保留區管理維護計畫執行報告

郭聰欽(1)　　張　媛(1)　　靳其偉(1)

摘　要：關渡沼澤區位於淡水河與基隆河交界處，由泽泽鹼草、蘆葦及水筆仔等優勢生物構成該區獨特之生態環境，爲了保護該沼澤區及生存其間之生物，並提供保育、遊憩、教育之目的。經行政院農業委員會與台北市政府以關渡堤防爲界分別劃設了自然保留區及自然公園用地。

本計畫執行期程自民國75年7月1日至民國79年6月30日，主要計畫目標有(1)規劃關渡自然公園(2)保護與管理關渡自然保留區及(3)推廣自然生態保育觀念與知識。（關鍵語：關渡自然保留區、關渡自然公園。）

前　言

關渡沼澤區位於淡水河與基隆河交界處，擁有大片泽泽鹼草、蘆葦及許多水筆仔，並與生活其間的魚蝦、蟹、貝類及其它無脊椎動物與鳥類等生物構成一完整的沼澤生態體系；充足的自然資源吸引了大批候鳥來覓食，以此爲遷徙旅途之中繼站或棲留越冬，使關渡成爲本省鳥類相最豐富的地區。台北市政府爲保育野生鳥類，於民國七十二年九月公告劃定關渡水鳥生態保育區，制頒：保護管理措施，並委託國立台灣大學動物系林曜松教授從事該區之初步規劃，經林教授等於參考英、美及日本先進野鳥公園之設計，並與國內學者專家研討後，乃建議將關渡沼澤區規劃爲一自然公園，以保護關渡草澤及生存其間之生物，並兼具遊憩、教育及研究之功能。

台北市政府於民國七十五年一月成立籌建關渡自然公園專案小組，積極推動籌建作業，而關渡水鳥保育區，亦經行政院農業委員會於同年六月公告爲關渡自然保留區，依

(1)台北市政府建設局，中華民國，臺北市。

文化資產保存法暨其施行細則嚴格保護之（保留區及自然公園範圍如圖一）。

計畫目標

本計畫全程執行執行期限爲民國七十五年七月一日至七十九年六月卅日，由台北市政府建設局負責執行，計畫目標如下：

一、規劃關渡自然公園。

二、保護及管理關渡自然保留區。

三、推廣自然生態保育觀念及知識。

執行方法與成果

一、關渡自然公園規劃

台北市政府建設局於七十五年七月委託台北市野鳥學會辦理「關渡自然公園細部規劃」，由台灣大學林曜松教授主持，至七十七年四月底完成：按該規劃案未來之關渡自然公園包括有半鹹水池、泥濕地、淡水池、水稻區、砂礫地、高莖草本地、低莖草本地、樹林地等八種環境，於園區內分設停車場、廣場、保護區、景觀區、休閒遊憩區及教育解說區等區域，總面積爲50公頃。自然公園之解說設施整體規劃將於七十八年度委託中華民國野鳥學會辦理。（自然公園區域規劃如圖二）。

二、設置標示牌

於七十六年五月在關渡宮前關渡防潮堤出入口處約30公尺處設置關渡自然保留區標示牌及範圍圖板各一面，以爲宣導之用。另設置台北市關渡水鳥生態保育區大型解說牌乙面，內容包括關渡水鳥保育區保護管理措施、關渡沼澤區生態環境簡介、位置圖及該區常見鳥類圖說等解說資料。

三、區界保護

除於區內設置標示牌以標明保護對象、面積及管理機構及範圍圖板來呼籲民衆勿擅自乘小舢舨等工具進出沼澤區，以免驚擾鳥類，並共同珍惜自然景觀資源外，並依照關渡水鳥保　區保護管理措施及區域計畫法、都市計畫法、文化資產保存法及狩獵法等有關法令，由台北市政府警察局及環境保護局加強查報取締於本區內改變地形、地貌及破壞自然狀態等行爲，並由環境保護局定期於區內實施例行整理清潔環境工作。

四、建立自然生態資料系統，加強基本生態之調查及研究

關渡沼澤區因其獨特而多樣性的環境條件，而擁有極其豐富的生物資源：

㈠動物方面：

根據台北市野鳥學會調查紀錄，近幾年來，在本區出現之鳥種類約 200 種（包括留鳥、過境鳥、冬候鳥、夏候鳥、迷鳥及外來種），其數量更爲龐大，因而每年吸引大批人士前來觀賞，使關渡沼澤區成爲台灣北部最佳賞鳥地之一。由於本區位於基隆河與淡水河交會處，且距離淡水河口僅10公里，故爲感潮河段的半淡鹹水區每天受潮水漲落的影響，水位變動頗大，而水中鹽分也隨之改變，造成了棲地環境的多樣性及複雜度，在此間生存的動物除了鳥類之外，尚有魚類（如彈塗魚、吳郭魚等）、貝類（如文蛤、台灣蜆等）、螃蟹（如招潮蟹、蝷等），兩棲動物（如澤蛙、蟾蜍等），陸棲昆蟲（如蝗蝶等常見於農業區內者）及水棲昆蟲（如負子蟲、水蠆蠏等）。

㈡植物方面：

本區原爲水稻栽培區，自民國五十七年堤防建築後，堤防沙洲上的江江鹹草、蘆葦及水筆仔逐漸形成一特殊的植動群落——鹽性濕生植群，而與整個沼澤區內及未來之關渡自然公園土地上之其它植被——水池（塘）中的水生植被，草原上的濕生植被，高地上的旱生植被，農耕地上的水稻單一植被，及零散分佈之木本植被，組成了各種生物生存所需要的各樣棲息環境，並成爲整個區內生態體系上食物鏈中之生產者。

五、編印推廣水鳥保育教育資料

編印「鳥類的伊甸園」、「關渡生態之旅」、「台北市關渡水鳥保育區」、「今關古渡」、「關渡生態保育區自導式賞鳥圖」等手册、海報與摺頁等宣導資料，分送各界人士參考，以提昇國民之生態保育觀念。

六、舉辦推動自然生態保育宣導活動

㈠與台北市野鳥學會於關渡自然公園預定地合辦水鳥季賞鳥活動，每年二次，帶引市民於享受賞鳥樂趣及接受大自然洗禮中，建立生態保育之觀念。

㈡舉辦生態資源系列講座，分別依一般市民及國民小學自然科學教師適用課程編排講習內容，以推廣自然生態保育觀念及知識。

待克服之課題及建議事項

一、自然生態保育之觀念在國際上已蔚爲風氣，唯對國內一般民衆而言，仍嫌薄弱，往往對政府推動的策略一知半解而無法配合，建議對目前國內所有之自然保留區及其它珍貴稀有或瀕臨絕種之生物或自然景觀做一有系統之介紹，並多利用大衆傳播媒體做定期性的系統報導與宣傳，使自然生態保育之觀念不致流於口號，而能在國民心目中紮根，

在國內社會中落實。

二、關渡自然保留區原有之豐富資源——鳥類，近因沼澤區的優勢植物紅樹林（水筆仔）之過度茂密而造成棲地面積減少，可能對未來自然公園的鳥類來源及數量有負面影響，台北市政府建設局刻委託台北市野鳥學會研訂該區水鳥棲地改善試驗計畫，擬將試驗區內紅樹林予以疏伐，以觀察棲地改善後野鳥族群數量是否回升，試驗結果做爲以後經營管理關渡紅樹林之依據。

三、關渡自然公園之籌建已併入台北市關渡平原整體開發方式處理，關渡平原開發計畫因牽涉太廣，實難預期何時可實施。關渡自然公園爲我國籌建之首座自然（野鳥）公園，備受各方矚目，爲減少該公園預定地所具優良自然環境，因未及早加以經營管理而遭受人爲、天然等不可回復之破壞，致失卻設置自然公園之天然條件，宜結合民間與政府的力量，敦促自然公園早日闢建。

誌　　謝

本計畫承行政院農業委員會長期補助，並獲台北市野鳥學會鼎力協助，特此致謝。

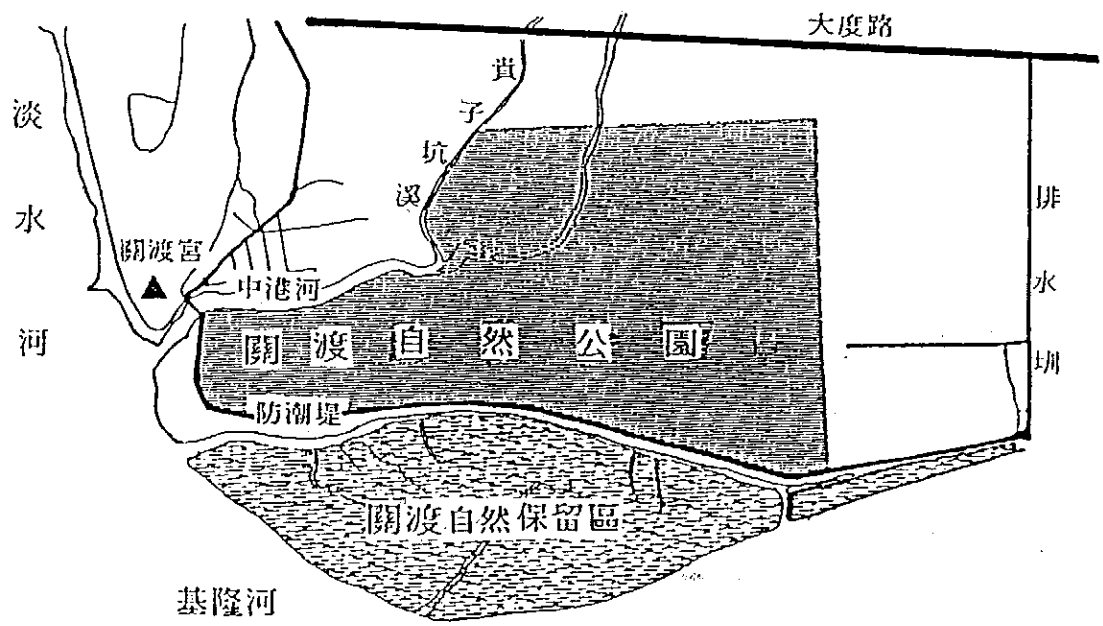

圖 一 關渡自然保留區與關渡自然公園範圍

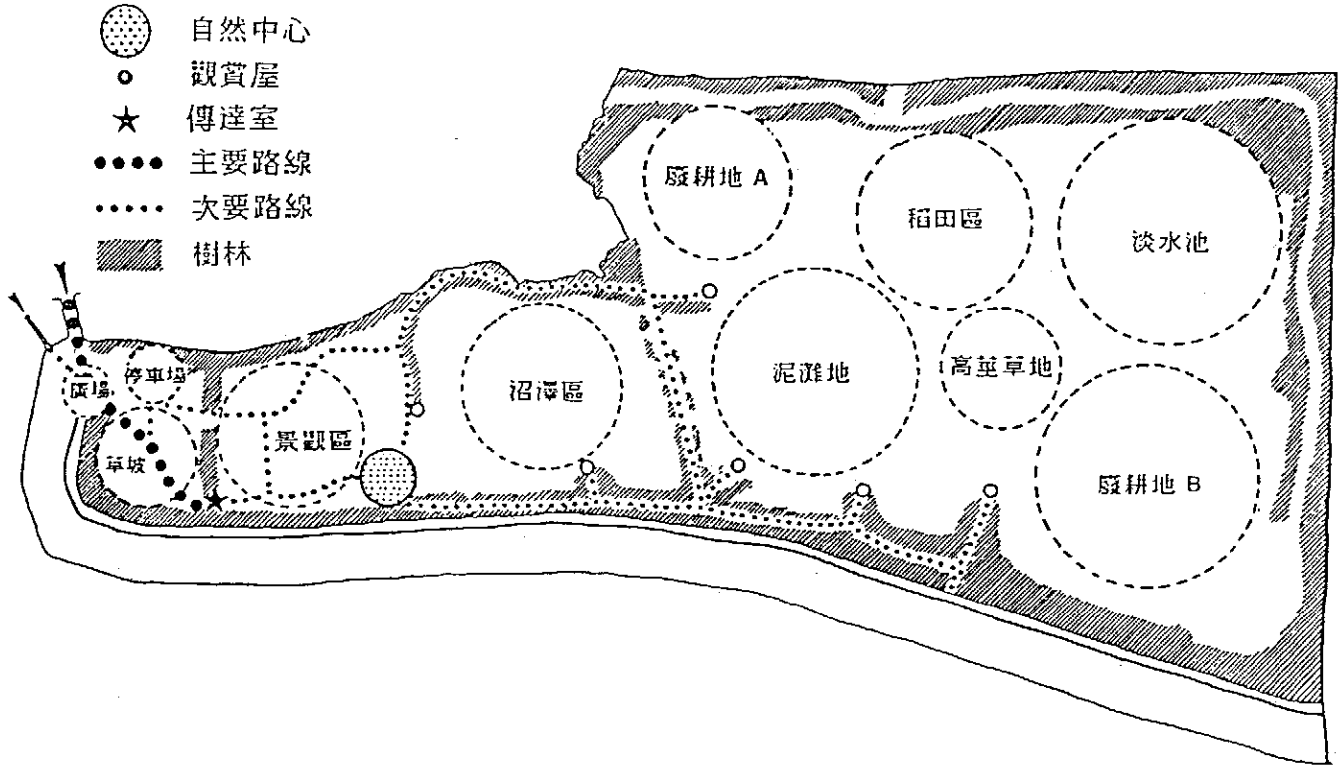

圖 二 關渡自然公園主要設施區域規劃圖

哈盆自然保留區管理及規劃之研究

呂錦明[1]. 章樂民[1]. 楊遠波[1]. 林則桐[1].

目 的

哈盆自然保留區隸屬台北縣烏來鄉、宜蘭縣員山鄉兩地，面積 332.7 公頃，由台灣省林業試驗所管理；此地區自然資源豐富，農委會於民國75年 6 月27日，公告爲自然保留區，其目的在保護代表本省北部山區自然生態系之天然濶葉樹林、動植物等，而管理與進一步之規畫爲必要之措施，故進行本計畫。

方 法

1. 設管制站，派駐管理人員，登記入山人數、事由，宣導自然保留區之規定，不定時巡山，以維護保留區。
2. 調查保留區內之植物資源，配合其它自然資源調查成果，以建立完整之資源資料檔案。
3. 研擬經營管理計畫，並建設本區經營管理之必要設施。

結 果

1. 民國75年11月成立管制站，聘僱管制人員。至77年6月底止，共有 844 人經過管制站，其中旅遊者 588 人，打獵者76人，捕魚者48人，採集植物者44人，工作者88人。
2. 平均每月進行 2 次巡山工作，曾發現殘舊吊阱 4 處，小型火災 1 次，獵人活動 1 次。
3. 設立保留區標示牌及告示牌共 4 塊。
4. 本區之植物種類共記錄了 124 科、322 屬、518 種；植物社會調查完成 2,500 平方公尺樣區 2 個， 500 平方公尺樣區21個。
5. 研擬完成本區之經營管理計畫草案。

結論與建議

1. 哈盆自然保留區面積小、遊憩衝擊大，應可選擇更適當之地區作保留區以保護代表本省北部山地森林生態體系，而本地區則改爲供野外活動、自然觀察、環境教育之用。
2. 日後制定相關法令時，應對自然保留區之通行權有所限制，同時管理機關對進出保留區人員携帶物品應有限制與檢查之權。

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恒春自然生態保護區之經營研究執行報告

李新鐸[1]. 邱文良[1].

前　言

恒春自然保護區位於林業試驗所恒春分所龜仔角林地，東經120°43′，北緯21°58′，面積約150公頃，海拔高150－320公尺。爲本省高位珊瑚礁僅存之原始地區，資源極具特色。本計劃之執行，目的有二：

㈠保持全區生態系之完整，使珍貴稀有之動植物免於絕滅，提供學術研究場所，協調並協助區內各項試驗之進行。

㈡研究自然保護區之動植物相及其他各種自然資源。

研究與執行方法

㈠定期與不定期派員巡視保護區，補修破損之境界圍籬，有效防止民衆及附近村莊飼養之牲畜進入，確保區內自然生態系的完整。

㈡設立進入人員登記制度，籲請進入之研究者先行登記，巡山人員亦依規定填製記錄，做爲長期監視之基本資料。

㈢隨時監視任何人爲干擾及天然災害，並記錄災害程度。

㈣設立10×25公尺之永久組合樣區44個，調查林木之組成，長期監視各種變化，觀查演替現象。

研究與執行結果

㈠有效制止民衆與牲畜進入，已往由於人行及放牧畜造成之小徑，經一年之隔籬，已長滿雜草與小苗。

㈡統計本年登記進入本區人數共21人764天次（每人4小時以內計半天，超過4小時計一天）：分別爲巡山：3人，580天，台灣獼猴研究：3人，120天。蝙蝠生態觀察與攝影：12人，6天。植物群落調查：3人，58天。

㈢植物社會經取樣調查分析，可分爲四個植物型：1.相思樹型；2.九芎－白雞油型；3.紅柴－樹青型；4.黃心柿－毛柿型。

1.林業試驗所恒春分所，屏東縣恒春鎭94606公園路203號

1. 相思樹型

主要樹種除相思樹外，以九芎、月橘、白雞油及過山香等爲較優勢之樹種。主要樹種小苗更新差，在往後的演替中，將逐漸衰退，而爲其它樹種所取代，低層胸徑不及一公分之小苗以月橘、血桐、過山香、白雞油等最多，地被草本以馬櫻丹、長穗木、弓果黍及槍刀菜等最佔優勢。

2. 九芎－白雞油型

主要樹種爲九芎、白雞油、月橘、山柚與台灣赤楠。九芎、白雞油與月橘小苗更新狀況差，而山柚與台灣赤楠更新持續良好。林下胸徑不足1公分之小苗以血桐、鐵色、火筒樹、紅柴、江某、魯花樹、白雞油、虫屎等最佔優勢，地被草本以長花九頭獅子草、月桃、竹葉草、野沿階草等最佔優勢。

3. 紅柴－樹青型

本型多發生於獨立之珊瑚礁峰頂及突起之山脊，組成樹種以紅柴、樹青、鐵色、白榕、山柚、枯里珍等爲主，除樹青外，幼樹更新狀況良好，族群應可繼續持續，林下胸徑不足1公分的小苗以血桐、黃心柿、葉下白、紅柴、枯里珍、鐵色等數量最多，下層草本以野沿階草、星蕨、長花九頭獅子草、針刺草、港口冷水麻、橢圓線蕨等佔最大優勢。

4. 黃心柿－毛柿型

本型發生於本區大部分之地區，樹冠層以黃心柿、白榕、鐵色、山柚、毛柿、軟毛柿、土楠、樹杞、柿葉茶茱萸等爲主，且幼樹更新良好，林下胸徑不足1公分之小苗以黃心柿、血桐、虫屎、紅柴、土楠、台灣土沉香、大葉楠、瓊楠、咬人狗、鐵色等最多。地被草本植物以姑婆芋、針刺草、野沿階草、三叉蕨、長花九頭獅子草等最佔優勢。

㈣本區之稀有植物有：象牙樹、排灣擬肋毛蕨、港口馬兜鈴、毛柿、中華雙蓋蕨、琉球蛇菰、柿葉茶茱萸、恒春皂莢等，應予密切監視族群之變化，並及時採取有效之應變措施。

結論與建議

本區天然資源極爲豐富且特殊，並具高位珊瑚礁之代表性，爲本省所獨有，應可列爲正式保留（護）區，宜及早立法公告，使本區能適切而完整的保存下來。

環境影響評估涉及自然文化景觀保育作業模式之研究

林達雄* 張穗蘋**

【摘要】環境影響評估之意義，係於擬定經濟開發行為或措施時，就該開發或措施行為，對環境（包括生活環境、自然環境、社會環境及文化經濟層面等）所可能影響程度及範圍，事前加以客觀、綜合之科學調查、預測、分析及評定。提出綜合環境管理計畫，進而公開說明，並付諸審議，以作為決定該項開發或措施行為決策之參考。

本研究計畫係對評估程序及技術問題中自然環境部分做相關資料的整理，並依評估作業中調查，預測分析，及評定的步驟就國內可能的作法提出建議，以供推動環境影響評估制度之參考。

Ⅰ. 研究目的

民國六十五年七月中國工程師學會近代工程技術討論會，首次在國內討論環境影響評估之觀念。由於其對環境事務之解決具積極性及建設性，遂迅速被國內所接受。民國七十四年十月，行政院並核定「加強推動環境影響評估方案」，以為推動上開制度之依據。民國七十五年元月，「山坡地保育利用條例」公布實施，並正式將環境影響評估作業之要求納入。雖然該制度在國內推動已相當時日，然爭議問題仍多。尤其在評估作業程序及評估技術上。本研究計畫係針對評估自然環境部分之內容主要包括生態環境，動植物、地質、地形、景觀等部分，收集國內現有已進行環境影響評估之個案及國外各國對上述評估項目之作法作整理與比較，並提出建議。

Ⅱ. 研究結果

至目前國內進行環境影響評估之重大經建計畫近百件，曾送環境保護主管機關審議之個案亦達49件。送中央環境保護主管機關審議之個案亦達44件。主要包括水資源開發計畫，電廠設置（包括火力、水力、抽蓄電廠），工業區及工廠設置，垃圾處理場廠，及交通港灣工程等。本報告就中央環境保護主管機關審議之44件個案與美、日、澳及歐洲相關國家在環境影響評估作業程序、項目、及技術上提出比較。

* 行政院環境保護署水質保護處處長

** 行政院環境保護署綜合計畫處科長

製播錦繡大地廣播節目宣導自然文化景觀保育

孫 瑞 華

一、前言

藉著廣播媒體無遠弗屆的特性，「錦繡大地」節目以訪談、專題講座、廣播短劇、敍述等多重方式，每週製播二次共一小時的專輯節目。以喚醒社會大衆對大地之愛，進而使生態保育工作能眞正落實於「生活化」、「社會化」的目標。

本計劃是由行政院農業委員會與幼獅電台共同合作。幼獅電台一貫所製作的節目，多偏重於各類啓廸青年的社教性，普遍受到大衆歡迎。

有鑑於當前生態環境嚴重的遭受破壞，已經到了今天不做明天就會後悔的關鍵時刻；因此開闢頗富親和力的節目內容，結合青年與社會大衆，來推廣國民生態保育的觀念希望能做好「全民保育一條心的連綫工作」。

二、目的

㈠引領聽衆走進「大自然教室」，並透過專家學者的現身說法，說明目前世界生態所面臨的危機，瞭解未來世界永續利用的重要性。

㈡啓導青年人鑑往知來，關心天下創造宇宙繼起之生命。

㈢認識台灣豐富的生物群像，也提醒大家尊重與我們共同生活在同一個地球的其他生命。

三、執行情形與成果

本計劃自七十六年度開啓執行至今，茲將三年來執行情形與成果分述於后：

㈠青年活動之特別報導：採訪報導「生態保育環境維護研習會」、「鳥類生態研習會」、「鴛鴦湖自然保留區知性之旅」。

㈡國家公園自然資源講座：包括「玉山國家公園」、「太魯閣國家公園」、「陽明山國家公園」等自然保育系列演講之集錦。

㈢舉辦「自然生態保育觀念之建立」座談會：邀請農委會副主任委員葛錦昭先生主持，專家學者列席討論。實況除了製播節目錄音播出之外，並刊登在幼獅月刊上成爲立體傳播。

幼獅廣播電台

台北市中山北路四段十六號 10452

㈣製播全國聯播節目－如讓我們的「青山長在綠水常流」、「綠色家族」－以戲劇手法將森林中綠色家族，予以擬人化，並藉其生動對話－顯現自然生態的珍貴及如何恢復自然系統保持平衡。「天地與我並生」，闡述「人法道，道法自然」……自然保育與環境保護乃爲一體兩面之事。

四、檢討與建議：

㈠聯合各大專院校保育及環保社團，成立聯綫網路以確實做到環保紮根的工作。

㈡自然文化景觀保育的工作無法有立竿見影之效，然而可由主管單位或相關機構，提供資訊，配合當前宣導政策，以一系列生動活潑的方式，以知性出發，透過感性方式表達，用深入淺出的手法，融入廣播節目中，使其發揮教育宣導之功能。

溪頭自然生態研習活動

黃英塗*・林世宗*

一、計畫目的

以溪頭森林遊樂區自然資源及遊樂設施，舉辦集體性活動，引導青年學生及社會大衆從事植物識別、賞鳥、及森林生態研習，俾增進自然生態保育觀念，提高國民生活品質。

二、執行方法

1.計畫經行政院農委會核定，即著手規劃全年度舉辦之研習活動項目，編印解說資料，聯絡合作單位，預定舉辦時間，梯次及人數等主要工作計畫。

2.研習活動期間除由主辦單位（台大實驗林管理處）負責主要之行政工作及學員之食宿安排外，並由本處獲有碩士學位以上者10～12人擔任森林生態觀察、植物識別及資源保育等課程之專題演講及野外研習指導；賞鳥活動方面則邀請東海大學及台中鳥會等有關之專家學者前來指導；另由合作單位負責學員之生活管理及團康節目。

3.野外參觀活動採小隊制，每隊15至25人，分別由1.至2.名解說人員帶領沿途解說，認識植物、參觀苗圃講解苗木培育、觀賞野鳥並介紹森林環境與人類生活之關係。夜間課程則提供自然資源與森林生態保育有關之幻燈片及影片欣賞與討論，包括溪頭有趣植物、森林知性之旅、鳥與人生、森林功能等。

4.各項研習活動結束後，即行針對活動期間有關事宜加以檢討，如有缺失，則擬具改善措施，並於下次研習活動時予以改善。

三、執行成果

77年度溪頭自然生態研習活動執行期限自76年7月1日起至77年6月30日止，共舉辦7梯次，參加學員計1104人次，均爲各級學校學生，包括臺灣大學、南投縣各國中學生、高雄市少年科學生態保育營、彰化縣及南投縣幼童軍等。

四、檢討與建議

1.溪頭自然生態研習活動，由於係在風景優美之溪頭森林遊樂區內舉辦，且由專業

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人員引導講解，其研習課程內容不但具有知識性且生動有趣，使學員不但能欣賞到溪頭的美景，更能由所參與的研習活動中，體認大自然之奧秘，而獲得豐富而愉快的知性之旅，各界反應極爲良好，咸盼此類生態研習活動能經常舉辦，讓更多青年學生及社會大衆均有參與的機會，共同爲推展自然生態保育而努力。

2.由於計畫經費有限，且舉辦此類大規模之研習活動，需投入相當之人力，包括解說資料之編印、活動課程時間、內容之編排、學員食宿及工作人員聯絡等，爲強化推廣教育之效，除擬請農委會繼續支持本項活動計畫，而學員對象以學校教師爲主，使生態保育觀念能續拓展，深入社會。

自然生態保育海報比賽及優勝作品展覽

王 嘉 祥

目　　的

政府在推行自然生態保育政策時，常因認識不同而無法獲得普遍之支持。本計畫可增進大衆對政府推行自然生態保育之認知，而有利於該政策之推行。

本計畫係以比賽及展覽(社會教育)的方式，希望獲致下列成果：1.增進社會大衆對自然生態保育政策之認知。2.增進社會大衆對自然生態保育工作之共鳴作用，以擴大推行政策之社會基礎。

方　　法

1.以比賽的方式公開徵求海報，藉著社會大衆的參與、投入，來擴散自然生態保育的觀念。

2.安排優勝作品等在臺灣省立博物館以特展的方式展出，後並安排巡迴全省展出，以擴大宣傳效果。

3.舉辦專題演講，以直接的方式灌輸聽衆自然生態保育的觀念。

4.編印自然生態保育海報專輯，以廣爲流傳，並可長遠的傳播自然生態保育的觀念。

結　　果

1.應徵作品共九〇八件，經評選出第二名二件，第三名三件，佳作二十一件，入選三十件，一共是五十六件爲優勝作品。並另選出五十八件作品參展，總共是一一四件作品展出。

2.中華民國七十六年五月一日至五月二十日在臺灣省立博物館舉辦特展，並自七十六年六月至七十七年八月間，在全省十八個站巡迴展出。

3.在臺灣省立博物館的特展期間，舉辦了七場專題演講。

4.將優勝及參展作品編印爲自然生態保育海報專輯三千本，分送各縣市文化中心及各中、小學校。

臺灣省立博物館動物學組　　台北市10014襄陽路2號

結論與建議

應徵作品達九〇八件之多，來自全省各地，顯示了這九〇八位作者對於政府推行自然生態保育政策已有認同。而且經過創作海報的過程，這九〇八位作者對於自然生態保育的意義，必然有了深刻的認識，日後將成爲自然生態保育的尖兵，在自然生態保育工作的推廣上，會扮演起推廣的角色。

在台北展出特展後，更採取文化下鄉的方式，巡迴全省各縣市文化中心或各中小學校展出，不僅可擴大宣傳的效果，而且以下一代爲教導的對象，相信會使本計畫更爲落實，發揮更長遠的影響效果。

社會大衆對自然生態保育的認識仍然不清，今後應結合有關單位，大力宣導自然生態保育的觀念及政策，以利政府推展保育工作的進行。

英 文 部 份

English Summary

Contents

An Introduction to Nature Conservation Work

Council of Agriculture [1]

I. Guidelines for the Conservation 1989 of Nature/Culture, Landscapes and Wildlife.

(I) Objectives:

The Council of Agricuture in cooperative with provincial (municipal), and county (municipal) governments are devoted to the work of natural/culture, landscapes and wild fauna/flora conservation. Priorities has been set-up to promote natural resources conservation in order to maintain the stability and resource rational utilization of the ecosystem.

(II) Scope and Priorities of the Work

A. Strategies

1. To collect baseline data and set-up the system of nature/culture, landscapes and wild fauna/flora.
2. To protect endemic species of special and rare wild fauna/flora and unique landscapes.
3. To strengthen the resources conservation of shore/marine and freshwater fishes.
4. To strengthen the specialist training proprom.
5. To promote publicity and education program.
6. To draft or amend nature conservation regulations.
7. To strengthen international cooperation and join the international conservation organizations to promote joint programs.

B. Measures:

1. To protect the forests and slope-land resources, and prevent excessive land use.
2. To investigate agricultural pollution problems and design control measures to improve agricultural production environment.
3. To implement long-range greening program.

C. The Priorities of the Work and Job Assignments

The followings are important and feasible items of the program. The sponsoring and co-sponsoring agencies of the work items are:

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1. 37 Nanhai Road, Taipei, Taiwan 10728, R.O.C.

Work item	Sponsoring agency	Co-sponsoring agency
1. To establish data system of natural landscape and wild fauna and flora.		
i) To establish the data base of the nature/culture, landscapes and wild fauna and flora	Council of Agriculture	The research organizations concerned, colleges or universities and private bodies
ii) To track the condition of foreign wild animals and establish their database after they was sold to Taiwan	Council of Agriculture	The research organizations concerned, colleges or universities and private bodies
iii) To investigate and commercial utilization of the wild animals by the game-shops.	Council of Agriculture	The research organizations concerned, colleges or universities and private bodies
2. The design, management and maintenance of the nature reserve		
i) Kwan-Tu Nature Preserve	Taipei provincial government	Council of Agriculture
ii) The Yuan-Yung-Lake Nature Preserve	The department of Forest development, the Vocational Asistance Commission for Retired Serviceman	Council of Agriculture

Work item	Sponsoring agency	Co-sponsoring agency
iii) Ha-Pen Nature Preserve	Taiwan Forestry Research Institute	Council of Agriculture
iv) The San-Yi, Ho-Yen-Shan Nature Preserve	Taiwan Forestry Bureau	Council of Agriculture
v) *Amentotaxus formosana* Nature Preserve	Taiwan Forestry Bureau	Council of Agriculture
vi) The Taiwan Cycas Nature Preserve	Taiwan Forestry Bureau	Council of Agriculture
vii) Tan-Shui River Mangrove Forest Nature Preserve	Taiwan Forestry Bureau	Council of Agriculture
viii) Pin-Ling *Keteleeria devidiana* Nature Preserve	Taiwan Forestry Bureau	Council of Agriculture
ix) Ta-Wu Mountain Nature Preserve	Taiwan Forestry Bureau	Council of Agriculture
x) To strengthen and improve the quality of environment of the ecological preserve, nature reserve, rare fauna and flora protect zone and forest recreational areas	Management organization concerned	Council of Agriculture
xi) To avoid the damage of the ecosystem when doing an engineering	Management organization concerned	Council of Agriculture

Work item	Sponsoring agency	Co-sponsoring agency
xii) Each engineering should be designed and improved before proceeding, and the methods of doing the work, such as taking mud, dumping the waste soil should be well-considered and the planting and greenish after the finishment of the work are also necessary	Management organization concerned	Council of Agriculture
3. To protect the endemic rare wild fauna/flora species and unique landscapes		
i) To investigate the rare wild-life and unique landscapes, and make a public announcement according to Cultural Heritage preservation law if necessary.	Council of Agriculture	The research organizations concerned, colleges or universities and private bodies.
ii) To strengthen the protection of Taiwan endangered species by artificial breeding or gene preserve the present its extinction	Council of Agriculture	The research organizations concerned, colleges or universities and private bodies.
iii) To strengthen the studies of the ecology, habit, population distribution of wild fauna/flora and forest stream fish and establish prolong monitor data base	Council of Agriculture	The research organizations concerned, colleges or universities and private bodies.

Work item	Sponsoring agency	Co-sponsoring agency
iv) The execution of gene preserve of endemic species and protection of special landscapes.	Provincial (municipal) government	County (municipal) government
v) Control the in/out trade of living specimens, products of rare or endangered species.	Council of Agriculture	County (municipal) government
vi) To strengthen the quarantine and monitor of rare or endangered importation species.	County (municipal) government	Council of Agriculture, Provincial (municipal) government
vii) To strengthen the prohibit of illegal behaviors of excessive felling of trees and lands, over-hunting, to fish by poison, dynamite, electricity.	County (municipal) government	Provincial (municipal) government
viii) To strengthen the studies of ecological environment of the sensitive zone and special landscapes	Council of Agriculture	Provincial (municipal) government
ix) To draft the law or regulation of nature ecological and wild fauna and flora conservation	Council of Agriculture	Provincial (municipal) county (municipal) government and private bodies.

Work item	Sponsoring agency	Co-sponsoring agency
x) To draft the laws or regulations each dealing with nature ecological and wild fauna and flora conservation of every provincial (municipal)	Provincial (municipal) government	Council of Agriculture
4. Personnal training		
i) To invite scholars or experts to take park in nature conservation seminar unregularly.	Council of Agriculture	The research organizations concerned, colleges or universities, private institutions, provincial (municipal) and county (municipal) government
ii) To send qualified specialists abroad for study	Council of Agriculture	The research organizations concerned, colleges or universities, provincial (municipal) and county (municipal) government
iii) To enhance the conservation concept, of government technicians	Council of Agriculture, provincial (municial) government	

Work item	Sponsoring agency	Co-sponsoring agency
iv) To design and establish the nature conservation library center	Council of Agriculture	
5. Education and Publicity i) To help the organizations concerned and private bodies to take in the nature conservation activities	Council of Agriculture, provincial (municipal) government	The research organizations concerned, colleges and universities, county (municial) government
ii) To help the organizations concerned and private bodies to print for publication of nature conservation	Council of Agriculture, provincial (municipal) government	The research organizations concerned, colleges and universities, county (municial) government
iii) To propagate the nature conservation concept by T. V. and other media.	Council of Agriculture, provincial (municipal) government	The research organizations concerned, colleges and universities, county (municial) government
iv) To strengthen the environmeatal interpretation at ecological reserves, nature reserves and protective zones of fauna and flora species	Management organization concerned	Council of Agriculture, provincial (municial) government

Work item	Sponsoring agency	Co-sponsoring agency
6. To strengthen the international cooperation		
i) To strength the cooperation and exchange of investigation/ research techniques, and to join the international organization concerning nature ecology and wild fauna and flora conservation	Council of Agriculture	The research organizations concerned, colleges or universities and private bodies
ii) To take park in the international conservation meeting of nature ecological and wild fauna and flora and invite the conservation experts to Taiwan to help our conservation work.	Council of Agriculture	The research organizations concerned, colleges or universities
iii) To earn the support from the international communities to sponsor international conference on nature ecology and wild fauna and flora	Council of Agriculture	The research organizations concerned, colleges or universities, provincial (municipal), county (municipal) government

(III) The Fund Sources:

1. The budget will be made available by Council of Agriculture, provincial (municial) and county (municial) government in every fiscal year.
2. The conservation fund will be raised from the fee of hunting certificate or games and the contributions from the public.

II. F. Y. 1989 Nature/Culture, Landscapes Conservation Projects Supported by Council of Agriculture

The Subject matter of Program	Executive Organization
A. The conservation of land-locked salmon (*Oncorhynchus masou*):	
A.1 The protection of land-locked salmon (*Oncorhynchus masou*) habitats	Wu-Ling farm VACRS
A.2 The ecological studies on breeding halitat of Taiwan land-locked salmon (*Oncorhynchus mason*)	National Taiwan University
A.3 Ecological studies on benthic fishes and algal flora of Yeau-sheng stream, associated with landlocked masu salmon (III),	National Taiwan Normal University
A.4 The residue control of pesticides in the water of Chi-Jia-Van River	Taiwan Agricultural Chemicals and Toxic Subtances Research Institute
A.5 Landused management planning of the salmon protection area in Chi-Chia-Wan Creek,	National Taiwan University
A.6 A fish way constructing project for fiscal year of 1989 at Chi-Chia Wan based on the survey results of the living habits of *Plecoglossus altivelis* in northern part of Taiwan (North).	Taiwan Fisheries Consultants, Inc.
B. The investigation of rare fauna/flora species and landscapes:	
B.1 Pilot banding project of east asia international migration birds	Wild Bird Society of Taipei
B.2 The conservation plan of natural renewable resources in Lien-Hua-Chih area	Lien-Hua-Chih Branch Taiwan forestry Research Institute
B.3 Survey of butterfly resources and recovery plan of *Troifes magellanus*	Taipei Chengkung High School
B.4 A behavioral and ecological study on formosan reeve's muntjac (*Muntiacus reevesi*) (III)	National Taiwan Normal University
B.5 Study of the behavior and ecology of Taiwan Macaque	National Taiwan University
B.6 Studies on the assessment of rare and threatened plant species in Taiwan	Tong-Hi Catholic University
B.7 Columnar basalt landscape in Penghu.	National Taiwan University

D.5	Pilot project of interpretative services in forest ecosystem	Experimental Forest of National Taiwan University
D.6	Technical improvement on natural protection project of F. Y. 1989	Technique Division, PDAF
D.7	In producing of "The beautiful land "broadcasting program for promoting natural culture and scenery conservation	The China Youth Broadcasting Station
D.8	Natural conservation library	Taiwan Forestry Research Institute, National Taiwan Normal University
D.9	Ecological conservation activities of collage students	China Youth CORPS
D.10	F. Y. 1989 nature conservation and environment protection workshop	China Youth CORPS
D.11	Project of research activities on natural ecology of Chitou	Experimental Forest of National Taiwan University
E.	The Wild area fauna resources investigation and assessment:	
E.1	Survey on the commercial utilization of insect resources in Taiwan	National Taiwan University
E.2	Health monitoring and disease survillance in exotic animals of the zoos	Pig Breeding Science Research Institute
E.3	An investigations on the egret resources and its impacts on aquiculture	National Taiwan Normal University, National Museum of Nature Science, National Ping-Tong Agriculture Collage, National Taiwan University, National Chung-San University
E.4	The investigation on the consumption of the wildlife resource by the aborigines in Taiwan	National Taiwan Normal University
E.5	Wildlife data bank of Taiwan (1) Amphibians	National Taiwan Normal University

E.6	The study of provisioning to Taiwan macaque (*Macaca cyclopis*)	National Taiwan University, Lan-Young Branch, Taiwan Forestry Bureau
F.	The international cooperation and specialist training:	
F.1	Symposium on natural resources conservation	Academia Sinica National Taiwan University, Taiwan Forestry Research Institute
F.2	First symposium on disease control of exotic animal	Pig Breeding Science Research Institute
G.	F. Y. 1989 support to the activities of nature conservation task force	Council of Agriculture
H	F. Y. 1989 the activities of nature and wildlife resource conservation task force (II)	
I.	The nature/culture, landscapes resources conservation projects:	
I.1	The conservation planning of fish in forest area	Taiwan Forestry Bureau
I.2	Project of research activities on natural ecology of Yuen-yang lake	Yi-Lan Branch, China Youth CORPS
I.3	Study of the hunting organization of atayal and research the relation between its function and wildlife conservation	National Taiwan University
I.4	The ecological study of formosan seron (*Capricornis crispus swinhoei*) – Dropping decomposition	National Taiwan Normal University
J.	Study project on planning and management of nature reserve	Taiwan Forestry Research Institute
K.	F. Y. 1989 the activities of nature and natural resource of flora and fauna conservation task force:	
K.1	Studies on the conservation of chinese pangolin *Manis pentadactyla pentadactyla*	Taiwan Forestry Research Institute
K.2	Habitat selection and its vegetation analysis of formosan muntjac (*Muntjacus reevesi* microcus the geo-kin-yang area, Ilan)	Fujen Catholic University

K.3	Fish protection of ching-shui-gou river	Nantou County Middle School
K.4	Preservation and uses of Taiwan wild tea germ plasm	Taiwan Tea industry improve Research Institute
K.5	Ecological study of beech forest of Taiwan	Taiwan Forestry Research Institute
K.6	Transplanting experiment of endangered aquatic plants around Taoyuan area	Taiwan Forestry Research Institute

III. Fiscal Year 1989 Nature Conservation Events, council of Agriculture (July 1988 ~ June 1989)

1988

Jul. 9 A meeting was sponsored by Council of Agriculture to discuss the work plans to protect the forest stream and river fish resources.

Aug. 22 This Council and the Ministry of Economic Affairs jointly signed to publicize "*Amentotaxus formosana* Li. *Keteleeria davidiana* (Franch), *Rhododendron hyperythrum* Hayata, *Rhododendron Kanehirai* Wilson, *Isoetes taiwanensis* Devol, *Cycas taiwaniana* Carr., *Fagus hayatae* Palib. ex Hayata, *Podocarpus costalis* Presl, *Juniperus chinensis* L. var *tsukusiensis* Masumune, and *Bretschneidera sinensis* Hemsl to be the rare flora species according to Cultural Heritage Preservation Law.

Aug. 30 In the first preparatory meeting for National Agricultural Conference the topic "How to strengthen the nature/culture and landscapes protection, maintain the ecology balance and promote the nature resource continuously utilization", and obtained preliminary conclusions.

Sep. 10 The 1988 annual meeting of International Association of Fish and Wildlife Agencies (IAFWA) held in Toronto, Canada, Dr. Liu Associate Researcher of Academia Sinica was our country's representive.

Sep. 22 The Executive Yuan approved "The Outline and Implementation plan for conservation of nature/culture, landscapes and wild fauna/flora".

Oct. 14 The members of Commission on Nature/Culture Landscapes of this council, Drs. Chang, Kun-hsiung and Yao-Sung Lin represented our country, and went to Japan to attend the "World Salmon and Trout Conservation Symposium" which is held in every four years.

Oct. 17 This Council cooperated with Department of Biology, National Normal University sponsored the Workshop of *Cerous nippon taiousanus* BLYTH recovery plan at the National Taiwan University.

Oct. 21 The Commission on Nature/Culture Landscapes of this council held the 25th joint meeting.

Nov. 7 This council with the pig Breeding Science Research Institute held "the first wild animal disease contral seminar" at National Taiwan University. And Dr. Lue, Si-kwan and Dr. Emil Dolensek were present at this workshop.

Nov. 28 Mr. Tom Milliken, TRAFFIC-Japan visited Taiwan.

Dec. 5 Dr. Yu yu-hsien, chairman of this council delivered a speech "The review and perspective of nature culture landscapes and wild fauna and flora conservation work" at the central conbinate commemorative meeting in memory of Dr. Sun yat-sen, founder of the Republic of China.

Dec. 6 Dr. Hiroyoshi Higuchi, the head of Japan Wild Birds Research Institute, made a speech at Taiwan Forestry Research Institute.

Dec. 18 The Bo-Po-Mo monkey park situated at Shin-Chu imported from England a female gorilla which was twenty years old, weighted 200 kilogram.

Dec. 19 The Commission on Nature/Culture Landscapes of this council held the 26th joint meeting.

Dec. 21 This council with many scholars, specialists and vidio production company to discuss how to make the vidio film of the four nature preserve of Ho-Yen-Shan, Kwan-Tu, Tan-Shui river mangrove forest and Pin-Ling *keteleeria devidiana.*

Dec. 24 This council and Scoiety of Wildlife and Nature R.O.C. and Construction and Planning Administration, Ministry of Interior, R.O.C. held "Nature Resource Workshop at Academia Sinica International Academic Center. Dr. C. Santiapillai, representative of WWF and Mr. H. Tokunaga, representative of TRAFFIC-Japan were invited. Nineteen papers were presented.

Dec. 28 Dr. Yu Yu-hsien, chairman of this council reported the application of Giant panda import at the Legislative Yuan.

Dec. 31 This council with scholars and specialists discussed the aim and principle of the Sino- American agriculture cooperation in wildlife and stream fish conservation and forestry recreation.

1989

Jan. 3 The Bo-Po-Mo Monkey Park situated at Shin-Chu imported from France a male gorilla which was fifteen years old; weighted 180 kilogram.

Jan. 20 This council with BOFT and Customs discussed the measures to prevent the illegal trade of animal. Among it, the ivory, horn and leather of rhinoceros, alligator meat, mask, coral and alive birds were all included.

Jan. 23 This council summoned the members of each county (municipal) government and held the meeting to discuss the topic: "How to improve the benefit of Taiwan wildlife".

Jan. 30 This council and the Ministry of Economic Affairs jointly signed to publicize "*Selenarctos tibetanus formosanus* (Swinhoe), *Neofelis nebulosa* Giffih, *Lutra lutra chinensis* Gray, *Pteropus dasymallus formosus* P. L-Sclater, *Oriolus traillii ardens* (Swinhoe), *Otus elegans* botelensis, *Ketupa ketupa flavipes* (Hodgson), *Spizaetus nipalensis fokiensis* Sclater, *Ictinaetus malayensis* (Temminck), *Strix leptogrammica calligata* (Swinhoe), *Strix aluco yamadae* (Yamashina), *Agkistrodon acutus* (Günther), *Eretmochelys imbricata squamata* Agassiz, *Dermochelys coriacea* (Linnaeus), *Chelonia mydas japonica* (Thunberg), *Caretta caretta* gigas, *Varicorhinus alticorpus* (Oshima), *Agehana maraho* (Shiraki & Sonan), *Sasakia charonda formosana* (Chen) and *Troides magellanus* (C & R Felder), to be the rare fauna by the Culture Heritage Preservation Law.

Feb. 4 The Yi-Lan County government and its policeman swept the game-shops and obtained a significant effect.

Feb. 14 This council sent a document to each county (muncipal) government, to inform the wildlife owners to register before the end of June, 1989.

Feb. 21 The 8th International Investigation Research and Management Seminar of bear tribe species, took place in Canada, Feb. 21-25. Dr. Wang Ying Associate Professor of National Taiwan Normal University represented our country to attend this meeting.

Feb. 23 The Commission on Nature/Culture Landscapes of this Council held the 27th joint meeting.

Mar. 15 This council publicized the document "The procedures of import/export of wildlife requiring intensive conservation" and "The notice for carrying or mailing wildlife requiring intensive conservation in or out of the country."

Mar. 23 This council invited Dr. Alan Rabinowitz, specialist of the New York Zoological Society (NYZS) to held the meeting to discuss "The design and management of the nature preserve of Ta-Wu Mountain."

Apr. 1 This council and Taipei Zoo Park sponsord the workshop of Taiwan Animal Geography and its Origin.

Apr. 11 This council and Taiwan Forestry Bureau spimsored a two-days workshop to discuss "River and stream in the forest" and invited Dr. David Heller and three Japanese specialists.

Apr. 13 Dr. Tom Milliken, TRAFFIC-Japan representative came to Taiwan to discuss about the ivory trade affairs.

May 12 This council and Taiwan Forestry Research Institute held a workshop to discuss wildlife investigiation techniques and organized a field trip on May 13. Mr. Donald L. Neal, american fish and wildlife research specialist was invited to make a speech on tracking the wildlife by the radio.

May. 28 This council held the conference of nature conservation for volunteers in nature conservation extension education at Chian-Tang Overseas Youth Center.

Jun. 13 This council held the second workshop of investigation of nature/culture and landscapes at National Taiwan University.

The Protection and Patrol for Formosan Landlocked Salmon (Oncorhynchus masou) and its habitat

by

Ming-Shan Chang

Introduction

Formosan landlocked salmon, an organic legacy of glacial epoch, is the only species of frigid-zoned fish in Taiwan. Formosan land-locked salmon was used to be anadromous; However, it finally evolved to landlocked due to the drastic change of topography. Formosan landlocked salmons live in mountain streams with water temperature under 16 degree Celsius. The change of forest vegetation raised the temperature of stream water. The population of salmon has been declining. The over harvesting (such as poisoning, electro-fishing and bomb-fishing), over developing agricultural activities along Dai-Chia River, and the construction of check dams have seriously affected reproduction of the salmons. Finally the Formosan landlocked salmon became threatened and endangered. Now they were confined only in Chichiawan stream. Conservationists and government started restoration program and fundamental researches pertaining to this population. This article reported the patrol and protection in Chichiawan stream during 1984-1988.

Area of patrol and protection

Formosan landlocked salmon inhabited at good-covered pools with flat bottoms in Chichiawan stream. East bank of the down stream of Chichiawan Stream were mix forest with natural broad-leaved trees and coniferous plantation. Vegetation covered the bank quit well. West bank was mostly hills with gradual slope or shoals, which were used for farming. Since 1963 under the government's policy, veterans could have cropped the high latitude and cold weather deciduous fruit trees and some summer vegetables. Farmland and stream were separated by typical stream bottom vegetation about 10 to 100 meters in width. A road from Wulin farm to the forest recreation region of the Forest Bureau was also on the west bank. Public cauld not be banned to enter the forest region, which was an scenic area for recreation.

Wu-ling Farm VACRS, 3 Wu-ling Rd. Lishan Taichung

Law of Enforcement

Preliminary program on nature conservation included the formosan landlocked salmon:

On December 18th 1983, an special team of policy makers and experts were organized and worked out the Preliminary Scheme of Nature Conservation for Taiwan on September 18th in 1984. Formosan landlocked salmon should be regarded as a threatened and endangered species. Design and planning for restoration and protection of this species were essential, and should be classified as a national operation. Thereafter, on January 31st 1985 the Executive Yuan proclaimed that the Preliminary Plan of Nature Conservation for Taiwan should include preservation of the Formosan landlocked salmon.

Based on the Cultural Assets Preservation Act, Administration of Economics announced that the Formosan landlocked salmon was an endangered species and was classified as cultural heritage. Also, its habitat should be sketched as an Ecological Conservation Area; any change and damage to it from its original status were forbided. Term of imprisonment is up to 5 years and/or fine is up to 60,000 NT dollars to whom cause the habitat damage. To whom catch the salmon, term of imprisonment is up to 3 years and/or fine is 20,000 NT dollars.

Methods of Enforcement

1. Duty sections:

On February 16th, 1984, the Executive Yuan considered the preservation of Formosan landlocked salmon as a major objective in the preliminary program of ecological conservation. Rules of patrolling and protection were proclaimed on February 26th. The area of patrol and protection were divided into ten units as duty sections, which included Wulin Guest House, Sections Fruit One, Fruit Two, Fruit three, Fruit Six, Vegetable One, Vegetable Two, Chin village, Ming village, and Daichia Planation Wulin Shanchuan. Meeting to review the results of enforcement have been organized every 6 months. Members of the meeting included the governer of Hoping count, polices and representative from each duty section.

2. Conservation Center:

September 13th, 1984, the Conservation Center were partially funded by the budget of patrol and protection. On October 1st. The Conservation Center were build from the original Produce QC Station. Two personnel and 2 military dogs were hired through the Committee of Veterans. The personnel were moved in the Conservation Center since January 1st, 1987, and the center were official named the "Masu Salmon Conservation Center".

3. Public Education:

To visiting individuals and groups, a motion picture" Fruits of the Restoration for Masou Salmon"

was shown. Memorandum "To Keep the National Heritage" has been postered at the guest rooms and passages. College students majored in biology or zoology were hired to interpret about the conservation of Masu salmons to tourists in summer vacations.

4. Control of Waterfront

To reduce law-broken events and to guarantee the security of salmons, fences were constructed around the Spring Pond and trials to stream side where salmons aggregated.

5. Prevention of stream pollutions:

Littering by residents along stream was banned. Garbages were cleaned and moved away every two weeks. Camping was prohibited aside the stream; camping ground was provided in down stream to reduce the pollution by tourists. Between a Wulin Shanchuang and Wulin Guest House, a six-mile waste water drainage channels were build. A waste water processing station near the Wulin Guest House has been under construction.

6. Managemennt of agriculture:

Banned pesticides and fertilizers were rigorously prohibited, and those with low toxicity were advised. Cooperating with the Center of Asian Vegetables Researches and Development, biological controls were conducted to reduce the dosage and amount of use of pesticides and fertilizers. The Institute of Agricultural Pesticides and Toxicity monitored the contents of fertilizers and pesticides from the steam water.

Results

Through the media and propagation, most public are getting realize that Formosan landlocked salmon is a natural and cultural heritage.

Duty sections were established, which followed the organization of produce sections. Farmers also shared the duty of monitoring illegal fishing, such as casting, electro-fishing, poisoning, netting, etc. Result was significant.

At the very beginning of this protection program (in 1983), Formosan landlocked salmons were sorely found at Spring Pond, Wulin Drawbridge, and several well-covered pools. According to field experts, the population size of Formosan landlocked salmons was only about 200 then. In 1986 the population size was 646, based on the census by Professor Y. S. Lin. In the summer of 1987 in the same area, it increased nearly to 2000. Salmons were easily seen in the shallow area of the stream while standing by the Wulin Road. During the breeding season (October) schools were simply noticed.

To increase the population of Formosan landlocked salmons, Lukang Fishery Experiment Institute conducted hatchery and propagation for salmons. Twenty-two fingerlings and adults in 1985, 307 in 1986, and 154 in 1987 were hatched successfully. On March 26th, 1988, 250 salmons born in 1986 were tagged and released in Shue-shan stream and Chichiawan stream. According to tracking

and investigation by field experts, released fish seemed to be well-adapted to the natural environment. The restoration of salmons should increase the population size tremendously.

Conclusion

Under the policy and decision of the Executive Yuan, restoration program of Formosan landlocked salmon became a national project and operation for conservation. It was funded by the Council of Culture Reconstruction in the very beginning. Thereafter, The Council of Agriculture gave its support and grands to this program.

East bank of Chichiawan stream were for the purpose of recreation and scenery, except some agricultural land. For the long-term goal of conservation for Formosan landlocked salmon, a management scheme of land utilization should be planned as soon as possible to compromise the conflicts among agricultural production, activities of tourists, and preservation of salmons.

Chichiawan stream was scenery and recreational area for public. Sorely two patrolmans were not enough to cover all area. I would like to propose that public education pertaining to ecological conservation would be essential for preserving endangered Formosan landlocked salmon.

The Monitoring of Pesticide Residues in the Water Samples from the Masu Trout Protection Area of Chi-Jea Van Stream

Gwo-Chen Li, Yi-Hwar Lee, Shwu-Pyng Hwu

In an attempt to protect the masu trout from the possible toxic effect of pesticides used at the orchard and vegetable fram around the Chi-jea van stream, a survillence program of pesticide usage in the area have been set up since 1986..

Chi-jea van stream was the major habitate of masu trout. Around the stream, vegetables, apples, pears, peaches have being grown. The total area is about 175 hactares. These farm all belongs to the Wu-ling Farm.

Wu-ling Farm kept good record of pesticide have being used in their farm. In 1985, eighty-eight percent of pesticide used in that area were fungicides, mainly belong to the heterocyclic nitrogen compounds, organic sulfates, and organo-copper compounds. Only 4% of pesticide used in that area was insecticides (Table 1). Most commonly used insecticides in that area were carbaryl, dimethoate, methomyl and chlorpyrifos. Similar use patterns were found in 1986 (Table 2) and 1987 (Table 3). The reduction both in quantity and types of pesticides were found.

In general speaking, the number of pesticide application was fluctuated depends on the occurrence of pests. Average 12-18 application of pesticide per year. and the application

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Taiwan Agricultural Chemicals and Toxic Substances Research Institute.
189, Chung Cheng Road, Wufeng, Taichung Hsien, Taiwan. 41301 R.O.C.

were concentrated from March to October. The total active ingredient used per hactare during 1985 was 29 kg/ha, during 1986 was 20.3 kg/ha, and during 1987 was 24.2 kg/ha. The types of pesticides used was decrease from more than thirty in 1985 to about 20 in 1986 and further declined to 17 in 1987. Apparently, the regulatory control of pesticides used in that area have gained good results.

In an attempt to investigate the possibility of pollution of the stream by the pesticide used in that area. A monitoring program have been set up since 1986. The water samples were collected from Taur-shan, Yeong-Chyuan, Cultivation pond, No.3 fruit farm and the junction of Chi-jea van stream and Yeou-sheng stream (Fig 1). The water samples were collected once every week from these five sampling sites during March to October while pesticides were relativ heavily used. During November to February, water samples were collected once every two weeks.

Fourteen different pesticides which included five fungicides, six insecticides, two miticides and one herbicide (Table 4) were analyzed. The fish toxicity of the analyzed pesticides was listed on Table 5. There were no pesticide residues have been found in 365 water samples collected during the period from February of 1986 to June of 1988 (Table 6,7). Because the detection limit of fourteen pesticides were all as low as ppb level, apparently, the pesticides used in that area have not caused any acute adverse effects to the masu tourt in that area. However, long term survillence program have to be kept going because the potential danger still exist in that area. Especially during the raining season, to avoid the use of pesticides with high fish toxicity are necessary.

Table 1. Pesticides Used in Wu-Ling Farm (1985)

Pesticides	Formulation	Use	Kg AI/ha	%	Period
Captafol	80% WP	F	10.477	28.94	3-9
Dodine	65% WP	F	7.642	21.11	3-9
Paraquat	24% S	H	7.491	20.69	12,3,5
Mancozeb	80% WP	F	2.555	7.06	3,5-8
Oxin-copper	40% WP	F	1.600	4.42	5-9
Captan	50% WP	F	1.424	3.93	3-9
PCP-Na	86% SP	H	1.152	3.18	2
Cyhexatin	50% WP	A	0.606	1.67	5-6
Carbaryl	85% WP	I	0.569	1.57	3,5-7
Thiophanate-methyl	75% WP	F	0.514	1.42	3
Dimethoate	44% EC	I	0.427	1.18	2,3,6-10
Iprodione	50% WP	F	0.312	0.86	3-6,8,9
Methomyl	90% WP	I	0.273	0.75	8
Acephate	75% WP	I	0.202	0.56	6-8
Benomyl	50% WP	F	0.197	0.54	4-7
Chlorpyrifos	40.8% EC	I	0.163	0.45	5-8
Glyphosate	41% S	H	0.143	0.40	12
Carbofuran	85% WP	I	0.109	0.30	9
Monocrotophos	55% S	I	0.067	0.18	9-10
Phenthoate	50% EC	I	0.052	0.14	9
Larvin	75% WP	I	0.045	0.13	9
Methamidophos	50% S	I	0.042	0.12	6-7
Fenarimol	12.27% EC	F	0.040	0.11	3-6
Mevinphos	25.3% S	I	0.037	0.10	9
Chlorobenzilate	25.5% EC	A	0.021	0.06	3
Permethrin	10% EC	I	0.019	0.05	3
Trichlorfon	95% SP	I	0.017	0.05	6
Terbufos	10% G	I	0.011	0.03	7
Endosulfan	35% EC	I	0.002	0.01	

Table 2. Pesticides used in Wu-Ling Farm (1986)

Pesticide	Formulation	Use	kg AI/ha	%	Period
Captafol	80% WP	F	4.625	22.8	2-10
Benomyl	50% WP	F	3.788	18.7	5,6,8
Mancozeb	80% WP & 33% FP	F	3.138	15.5	4-10
Captan	75% WP	F	2.578	12.7	1,3-9
Oxin-copper	40% WP	F	0.970	4.8	4-9
Dodine	65% WP	F	0.824	4.1	4,5,11
Carbaryl	85% WP & 40% EC	I	0.811	4.0	6-9
Monocrotophos	55% S	I	0.630	3.1	5-8,10
Terbufos	10% G	I	0.459	2.3	4-6,8,9
Mevinphos	25.3% EC	I	0.425	2.1	4-10
Chlorpyrifos	25% WP & 40.8% EC	I	0.418	2.1	3-8
Carbofuran	85% WP	I	0.381	1.9	4-6
Methomyl	90% WP	I	0.365	1.8	5-8
Dimethoate	44% EC	I	0.333	1.6	4,5,11
Endosulfan	35% EC	I	0.267	1.3	5,6
Cyhexatin	50% WP	A	0.208	1.0	4-6
Fenvalerate	20% WP	I	0.024	0.1	8
Permethrin	10% EC	I	0.022	0.1	10

Table 3. Pesticides Used in Wu-Ling Farm (1987)

Pesticides	Formulation	Use	Kg AI/ha	%	Period
Mancozeb	80% WP	F	5.483	22.88	3-10
Terbufos	25% EC	I	4.599	19.19	2-5,9
Captafol	80% WP	F	3.937	16.42	2-6,8-10
Captan	75% WP	F	2.081	8.68	4-6
Oxin copper	40% WP	F	1.865	7.75	4-6
Mevinphos	25.3% EC	I	1.513	6.31	3-9
Permethrin	10% EC	I	1.444	6.03	3-4
Dodine	65% WP	F	0.720	3.00	6-7
Methamidophos	55% S	I	0.588	2.45	4-8
Benomyl	50% WP	F	0.403	1.68	3-4
CuOH	83% WP	F	0.330	1.38	6,7,10
Cyhalothrin	2.8% EC	I	0.314	1.31	5,6,9
Cyhexatin	50% WP	A	0.301	1.26	3,5,8
Fenvalerate	20% WP	I	0.241	1.01	9
Iprodione	50% WP	F	0.201	0.84	3,9
Acephate	75% SP	F	0.100	0.41	4
Etridiazole	50%,25% EC	F	0.051	0.21	8-9

Table 4. The Common Name and Chemical Name of Analyzed Pesticides

Common Name	Chemical Name
Captafol	Cis-N-[(1,1,2,2-tetrochloroethyl)thiol]-4-cyclo-hexene-1,2-dicarboximide.
Captan	Cis-N-[(trichloromethyl)thiol]-4-cyclohexene-1,2-dicarboximide.
Carbaryl	1-Naphthyl N-methylcarbamate.
Carbendazim	2-(Methoxycarbonylamino)-benzimidazole.
Carbofuran	2,3-Dihydro-2,2-dimethyl-7-benzofurangl methyl-carbamate.
Chlorobenzilate	Ethyl 4,4'-dichlorobenzilate.
Chlorpyrifos	O,O-Diethyl O-(3,5,6-trichloro-2-pyridyl)-phosphorothioate.
Dicofol	4,4-Dichloro-alpha-trichloro-methylbenzhyldrol.
Methomyl	S-Methyl-N-[(methylcarbamoyl)oxy]-thio-acetimidate.
Paraquat	1,1'-Dimethyl-4,4'-bipyridinium ion.
Parathion	O,O-Diethyl O-4-nitrophenyl phosphorothioate.
PCP-Na	Sodium pentachlorophenyl.
Permethrin	3-(Phenoxyphenyl)methyl(I)-cis,trans-3-(2,2-dichloroethenyl)-2,2-dimethyl cyclopropane-carpoxylate.
Thiophanate-methyl	Dimethyl (1,2-phenylene) bis-(iminocarbonothioyl) bis-carbamate.

Table 7. The Number of Samples Collected from Chi-Jea Van Stream (July, 1987 -- June, 1988)

Time of sampling		No. of samples					
		W-1	W-2	W-3	W-4	W-5	TOTAL
1987	Jul.	1	1	1	1	1	5
	Aug.	4	4	4	4	4	20
	Sep.	2	2	2	2	2	10
	Oct.	4	4	4	4	4	20
	Nov.	3	3	3	3	3	15
	Dec.	3	3	3	3	3	15
1988	Jan.	2	2	2	2	2	10
	Feb.	1	1	1	1	1	5
	Mar.	1	1	1	1	1	5
	Apr.	3	3	3	3	3	15
	May	3	3	3	3	3	15
	Jun.	3	3	3	3	3	15
	TOTAL						150

W-1 : Taur-shan
W-2 : Yeong-chyuan
W-3 : Cultivation pond
W-4 : No. 3 fruit farm
W-5 : Junction of Chi-jea van stream and Yeou-sheng stream

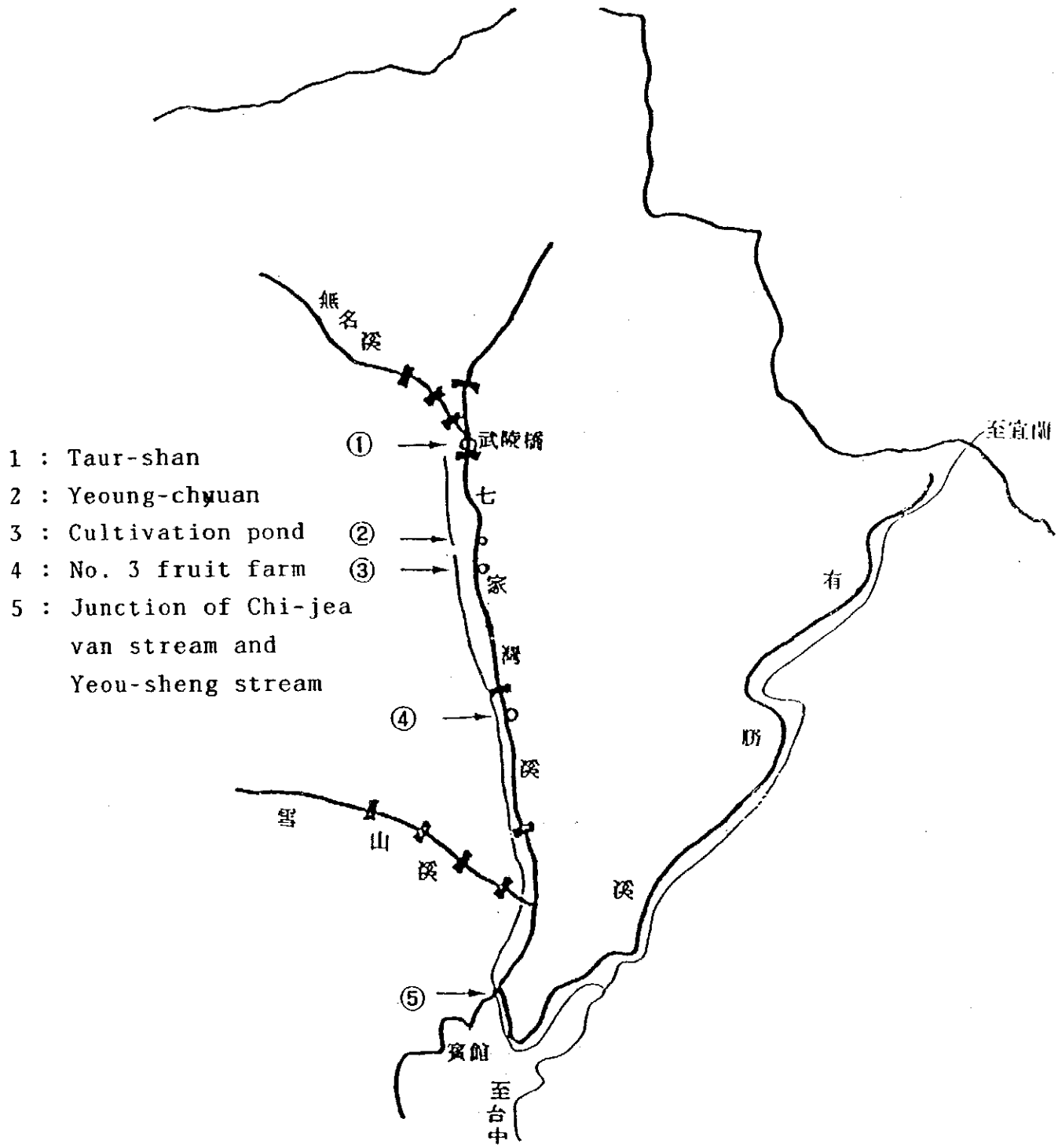

Fig. 1. The Sampling Sites

artificial food was too big for them. During the artificial food training, they need plankton for substituted food. In addition, the river sands during raining season covering the gills of fries, and the shortage of manpower during fries stages, both could cause the death of fries. Those could be improved in the future.

Study on the Plankton and Water Quality of the Upper Ta-Chia River

Chi-Hsiang Lei[1], Jiann-Chu Chen[2], Chao-Kuan Chen[1] and Ping-Chung Liu[2]

I. PURPOSES OF STUDY

The upper Ta-Chia River has been a good habitat for masou salmon Oncorhynchus masou formosanus in the past. However, in recent years, owing to the increasing human activities and the clearance of vegetation for the plantation of apple and pear trees on the steep slopes along the river, the erosion and nutrient loss of unprotected soil has been accelerated greatly. Moreover, the application of large quantity of fertilizers (both inorganic and organic), pesticides caused an increase in the loading of plant nutrients and pesticides in the river water through runoff. As a result, the habitat of masou salmon has been severely damaged, and the survival of masou salmon in the area has been threatened. In order to prevent the extinction of this species of fish the Council of Agriculture initiates a program to carry out ecological study, and tries to protect and preserve this species of fish. The purpose of this study was to investigate the water quality and plankton (species composition and abundance), the relationship between them, and to obtain the basic data required for assessing the degree of eutrophication and for environmental conservation.

II. MATERIALS AND METHODS

Water and plankton samples were collected once every three weeks from 6 stations (Te-Chi, Yu-Non, Sung-Mou, Chung-Hsing, Ping-Teng and Wu-Ling) in the upper Ta-Chia River during the period from October 1986 to June 1987. Water samples for water quality analysis were collected with a plastic water sampler, poured into a polyethylene bottle and kept frozen in an ice box until the measurement of water quality parameters was made in the laboratory. On each sampling date, temperature, pH, DO and conductivity of water at each sampling station were measured immediately after the water sample was taken. Zooplankton samples were collected by concentrating 30 liters of water, taken with a plastic sampler, with a 55 μm mesh netting and preserved in 10% formalin in a 150-ml plastic bottle. For phytoplankton samples water at each station was taken with a graduated cylinder and poured to fill a 250-ml plastic bottle containing 2.5 ml of Lugol's solution to a volume of 250 ml. In the laboratory subsamples of plankton in each sample were identified and counted under a microscope at 100x or 200x magnification, and the spe-

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THE BIOLOGY AND MANAGEMENT OF LANYU SCOPS OWL (Otus elegans botelensis)

*Lucia Liu Severinghaus**

The Lanyu scops owl is endemic to Orchid Island (Lanyu) southeast of Taiwan. This study investigated the species' current status, distribution, and natural history on Orchid Island. Methods used included a literature search, interviews of local people at regular intervals, and field studies of the species' ecology, behavior, and breeding biology.

The results show that only 150 to 230 owls still exist, but the population has been relatively stable. The owls are largely insectivorous. Their prime habitat of mature forest with old trees has been greatly reduced, but the species does use some areas highly altered by people. However, because social behavior seen in prime habitat may have significance in the breeding or survival of individuals, disturbed habitats containing maximum 2-4 birds should not be considered suitable habitat in the long term survival of this species.

Some owls remain in the same location year round, some individuals move away from their breeding locations during the non-breeding season, while some other individuals appear in certain locations at the time of courtship but move away in a couple of month to other places to breed. The specifics of this aspect of their natural history is not yet understood. For the owls that stay in the same location year round, a pair may use more than 6 ha of area in its yearly activities.

In prime habitat the density of Lanyu scops owls is very high. Their activitity areas overlap greatly year round. They forage and roost in adjacent trees but no intraspecific aggression has ever been witnessed.

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Whether the high density of these areas is forced on them by the loss of other prime habitats, or whether it carries social significance to the species is not yet known.

Lanyu scops owls breed in pairs and seem to maintain no territories. Multiple copulations take place prior to egg laying. There is courtship feeding and procopulatory dueting as well as copulatory vocalization. Pair bonds may last several years. Nests are mostly in natural tree cavities, although a few nests are reported to be on the axil of coconut palm fronds. The same cavity may be used several years in a row by the same pair especially in areas where suitable nest sites are limited.

Clutch size is two or three, and the egg laying schedule is deduced to be one egg every three days. If a nest is lost early in the season, the pair would reproduce a replacement clutch. The female does all the incubation. Incubation time is probably around 30 days. Young are fed by both adults and fledge in 32 days. Parents continue to care for the young after fledging for at least 24 days.

Young owls are covered with white down at hatching. At 9 days age, juvenile feather sheaths begin to show. At 20 days age the young bird is covered with juvenile feathers, and the juvenile molt is almost complete. The weight of young exceeds that of adults weight before fledging. Their tarsus lengths reach adult sizes at about two weeks age while culmen length does not reach adult size until after fledging.

Fledglings may remain near their nests from a few days to three weeks. With only one exception, no young owl was ever seen again after it was two months old. No young owl was resighted in the second breeding season when it

was a full year old. Thus, when Lanyu scops owls reach sexually mature age is still unknown.

The breeding success of Lanyu scops owl is limited in part by the lack of suitable nest holes, and in part by human persecution, especially that of bored soldiers. Hunting pressure is high given the small population size and the low productivity. Among the birds banded in 1986, only 36.7% are still present, 71.4% for the 1987 birds, and 39.6% for the 1988 birds. Thus these owls may have fairly high mortality. Consequently, if there is further habitat loss on top of these two pressures, the population size of Lanyu scops owl surely will decline very rapidly.

Recommemdations submitted to the Council of Agriculture include:

1. Protect existing habitat strictly. No trees should be cut for purposes other than traditional yami uses.

2. Persuade the soldiers to stop catching owls for recreation but rather participate in bird watching or assisting on-going research efforts in their spare time.

3. Prohibit strictly the harvest, sales, and transport of the endemic and endangered species of Orchid Island.

4. Establish a Lanyu scops owl refuge with proper protrol and management.

5. Implement a public education program to explain to people why Lanyu scops owls should be protected.

A Study of the Tatu Estuary Bird Sanctuary

Peter Ping-huang Chen

I. Purpose of study

The purpose of this study is to investigate the species composition in the Tatu Estuary, to evaluate the importance of varied habitats for the dominant bird species, to identify the movement of these populations and to evaluate the impact of the trend of land use.

The final goal of this is to determine the feasibility of developing this estuary as a multiple-purpose bird sanctuary and to recommend alternative development strategies.

II. Materials and methods

Data on the distribution, abundance, and movement of birds were collected by field observation using binoculars and spotting scopes. The field work was conducted monthly during summer and winter and weekly during the spring and the autumn migration period.

Information about land use was obtained by document references, field observation and interviewing local people.

Conclusions and recommendations were drafted by the investigator and then reviewed in a conference for criticism and comments from interested parties, including representatives of governmental agencies, conservation groups, scholars and local people.

III. Results

1. Habitat usage and movement of major bird species

a) Egrets and herons: Little Egrets, Cattle Egrets and Black-crowned Night Herons form a heronry in the woods south of the Tatu River bank. Littles Egrets are distributed evenly in river, intertidal and reclaimed zones. Great White Egrets, Intermediate Egrets and Gray Herons feed mainly in the river zone. The feeding egrets move back and forth according to the tide. The egrets and herons use the heronry for roosting, respectively night and day during the non-breeding season.

b) Ducks: Thousands of ducks rest at the lower part of intertidal zone during autumn migration period. Most wintering ducks stay the whole day in the river zone. Only small flocks of ducks hide in the grassland of the reclaimed zone. At least some ducks fly up-stream to feed and fly back to the estuary at dawn.

c) Plovers and sandpipers: Most of these waders spread out to feed in the intertidal zone during low tide and retreat on land when the zone is flooded. However, some waders like Common Snipe and Green Sandpiper occur mainly in reclaimed zone.

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There was no predator, except *Rattus rattus*, present in the Islet. Human activities derived from resources exploitation around the area were the major disturbance. The abundant fish resource in the area attracted a constant fishing activity year around. Thirty-two fishing boats, belonged to seven islands, were seen nearby the Islet. Data collected from twenty-five boats showed that a boat with 1 to 3 persons spent on the average 17.62 days in the area during the breeding season, while 14.08 days during the non-breeding season. In addition, the abundant mollusk, crabs and seaweed on and in the vicinity of the Islet also attracted fishermen to visit the Islet constantly. Furthermore, during the breeding season many visitors (3-50 persons per boat, 1-6 boats per month) came to visit the Islet and caused some disturbance. The Islet was no longer a target for the military practice. However, the military events occurred in the vicinity is still a possible threat to the existence of the population.

Conclusion

The Islet, with a unique seabird fauna and abundant breeding population, is worth of establishing a seabird sanctuary. We propose to set up a sanctuary which includes the Islet and parts of its surrounding area. Fishing activity will be allowed to avoid local conflict. However, a temporal and spatial restrictions to visit the area or to exploit the resources of the nearby area will be regulated to minimize the human impact on seabirds.

Pilot Banding project of East Asia International Migration Birds

Kuo, Da-jen[1]; *Tseng, Mary*[1]; *Chuang, Yuan-hong*[1]; *Tsau, May-hwa*[1]

Abstracts

The purpose of this banding project is to provide complete and reliable biological data upon which sound conservation policies may be based.

This project is a continuous project funded by the Committee of Agriculture (COA), and this is the third year. Since November 1986, the banding operations took place in Kuanto swamp area once every weeks. The contributors include volunteers of Wild Bird Society of Taipei and some university students. The birds were trapped by mist net. After banding, meansuring, and recording the biological data, then the birds were released.

From November 1986 to February 1989, There are 95 times operations. A total of 57 species and 3400 birds were banded with 150 retraps and 43 recoveries. The most exciting finding in this project is that two foreign banded wanders were caught in our project. One is a Terek sandpiper (*Xenus cinereus*) banded by Japan and the other is a Grey tailed tattler (*Tringa brevipes*) banded by Australia. The information of these two birds had been transfer to the original banders and we also received the responses. Another important finding in our project is that we had discovered some birds new to Taiwan. These birds include Reed bunting (*Emberiza schoeniclus*), Little stint (*Calidris minuta*), and western sandpiper (*Calidris mauri*). Besides, we also trapped some vagrants such as house matin (*Riparia riparia*) and Schrenck's little bittern (*Ixobrychus eurhythmus*).

After analyzing the data we had collected, we had following finding.

1. The method of deciding the bird age: In order to realized the population ratio of adult and juvenile birds, we analyzed the data of wintering Dunlin (*Calidris alpina*) in Kuanto area. From 1143 traps, 67 retraps, and 23 recoveries, we found that adult and juvenile birds can be distinguished by the shape of the primary flight feathers, the wearing of the primaries, and the color and pattern of the covert.
2. Moult in migratory birds: Every species has its own moulting sequence and schedule. Generally, the waders' primary moult are from inner to outer, but some other juvenile have outer primary moult in February. And some adult birds might have suspended moult during migration season. Even in different races of same species might have differences in moulting. Now we are making effort to collect more information of moulting to improve our knowledge in this field.
3. During migration season, we found that Kuanto is very important resting place for migratory waders. For example, during northern migration, we could trap as many as 130 Grey tailed tattler (*Tringa brevipes*) within 6 weeks. From the data collected, we found that these Grey tailed tattler only stay for a short period, may be 2 – 3 weeks. In this period, they restore their energies. The body weight increased nearly 50%, from a two week retrap (109 grams to 154 grams.) Thus, we can conclude that Kuanto is a very important place for migratory birds.

According to our experiences in three years research. We have following suggestions.

1. As the growing of banding activity in Taiwan, there should be a banding center for coordinating all of the banding activites.
2. The banding is very important research work for conservation, so the objective should not limited in migratory waders. If possible, it should expend to the migratory passerine or even resident birds.
3. In spite of banding, bird count is also a very important study. In order to get more complete information of migratory waders, It should have some bird count project to assist banding project.

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The Study on the Consumption of Wildlife Resources in Taiwan

Ying Wang, Chinying Chen and Wen-Chun Lin

Introduction

Taiwan, with a great geographic and topographic variation, has a very rich fauna. Due to heavy hunting exploitation and habitat destruction in recent years, the wildlife population decreased sharply. In this study, 18 species of mammals were selected to study their population status and utilization by people. Results obtained will be applied to the future management.

Method

From July 1985 to June 1988, game store owners were surveyed by direct and telephone interviews and questionnaires to study the game trade and its monetary value. Aborigines and forestry workers were also interviewed and sent questionnaires to report their views on current population changes among different species. Besides, consumers were asked by questionnaires to learn their ways of utilization of different games.

Results

1. Distribution and Patterns of Game Stores

Total 127 game stores were found during past 3 years. About 83% of them were distributed in the Southern (54) and Eastern (51) Taiwan. The average store age was 15 years. In addition to game trade, many of them (55.1%) also ran other business such as restaurants and groceries.

2. Level of Trade

Three categories could be found among different species according to the number of each game species sold annually. No cloudy leopard (*Felis bengalensis chinensis*) was found.

(1) Major target species :muntjac (*Muntiacus reevesi micrurus*), hare (*Lepus sinensis*), gem-face civet (*Paguma larvata taivana*), wild boar (*Sus scrofa taivanus*), serow (*Capricornis crispus swinhoei*) and flying squirrel (*Petaurista spp.*) were included. The average annual trade of each species was between 100 and 400 per store within 3 years. The highest annual trade number for a store varied between 500 and 2000 among 3 years.

(2) Common species : monkey (*Macaca cyclopsis*), ferret-badger (*Melogale moschata subaurantiaca*), mongoose (*Herpestes urva*), pangolin (*Manis pentadactyla pentadactyla*) and small Chinese civet (*Viverricula indica pallida*) were included. The average annual trade was between 10 and 50, the highest annual

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trade for a store was over 100. Of these species, monkey population seems to increase recently.

(3) Rare species : weasal (*Mustela sibirica davidiana*), sambar (*Cervus unicolor swinhoei*), leopard cat (*Felis bengalensis chinensis*), black bear (*Selenarctos tibetanus*), yellow-throated marten (*Martes flavigula chrysospila*) and otter (*Lutra lutra chinensis*) were included. The average annual trade was below 5. The highest record was 50 in one store. Among those species, only 1 otter was found during past 3 years.

3. The Price of Game

Among 7 consumed species (muntjac, hare, boar , serow, gem-face civet, pangolin, sambar). Unit price of pangolin was the highest (1000/0.6kg), gem-face civet (830/0.6kg) was the second. The prices of the rest animals varied between 250 and 370. However, the sale prices of whole live animals were different. Bears were between 60000 and 100000. Sambar, leopard cat, yellow-throated marten and others ranged from 12000 to 40000, and the rest of animals were under 10000. Species such as monkey, gem-face civet and boar which were potential pets were sometimes sold for higher prices when animals were younger and smaller.

4. The Utilization of Game

Among games, boar (98.9%), hare (97.5%), and bear (96.0%) were the most familiar species to people. Seven species (11%-32%), including muntjac, hare, boar, serow, sambar, gem-face civet and flying squirrels, were more often used for meat. The consumption of bear (3%) and pangolin (80%) was less because of the higher price. Monkey, and other species with unpleasant odor such as mongoose, Chinese civet, ferret-badger, and weasal were seldom cooked. There were no records of cloudy leopard, leopard cat, and otter on the table.

Curiosity was the major factor which motivated people to use games. Nearly every part of games were used, including meat, blood, bones, penises, antler from deer and gall bladders of bear. The skulls, horns, and skin were made into specimens. Besides, small games, such as hare ,monkey, gem-face civet and flying squirrels, were kept as pets.

5. The Population Status of Game

According to opinion polls from aborigines and forestry workers on population status among different species, 3 classes of animals could be established :

(1) Abundant species : flying squirrels, monkey, boar, serow, muntjac, gem-face civet and hare.
(2) Common species : ferret-badger and weasel.
(3) Rare species : pangolin, bear, Chinese civet, mongoose, sambar, leopard cat, otter,and yellow-throated marten.

Conclusion

From the opinion polls and interviewing results of game store owners, aborigines and forestry workers, 17 species (cloudy leopard possibly near extinction not included) could be divided according to their relative abundance and exploitation rate into 4 classes.

(1) Endangered species : sambar, pangolin, otter and bear.
(2) Threatened species : muntjac and serow.
(3) Less-threatened species : mongoose, gem-face civet, boar and hare.
(4) Non-threatened species : weasel, leopard cat, Chinese civet, ferret-badger, flying squirrel, monkey, and yellow-throated marten.

Study on the Butterflies Fauna and the Recovery of *Troides Magellanus* of Lanyu

Chen Wey-Sou *

1. Purpose

Lanyu used to be a well-known place where butterflies are rich breeding. But in the recent years butterflies are seldom seen there. On the other hand, there is even up to now still no any completed research report relating to butterflies. The purposes of this study are:

(1) To investigate the unigue butterflies fauna at Lanyu, and collect the basic data of the butterflies there.

(2) To find out the causes of the decline of the *Troides magellanus* and the Lanyu origin butterflies population so as for preparing a conservation plan. Since the *Troides magellanus* has been verging on extinction, urgent actions should be taken to preserve it; and, on the other hand, experiment of its recovery should be processed as to study a workable recovery way.

(3) To study how to develop the butterflies as resources for education and sightseeing when the Lanyu origin butterflies are successfully recoveried.

2. Methods

(1) Use the conventional methods to collect the basic data of the Lanyu origin butterflies, suce as the butterflies fauna, distribution, ecology, and living history etc.

(2) Based on the scope and the vicissitude of the butterflies population to design, under the limitation of available manpower and

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5,000 butterflies.

(4) When the recovery plan was succeeded, butterflies will be a special scenery at Lanyu. If a Butterfly Garden with a Butterfly Museum (small-sized) is set up, butterflies shall be developed as the resources of education and sightseeing.

Population Distribution and Habitat Utilization of Formosan Macaques at Nan Tsi Shien Shi Logging Road, Yushan National Park

Yao-Sung Lin, Jane-Fu Lu, Ling Ling Lee

Abstract

This study was conducted at Nan Tsi Shien Shi logging road from 11.6K to 33.2K, to investigate the population distribution, density, troop composition, activity and behavior of Formosan macaques (*Macaca cyclopis*), as well as the relation of macaque distribution and activity with vegetation along the logging road.

During the study, macaque troops were spotted 140 times. Density of macaque along the road was estimated to be 2.01 troops/km^2. Troops were most often sighted between 18.8K to 26.4K of the road (69.8% of all sightings). Troops size varied between 1 to 14 individuals. Most troops sighted had 1 to 5 individuals. Troops of troop size of 6 to 10 was next often sighted. Troops of troop size greater than 10 was least often seen. Based on the information of 10 troops in which all members could be identified, everage troop size was 7.8, which including an average of 3.7 adults and 4.1 youngs. Sex ratio of adult male vs. adult female was 1:2.2 .

Vegetation along the logging road was mainly Primary broadleaf forest (40.2%),secondary broadleaf forest (34.0%), Primary coniferous forest (13.5%),and artificial plantation (11.0%). Macaque density was the highest in natural coniferous forest (3.2 troops/Km^2), then in the secondary forest (3.0 troops/Km^2), articificial plantation (2.66 troops/Km^2), and the lowest in natural broafleaf forest (0.75 troop/Km^2). The reasons for the lowest density in the natural broadleaf forest may be (1) Visibility in natural broad forest was lower due to dense vegetation, and the macaque density was understimated; (2) Acitivity of forest workers, such as *Picus pumila* pickers may have disturbed and affected the activity of the macaques.

Formosan macaques were active at different forest stratum at different time of the day. They generally feed on trees at 5 to 6 a.m., groomed and rested besides feeding and started to appear on the ground at 7 to 8 a.m. From 9 a.m. to noon, they often rested on large branches near the canopy. After 3 to 4 p.m. , macaques would increase the frequency of their social activity, grooming and resting, reduce the amount of time in feeding, and move around more often, but the activity now is still mainly on trees.

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because some molluscan and bethonic foraminiferal fossils were preserved still possiblly, they can be recognized by naked eyes. The sandy soil-like limestone was the sandy soil which resulted from weathering and covered on the limestone surface. Sometime these are some limestone blocks distributing on the surface of these sandy soil. The surface of the block-like limestone is sometimes covered by some weathered soil and under this block-like limestone is the massive limestone. Most of the block-like limestone is in fragmental and disorder distribution. The close hard limestone looks like in massive, whole and stratum conditions. This member resulted from the cementation of many kind animal fragments. It can be still recognized some organisms such as coral, spongea, bryozoa, echinordea, foraminifer and some arthropod fragments.

The thickness of the Shou-Shan Limestone is about 500 M. Under this limestone is the sandy mudstone. This limestone belongs to reef-limestone which all resulted form the cementation of the organism bodies or their fragments. The lowermost part is comprised of mollusca,lime-alge, spongea, bryozoa, echinoidea and foraminiferal bodies or their fragments. The middle part is occasionally comprised of little colonial coral or their fragments. The uppermost part can be found many colonial corals and their fragments, and these materials are cemented very close and hard. Sometimes they are found recrystalization and to become more hard than their original organisms.

There many be a stress from south-east to force both the Shou-Shan and the Ta-Kang-Shan Limestone. This stress resulted in the NE-SW trend lineation structures. The joints, faults and folds are all in trend of NE-SW. The trend of lineation structures are the main geological processes which reaulted in many special valuable landscapes.

Under these geological conditions and after detailed surveying and classification, many special valuable landscapes are found. They are cave landscapes, cliff landscapes, canyon landscapes, fossil landscapes and stalactite landscapes. In the following parts, they are described according to landscape characters, visual elements of landscape and geological processes resulting in landscapes.

The cave landscapes have the landscape characteres as close landscape, cover landscape, focus landscape and detail landscape. For the visual elements, they have unconstant forms, straight, curve and irregular lines, sigle color but becoming various color for various lights. Their geological processes are the faulting of the endogenetic geological process and the solution erosion of the exogenetic geological process.

The cliff landscapes have the landscape characters as panorama landscape and detail landscape. For the visual elements, they have erecting-flate plane form, straight lines, rocky and vegetation colors. Their geological process is the faulting of endogenetic geological process.

The canyon landscapes have the landscape characters as close landscape and detail landscape. For the visual elements, they have various forms, straight, curve and rupture lines, sun-light and vegetational colors. Their geological process are the faulting of the endogenetic geological process and the solution erosion of the exogenetic geological process.

The fossils landscapes have the landscape characters as characteristic landscape and detail landscape. For the visual elements, they have various forms and lines. Their geological process are erosion, transportation and deposition of the exogenetic geological processes.

The stalactite landscapes have the landscape characters as characteristic landscape, detail landscape and temporary landscape. For the visual elements, they have stone peach, stone curtain, stone rattan and human body-like forms, straight, curve and rupture lines, various colors. Their geological processes are erosion, transportation and deposition of the exogenetic geological processes.

P r o p o s a l s

The limestone areas have many special landscapes. Because these landscapes have the values of sightseeing and academics, they must

Studies on Planning and Management of Hahpen Nature Preserve

Chin-Ming Lü[1]; Lo-Min Chang[1]; Yuen-Po Yang[1]; Tzer-Tong Lin[1].

Purposes

The 332.7-hectare Hahpen Preserve which belongs both to Wulai, Taipei County and Yuan-shan, I-lan County in administration is yet under the charge of the Taiwan Forestry Research Institute. Owing to its abundant natural resources, the Council of Agriculture officially set aside this area as a Nature Preserve on June 27, 1986. It aimed at protecting the broadleaved forest, fauna and flora in the representative northern mountain area of Taiwan. Management and further planning are therefore necessary. Thus comes the purpose of this project.

Methods

1. Set up the Forestry Governing Agency with rangers recording the number of mountaineers and their purposes, making known the Preserve's regulations. The rangers patrol this area two times per month.

2. Complete the file listing the natural wealth in this area through investigating the existent plants in the Preserve together with outcomes of investigations on other natural resources.

3. Study and draft managing and governing project. And bolster it by establishing required facilities.

Results

1. The rangers-equipped Forestry Governing Agency was organized in November, 1986. Up to June, 1988, the people passing this Agency totaled up to 844 with 588 travellers, 76 hunters, 48 fishmen, 44 plant collectors and 88 field workers.

2. Four worn, used snares, a small fire and one hunting were cracked during the mountain patrolling.

3. Four signposts and notice signs were posted.

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1. Taiwan Forestry Research Institute, 53 Nan-Hai Road, Taipei, Taiwan, ROC.

4.124 families, 322 genera and 518 species were recorded here. Follow the society study of these plants, two sample areas measuring 2500 sq. meters and twenty-one of 500 sq. meters respectively were completed.

5. Study and draft the managing and governing project.

Conclusion and Suggestions

1. The Hahpen Nature Preserve covers just a small area yet suffers entertainment. impact. Therefore, it would be wise to set aside a more appropriate area to represent a forest ecological system of the northern mountain area in this island. Instead, this area can be preserved as space for outdoor activities, nature observation and as a showcase for purpose of environment education.

2. Restrictions on entry right to this area should be placed when concerned laws are drawn in the future. At the same time, the Governing Agency should put it into enforcement that what the Preserve-goers carry be subject to check and be properly restricted.

roxburghina.

4. There are some rara species in this region, i.e. *Diospyros ferrea, Ctenitopsis subfuscipes, Aristolochia kankauensis, Diospyros dioscolor, Diplazium chinese, Balanophora kuroiwai, Gonocaryum calleryanum, Gleditsia rolfei.* Those population need be monitored closely.

Suggestion

There are abundant and special resources in the Heng-Chun Natural Preserve. These resources are the characteristics of highly raised coral rock and are unique in Taiwan and should, therefore, be legally preserved.

The study for Idea Conceptual Frameworks and Process for Environmental Impact Assessment in Natural Environment Aspects.

T.H. Lin; S.P. Chang

ABSTRACT

Better methods and more organized systems of information flow that in more timely, accurate, complete and presented in useful format will help decision makers balance the demand for immediate gains from exploitation of resources with the necessity to maintain long-term ability of environment to sustain development. Environmental Impact Assessment (EIA) serves to provide organized information transfer on relevant aspects to decision makers. This process of assessment is forward fooking, seeking to predict the status of the environment. It includes indentification, measurement, anlysis, interpretation of technical knowledge and judgement and presentation.

This study is focus on Comparing 44 major EIA projects, which reviewed by the R.O.C. central goverment, with the EIA. framework and process in natural environmental aspects of some developod countries. Author also gives some sugestions for the R.O.C. Taiwan area working as referonce to set EIA program.

Environmental Protection Administration, Executive Yuan.

2. Objectives

(a) To lead the audiences to the classroom of " Nature " through the introductions and explanation of Experts and scholars. The audiences may familiarize themselves with (1) the concept of environmental protection; (2) the description of the worldwide ecological crisis and; (3) the understanding of the importance of continuous cnsumption of natural resources.

(b) To endow the youth with the sharp insight into the future; to raise their concerns about life in the universe.

(c) To have the andiences come to realize the abundance of life, including animals & plants in Taiwn; Audiences are to be reminded that they should also pay respect to other creatures on this planet.

3. Implementation and results

The project started in 1986; the results of the implementation for the past 3 years are listed as below—

(a) The features on the youth activities. such as " The workshop on environmental protection and maintenance " " The workshop on the ecology of birds " " The travel to the Yuan Yang lake a reserve for natural resources. "

(b) Seminars on the natural resources in National Parks, includig of Yu-Shan Nationl Park; Taroko National Park and Yangming-Shan National Park.

(c) Panel discussion on the concept of esablishing the preservation of the natural ecology and environment. We invited Mr. Koh Ching-Chau, Vice Chairman, The Council of Agriculture, Executive Yuan; preside over the panel discussion with famed Scholars/Experts participating. Aside from making an on-the-spot broadcasting program, We also had the article carried in " The Youth Monthly ", making the program a multi-media campaign.

(d)A Nation-Wide Simultaneous Broadcasting program we had some programs such as 〝青山常在綠水長流〟〝綠色家族〟 dramatized and trees, flowers etc.; in the forest personalized. The vivid dialogue demonstates metaphorically. How precious natural resources are and the importance of keep an ecosystem balance.

We expanded upon the theme of getting back to the nature. The true spirit behind he topic of natural preservation and environmental protection is the same.

4. Review & Suggestions

(a)To rally the support of collegiate after-the-class clubs advocating the campaign to form a network, vertically and horizontally, to ensure the job is deeply implanted in people's mind.

(b) Although there is a long way to go and no immediate feedback we will be seen, the movement callig for the personal involvement in the ecological reservation and environmental preservation is an on-going job. Parties conerned in the goverment are urged to furnish pertinet timely information to further marry current policy or ecology together, With all of above. The masses will then be well-informed through the omnipresent broadcasting programs.

personnels.

3. The Seminar was heartly welcomed by the youth, and the enthusiasm was high. All those participants were able to exchange opinions according to their own specialities. It is worth to be continuely held.

E. Conclusion

We appreciate the supports and assistances provided by Council of Agriculture and all the relevant organizations to make this Seminar successful.

Over the past three years, the alumni are spreading seeds of ecologic preservation and environmental protection at every cornor in the country, we believe that soon it will bear fruits, and make everyone to realize the importance of ecologic preservation and environmental protection, thus truly love and care for our magnificient nature.

Project of Research Activities on Natural Ecology in Chitou Area

Huang, Ying-Tu* & Lin, Shutzong*

Abstract

In order to promote the concept of ecological conservation to the public and raise the quality of life, an educational activity was held in Chitou Forest Recreation Area where have an expanse of landscape and abundant natural resource.

The general affairs of the activities such as arranging items, schedule, participated uniys and interpretative information was executed by the Experimental Forest of National Taiwan University. Field observation and lecture on natural resource were conducted by 10-12 staff (M.S. degree) and experts invited.

The activities had been held for 7 times in 1988 and the amount of 1104 school students had joined. Each field observation team for 15-25 members was guided by 1-2 interpreters to engage in plant identification,seedlings cultivation, birdwatching, acquaintance of forest ecosystem. In the evening, the screen that intriducing the relationship between natural environment and human's life was shown.

In the activities, participator enjoyed beautifull scene, also perceived the mystery of nature intuitively. So achievement was excellent and attractive as to be suggested to hold this kind of activities continuously.

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Competition and Exhibition of Posters of Nature Conservation

Chia-Hsiang Wang

Purpose

1. Educate the public to recognize the govement's policy of nature conservation.
2. Improve the public to consent to the policy of nature conservation.

Method

1. Solicit posters of nature conservation publicly as a competition.
2. Arrange the selected posters for a special exhibition in Taiwan Museum and traveling exhibitions around Taiwan.
3. Arrange some orations in Taiwan Museum.
4. Publish a special book on the selected posters.

Result

1. 908 works responded to our wanted advertisment, and after several comparitive examinations, the positions in this posters contest were decided by the advisory committee. 114 pieces of them were selected to be exhibits.
2. The special exhibition of selected posters of nature conservation was held in Taiwan Museum from May 1, 1987 to May 20. And traveling exhibitions in 18 stops around Taiwan were held from June 1987 to August 1988.
3. Invited experts to give speeches to the public 7 times in total.
4. Published the book "Posters of Nature Conservation' 3000 copies.

Conclusion and Suggestion

1. 908 pieces responded to the competition, we think thet the 908 painters should have deeply thought about the significance of nature conservation during their paiting procedures, and in the future, they will be the propagators of conservation concept.

2. We belive that traveling exhibiyions extended the influential effects

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to the full island of Taiwan.

3. The concept of nature conservation still does not know clearly by the public, we have to educate them through any activities in the future.