林業特刊第三十五號

自然文化景觀調查研究計畫成果提要集(四)

Summary of Reports on Studies and Investigation of Nature/Culture and Landscapes (4)

(1991)

行政院農業委員會印行
中華民國八十年六月

序

本會自民國七十三年九月接辦自然文化景觀工作以來，每年均由各研究機構及學術單位提出研究計畫，經本會自然文化景觀審議小組審定後，交由各執行單位執行。各項研究計畫，均能照預定進度辦理，並已獲致顯著成果。為便於社會各界共同了解，多方探討，及促進今後自然文化景觀工作之推展，特邀請各計畫執行人，撰擬執行結果之中、英文提要，由本會彙整編印成集。其中除了本會提供之八十年度自然文化景觀有關計畫一覽表及自然保育大事紀外，共有十八篇報告，包括動物資源調查研究部分四篇，地景資源調查研究部分四篇，植物資源調查研究部分五篇，資源調查及規劃研究部分五篇。每篇並附有作者之聯絡地址，以便日後讀者可直接和計畫執行人討論。而英文部分，除可供國外人士研究參考之用外，將有助於促進國際間學術之交流。

本會於本年六月四日舉行自然文化景觀調查研究計畫成果研討會，本書於召開之時問世，富有重大意義。諸承各位計畫執行之專家學者及參與編纂工作同仁襄助玉成，使本書得以順利出版，特申謝忱。付梓前夕，謹綴數語，是為之序。

行政院農業委員會副主任委員

林享能　謹識

兼自然文化景觀審議小組召集人

中華民國八十年六月

Preface

Soon after taking over the management of part of nature conservation along with its formal inauguration in September 1984 , the Council of Agriculture set up within itself a committee for screening and financing research projects concerned with nature conservation. All projects are implemented following approval by this committee.

A workshop is held annually to ensure a careful evaluation of such nature conservation projects. All project managers are requested to report on their studies. For FY1991 18 summary reports of the research projects in both Chinese and English are included in the present collection.

In addition to a list of the nature conservation projects supported by the Council of Agriculture and another of major nature conservation events in FY1991, there are four summeries on animal resources investigation and research, four on landscape resources investigation and research, five on plant resources investigation, and five on other resources investigation and research planning.

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 on the findings of the research projects takes place on June 4, 1991. The project managers and other experts will have the opportunity to thoroughly exchange 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.

Ling Shiang-nung
Vice Chairman, Council of Agriculture
Convenor, COA Nature Conservation
Committe
June 4, 1991

總 目 錄

Content

中 文 部 份

Chinese Summary

目　　錄

行政院農業委員會八十年度自然文化景觀有關計畫一覽表

行政院農業委員會[1]

	計畫名稱	執行機關
一.1	櫻花鉤吻鮭族群生態與復育研究(二)	國立台灣大學動物系
一.2	武陵農場魚類教育中心解說設施細部規劃	國立台灣大學動物系
一.3	櫻花鉤吻鮭及其他大甲溪魚類寄生蟲之研究	國立台灣大學醫學院寄生蟲學科
一.4	七家灣溪櫻花鉤吻鮭保育區水域農藥殘留監視	台灣省農業藥物毒物試驗所
一.5	大甲溪石鱉資源之生態與利用研究	台灣大學動物學系
一.6	櫻花鉤吻鮭棲息地巡邏保護	退輔會武陵農場
二.1	本省原生闊葉樹林植物社會資料庫之建立	台灣省林業試驗所
二.2	泥火山地區植物調查(第一年)	國立中興大學
二.3	台灣蝶類保育研究資料庫之建立	國立台灣大學植物病蟲害學系
二.4	台灣區野生動物資料庫(三)蜥蜴(1)	國立台灣師範大學生物學系
二.5	台灣長鬃山羊之生態研究(四)--食草種類及食草之能量和養分季節變化之分析	國立台灣師範大學生物學系
二.6	台灣獼猴之族群生態研究(二)	國立台灣大學動物學系
二.7	台灣特有飛蜥種類之調查研究與復育試驗	私立中國文化大學生物學系環境生態研究室
二.8	台灣黑熊之生態調查及其經營管理策略	中華民國自然生態保育協會
二.9	台灣山羌之生態及行為研究(五)	國立台灣師範大學
二.10	大武山自然保留區哺乳動物相調查(一)	中華民國自然生態保育協會
二.11	台灣獼猴野外供餌之研究(三)	台灣大學 羅東林管處
二.12	闊嘴角鴞之社會行為及棲地利用	中研院動物所
二.13	東亞國際候鳥繫放先趨計畫	中華民國野鳥學會
二.14	桶後溪之水棲昆蟲資源及生態研究(二)	台大植病系
二.15	花東海岸山脈地景調查(二)	台大地研所

1. 台北市南海路37號

計畫名稱	執行機關
二.16 圈養野生動物所須空間之探討	豬科所
二.17 台灣野生動物疾病防治計畫	豬科所
二.18 國內圈養瀕臨絕種哺乳類之調查與血統書建立計劃	台北市立動物園
二.19 全省猛禽調查計劃	中華民國野鳥學會
二.20 大度溪口水鳥保育區之整體發展構想研究	東海大學環境規劃暨景觀研究中心
二.21 翡翠水庫及其水系魚類寄生蟲相之調查	國立台灣大學動物系
二.22 台南縣境內六甲鄉水流東地區密集化石地質景觀之調查	成功大學
二.23 恆春半島之沈積地質景觀調查	成功大學
二.24 高雄市壽山地區台灣獼猴(Macaca cyclopis)之族群分佈與棲地利用之調查	成功大學
三.1 關渡自然保留區管理維護計畫	北市府建設局第三科
三.2 哈盆自然保留區管理及規劃	林試所福山分所籌備處
三.3 鴛鴦湖自然保留區管理維護計畫	退輔會森林開發處
三.4 大武山自然保留區、緩衝區管理維護計畫	林務局
三.5 坪林台灣油杉自然保留區管理維護計畫	林務局羅東林管處
三.6 淡水紅樹林自然保留區管理維護計畫	林務局羅東林管處
三.7 苗栗三義火炎山自然保留區管理維護計畫	林務局新竹林管處
三.8 台東台灣蘇鐵自然保留區管理維護計畫	林務局台東林管處
三.9 大武山台灣穗花杉自然保留區管理維護計畫	林務局台東林管處
三.10 南澳湖泊及原始闊葉樹林保留區經營管理計畫	林務局羅東林管處
三.11 澎湖自然保留區保育管理	澎湖縣政府農業科
三.12 台灣一葉蘭保留區管理維護計畫	林務局嘉義林管處
三.13 插天山自然保留區管理為護	林務局新竹林區管理處
三.14 出雲山自然保留區管理維護計畫	林務局屏東林管處
三.15 烏山頂泥火山自然保留區管理維護計畫	高雄縣政府
三.16 恆春自然生態保護區之經營研究	林試所恆春分所

	計畫名稱	執行機關
三.17	澎湖縣自然文化景觀調查(一)	台灣省立馬公高級中學
四.1	自然保育圖書資料中心	自然生態保育協會
四.2	八十年度青年自強活動鴛鴦湖自然生態保育研習營	救國團宜蘭縣團務指導委員會
四.3	自然保育教育及宣導整體綱要計畫	中華民國國家公園學會
四.4	八十年度自然生態保育技術改進計畫	農林廳技術室
四.5	製播"錦繡大地"廣播節目宣導自然文化景觀保育	幼獅廣播電台節目組
四.6	自然文化景觀宣揚工作計畫	國家公園學會
四.7	八十年寒暑假期青年自強活動生態保育環境維護研習會(內)	救國團總團部青年育樂活動處
四.8	兒童文學宣導自然保育先驅計畫	中華民國兒童文學學會
四.9	扇平台灣藍鵲的錄影帶製作	台灣省林業試驗所
四.10	鳥類保護研習會實施計畫	中華民國野鳥學會
四.11	台灣自然保留區簡介之編印	林試所集水區經營系
四.12	自然環境保育教育	大同教台灣總靈體會
四.13	親子科學研習營	省立台中圖書館
四.14	自然環境綠化與生態保育之宣導計畫	中華民國環境綠化學會
四.15	屏東縣隘寮溪青山溪生態調查與溪流保育宣導手冊編印	屏東農專 科博館
四.16	澎湖縣自然保育及宣導計畫	澎湖縣立馬公國中
四.17	金門地區自然保育研習活動計畫	金門縣政府
五.1	蓮花池地區自然資源保育計畫	林試所
五.2	台灣野生茶樹種源調查及其利用	茶改場及其分場
五.3	水青岡生態調查保護	林試所
五.4	新豐紅樹林調查保護	新竹縣政府農業局
五.5	台灣地區稀有及危機植物之保育評估研究	東海大學園景系
五.6	穿山甲之繁殖保存研究(III)	林試所
五.7	宜蘭地區水鳥保育區規劃調查研究計畫	宜蘭縣政府農業局

計畫名稱	執行機關
五.8 大肚溪口鳥類保護計畫	彰化縣政府
五.9 森林溪流淡水魚類保育工作計畫	林務局
五.10 基隆海蝕地形保護	基隆市政府建設局
五.11 清水溝溪魚保護	南投縣立瑞峰國中
五.12 八十年度台中縣鷺鷥鳥調查保護計畫	台中縣政府農業局
五.13 八十年度台中縣巨木調查保護計畫	台中縣政府農業局
五.14 四德化石區保護計畫	林務局屏東林管處
五.15 台灣引進野生動物對生態體系的影響	東海大學生物系
五.16 八十年度台北市野生動物保育工作計畫	台北市政府建設局第三科
五.17 宜蘭縣八十年度加強野生動物保育計畫	宜蘭縣政府
五.18 八十年度南投縣加強野生動物保育計畫	南投縣政府
五.19 八十年度台灣省加強野生動物保育計畫	台灣省政府農林廳
五.20 八十年度加強台中縣野生動物保育計畫	台中縣政府
五.21 八十年度加強桃園縣野生動物保育計畫	桃園縣政府
五.22 八十年度加強高雄縣野生動物保育計畫	高雄縣政府
五.23 八十年度加強屏東縣野生動物保育計畫	屏東縣政府
五.24 八十年度加強花蓮縣野生動物保育計畫	花蓮縣政府
五.25 八十年度加強新竹縣野生動物保育計畫	新竹縣政府
五.26 八十年度加強台東縣野生動物保育計畫	台東縣政府
五.27 八十年度加強彰化縣野生動物保育計畫	彰化縣政府
五.28 八十年度加強嘉義縣野生動物保育計畫	嘉義縣政府
六.1 台灣本土哺乳動物研討會	台北市立動物園
六.2 國際野生動物保育研討會	中華民國國家公園學會

八十年度自然保育工作紀要
(79.7 ~80.6)

1
行政院農業委員會

79年

7. 本會核准八十年度自然文化景觀生態保育計劃，共六大項計劃，九十餘項子計劃。

7. 本會與救國團合辦七十九年暑期青年自強活動鴛鴦湖自然生態保育研習營，倡導自然生態及野生動植物暨水土保持之觀念，共約百餘人參加。

7.13（五） 本會邀請有關機關及學者專家召開研商「象牙管理會議」，會中決議：為配合國際保護大象之規範，除限制象牙之商業使用外，對於旅客攜帶非商業性象牙，除已加工整支象牙及未加工全部象牙或部分原牙不得進口及區域性限制外，如有合法文件，每人每次限攜帶象牙章一個，象牙筷一雙，象牙球一個或其他象牙產品一件，惟總重量不得超過一公斤。

7.31（二） 本會邀請國際知名系統生態學家郝華德.奧登教授(Prof. Howard T. Odum)來華舉辦多場演講，以使國內各界能更深入了解自然保育及經濟發展所面臨之問題及因應原則，作為學術研究及施政參考。

8.31（五） 本會依野生動物保育法第二次公告保育類野生動物及產製品名錄，除依華盛頓公約第七次會員大會最新修訂名錄將附錄一部分全數列入外，並增選部分附錄二物種，國內部分亦予列入以資保護；同時，將未加工或以加工整支象牙及犀牛角(粉)予以公告，民眾應於三個月內向縣(市)政府辦理登記。

9. 2（日） 台北縣警查局瑞芳分局查獲走私百步蛇四五箱，共約一〇〇〇餘條，經本會協調確認無相關單位可予暫養或研究後，由財政部基隆關(即現今之基隆關稅局)會同查獲單位及商品檢驗局於九月四日假大粗坑垃圾場焚燬。

9.24（一） 新竹憲兵隊查獲走私百步蛇一〇九箱，共約一〇〇〇餘條，並於九月二十六日假南寮垃圾場銷燬。

9.27（四） 本會接獲國際組織密報，指稱有我不法人士自南非郵寄走私犀牛角被查獲，本會即通知財政部海關總稅務司署(即現今之財政部關稅總局)及郵政總局等相關單位特別加以注意。

9.27（四） 本會自然文化景觀審議小組暨技術組舉行第三十六次聯席會議。

10. 南非共和國駐華大使荷維先生來訪，了解我國自然生態保育工作概況，對我政府執行情形深表敬佩。

10.12（五） 本會與台北市政府教育局、建設局、兒童日報及中華航空公司合辦保護野生動物徵文比賽。

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1. 台北市南海路37號

10.22（一）中華民國溪流環境協會成立大會假中央研究院舉行。
10.23（二）本會與中華民國溪流環境協會舉辦森林溪流淡水魚保育研討會。
10.23（二）「鴛鴦湖自然保留區管理要點」經本會核訂。
10.26（五）蘆洲警察局查獲民眾非法宰殺、販賣台灣獼猴、水鹿、梅花鹿等野生動物，並將全案移送地檢處。
10.31（三）墾丁國家公園查獲後壁湖漁港漁民非法捕獲大翅鯨，因鯨已死亡腐臭，由自然科學博物館領回製作鯨骨標本。
11. 6（二）本會邀請國內相關單位、公會、業者、立法委員及學者專家等假本會七一八會議室舉辦「國內現有象牙產製品管理座談會」，以供擬訂管理政策之參考。
11.16（五）本會邀請相關單位召開「研商紅毛猩猩回印尼細節會議」。
11.25（日）本會假台北市立動物園舉行徵文比賽頒獎典禮及紅毛猩猩回娘家歡送會。
11.27（一）本會假淡水家畜衛生試驗所第二次公開銷燬走私沒入之熊掌、動物皮製品及象牙等共約七十餘公斤。
11.28（三）在台北市立動物園暫養下已日益健康活潑之紅毛猩猩，在百餘位國小學童護送下返回印尼原生地。
12.27（四）本會邀請省(市)政府、動物園、相關單位及業者假林試所舉辦「飼養或繁殖保育類野生動物管理要點」(草案)及「保育類或具有危險性野生動物飼養場所及設備標準(草案)」會議。
12.27（四）本會自然文化景觀審議小組暨技術組舉行第三十七次聯席會議。

80年

1.16（三）本會邀請相關單位假七一八會議室舉辦「保育類或具有危險性野生動物飼養場所及設備標準(草案)」會議。
1.30（三）本會假淡水家畜衛生試驗所第三次公開銷燬走私沒入之象牙等產製品一批，共計約三百餘公斤。
1.30（三）本會自然文化景觀審議小組暨技術組舉行第三十八次聯席會議。
3.23（六）IAFWA 前執行長 Mr. Jack H. Berryman 來華訪問，並就野生動物經營管理之主題進行演講。
3.25（一）本會與中央研就院聯合舉辦為期二天之「野生動物保育研討會」並邀請國際知名人士演講，各方反應頗佳。
3.26（二）為期三天之「台灣生物資源調查及資訊管理研習會」假中央研究院學術活動中心舉行。
3.27（三）本會將擬訂之「行政院農業委員會野生動物保育諮詢委員會設置要點」報院核備。
4.16（二）本會邀請學者專家及相關單位假本會七一八會議室舉行「櫻花鈎吻鮭自然保留區規劃、土地管理及後續處理原則座談會」，對未來該區之經營方式進行初步溝通。

4.16（二） 本會邀請各有單位假本會1011會議室召開研訂「野生動物檢疫辦法」會議。

4.22（一） 本會邀請省(市)政府、動物園、相關單位及業者假本會七一八會議室召開「飼養或繁殖保育類野生動物管理要點」(草案)第二次會議。

4.24（三） 本會邀請學者專家、相關單位及學術研究機構，舉行「澎湖縣湖西鄉公所沙港海洋遊憩區海豚保育計畫審查會」。

5. 7（二） 汶萊 Sultano Science College科學系主任，紐西蘭籍紅樹林專家 Mr. Gordon S. Maxwell偕同家人來華訪問四天，除與國內相關學者專家進行座談外，並至各紅樹林實地參觀。

5. 7（二） 本會與海洋大學合辦「台灣漁業轉型系列研討會--台灣海洋哺乳類問題面面觀」。

6. 3（一） 本會自然文化景觀審議小組暨技術組舉行第三十九次聯席會議。

6. 4（二） 本會於五樓大禮堂舉行「第四屆自然文化景觀調查研究計畫成果研討會」。

6.24（一） 本會假五樓大禮堂舉行「野生動物保育法執行二週年檢討會」。

臺灣區野生動物資料庫（一）兩棲類

呂光洋[1]、林政彥[1]、莊國碩[1]

摘　要

本報告乃是以兩棲類動物為例子，嚐試建立本島野生動物資料庫，以做為日後兩棲類動物資源經營管理之依據。處理的資料是以國立臺灣師範大學生物系1982至1990年所蒐集的兩棲類野外調查記錄，利用個人電腦及套裝軟體成立臺灣地區兩棲類動物資料庫，並對其地理分布、海拔分布與棲地環境進行初步分析。

資料庫共包括7609筆紀錄，紀錄地點涵蓋 289個臺灣地圖座標單位。由建檔的資料，現在已可透過軟體獲得三十種兩棲類在臺灣的分在圖，此包括各種之平面及垂直分布。結果顯示，臺灣地區的兩棲類可分泛島性分布、區域性分布與特定區域分布等三類型，其中泛島性分布類型包括黑眶蟾蜍、盤古蟾蜍、中國樹蟾、莫氏樹蛙、白頷樹蛙、褐樹蛙、日本樹蛙、艾氏樹蛙、面天樹蛙、小雨蛙、古氏赤蛙、虎皮蛙、澤蛙、斯文豪氏赤蛙、金線蛙、長腳赤蛙、梭德氏赤蛙、腹斑蛙、貢德氏蛙、拉都希氏蛙等五科20種，區域性分布類型則包括台北樹蛙、黑蒙西氏小雨蛙、史丹吉氏小雨蛙、台北赤蛙、阿里山山椒魚等四科 5種，特定區域分布類型有翡翠樹蛙、巴氏小雨蛙、能高型山椒魚、南湖型山椒魚等三科4種，同時此4種均為珍貴稀有種。海拔分布以每 500公尺為單位，記錄到的種類從低海拔（0-500 M）的27種依序遞減至高海拔（3500-4000 M）的 1種，如黑眶蟾蜍、中國樹蟾、臺北樹蛙等絕大部分皆

1. 國立台灣師範大學生物學系

分布在海拔 500 M以下，阿里山山椒魚則分布至海拔3500 M 以上。其中出現在海拔0-1000公尺的種類最多，佔所有海拔梯度出現種數的55%。至於生殖類型場所可以分為流動水域型、靜止水域型、混合水域型、及樹上型等四種。此外，地理分布與海拔分布有著特定關係存在。每一種兩棲類的分佈情形、巨微棲地需要及族群現況都以圖、表等詳細的述說。

臺灣地區兩棲類動物資料庫的最終目標，是希望能透過電腦的軟、硬體應用，加上程式的設計，進一步的統整臺灣地區兩棲類動物的資料以及規劃新的功能，期能經由類似 Wildlife-Habitat Relationships Models 的資料處理模式和新的人工智慧語言（Artificial Intelligence Language），使臺灣地區的兩棲類動物資料庫變成一專家系統（Expert System），而能自行分析所給資料內容，給予使用者方便、更詳實的兩棲類各項生態訊息。並且能和植物資源及各地生態因子配合，探討種與種之間的相互關係，以及用來判斷和評估族群的動態，提供各項環境評估和自然保育工作之用。

台灣獼猴野外供餌之研究

李玲玲[1]

前　言

本省特有種動物中體型最大的台灣獼猴，不僅具學術研究價值，且因被獵捕情形嚴重，極待保育，因此有關其生態行爲資料之需求甚爲迫切。然而因本省地形崎嶇，台灣獼猴在倍受人爲干擾之際，不僅棲身之處通常不易爲人所接近，加上動物本身極爲畏人，因此野外追踪及研究頗爲困難，資料之收集與累積亦頗緩慢。本計畫乃依日本靈長類資深研究人員川村俊藏教授及乘越皓司教授之建議，並借助其多年之經驗，在宜蘭縣仁澤地區嚐試以野外供應台灣獼猴食物，吸引猴群到餌站附近逗留，以便增加野外觀察之機會，並嚐試利用猴群做爲對遊客進行自然教育之素材。

材料與方法

自 1988 年 12 月至 1991 年 6 月間，由林務局羅東林區管理處派員每隔 1 ～ 2 天前往仁澤地區餌站供應食物，包括蘋果、香蕉、地瓜、花生、筍、百香果、奇異果及大豆等，供餌之同時並估算及記錄自前次供餌後，食物被取食量。台大動物系之研究人員及川村教授與乘越教授則每月至少一次，每次在仁澤地區停留 2 天至數週，對當地台灣獼猴進行野外觀察。野外觀察乃沿當地之路、小徑及溪床巡視以發現猴群。每次發現猴群均加以追踪並記錄其出現地點、位置、隻數、組成、行爲、其移動路線、方向及活動情形。此外，並藉直接觀察獼猴所食用之天然食物，如植物的不同部份，及收集糞便在實驗室內進行分析，以研究台灣獼猴之食性。

結　果

調查期間共發現 5 群猴群在仁澤地區活動，猴群大小分別爲 22 ～ 31 隻（ JR 群），26 隻（ JL群），7 ～ 16 隻（ RI 群），15 隻（RH群），及 5 隻以上（ DS 群），活動地點主要在仁澤山莊背面，公路旁及森林公園等處，其中尤以 JR群最常出現。獼猴利用餌站之情形，在計畫初期因對猴群狀況不甚明瞭，設餌站地點不理想，利用率極

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低。1989 年9月起，獼猴在新設餌站附近活動的跡象較多，且有前來取用食物之記錄，然而由於附近松鼠亦會取食餌站之食物，使食物供應量雖大，但獼猴實際可以取用到的有限，且獼猴的確實取食量難以估算。此外仁澤地區仍有獵捕、遊客干擾及工程施工等之干擾因素。因此，猴群利用餌站及食物之情形仍未臻理想，在天然食物較缺乏的季節，猴群仍會往他處移動。

總結與建議

根據日籍專家之經驗，供餌成功的要素之一是避免對猴群不必要的干擾，這也是仁澤地區未來供餌成功之重要關鍵之一。而其他因素如更佳之給餌地點、給餌方式、餌料之供應量等，以及如何減少其他動物消耗餌的量亦應加以改善。仁澤地區交通尚稱便利，且有至少5群猴群在此活動，長期之研究不僅有助於對台灣獼猴個體資料之收集，對於影響猴群組成變化的因子，猴群間之互動關係、活動範圍、棲地利用及食性之了解亦極爲重要，對於進一林了解社會性的台灣獼猴及其保育亦將更有助益。

臺灣長鬃山羊（Capricornis crispus swinhoei）排遺分解之研究

呂光洋[1]、黃紹毅[1]

摘　　要

臺灣長鬃山羊（Capricornis crispus swinhoei）是臺灣特有亞種之大型草食性哺乳動物。本研究主要目的是想要了解臺灣長鬃山羊的排遺於自然環境中的分解速率，以探討臺灣長鬃山羊在臺灣山區生態系中所扮演的角色，並探討影響排遺分解速率的因子，以及分解過程中元素的變化情形。另外針對排遺上之糞生菌，進行初步的鑑定及族群消長觀察。

研究的材料主要是以野外和動物園收集臺灣長鬃山羊之新鮮排遺，帶回實驗室後，將其乾燥、秤重。然後利用尼龍網方法（Nylon mesh bag method），將排遺裝到有網眼的尼龍網中，帶至野外五個實驗地安置。這五個實驗地點是玉山圓峰（3500公尺）、合歡山北峰（3200公尺）、大禹嶺（2800公尺）、陽明山（650公尺）及大尖山（410公尺）。然後每個月分別到上述五個地點去收集尼龍袋，攜回實驗室內以決定排遺的分解速率。排遺中有機物含量的變化則以高溫燃燒法來決定，至於含氮量則以改良過的凱氏含氮分析法來加以決定。

經過一年的野外實驗，結果顯示，在高海拔地區之排遺分解速率（15-35%）比低海拔地區排遺之分解（51-85%）為慢。分析其原因可能是因為氣候因子不同而造成，其中又以濕度之影響最大（Adjusted $R = 0.82$, $P < 0.05$）。在高海拔地區，動物園的臺灣長鬃山羊排遺分解較快

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；而在低海拔區，兩種排遺之分解速率沒有顯著差異。高海拔區，分解期間，有機物之變化不大（98-90%；86-76%）；在低海拔區，有機物則呈現明顯減少之趨勢（98-45%；86-54%。排遺之最初含氮量為0.2%，分解期間呈現不規則變化，最高升至0.33%，最低降至0.10%，這種不規則的變化情形可能與微生物在排遺上之生長有關係。

糞生菌之培養、鑑定方面，在野外臺灣長鬃山羊排遺中觀察到了13種糞生菌；動物園臺灣長鬃山羊排遺中則觀察到了 7種糞生菌。這兩種不同來源排遺上長出之糞生菌皆有消長現像。一般利用簡單醣類之菌（如 Mucor spp.）先出現，然後是利用纖維素的菌（如 Sordaria fimicola）出現，再接著才是利用木質素的菌（Coprinus sp.）出現，顯示出真菌與排遺之分解有密切關係。

藉由上述的研究，我們對於臺灣長鬃山羊在本島山區森林和草原生態系中所扮演的角色，已有進一步的瞭解，未來的野外調查及研究，除了加強現場的行為觀察、生態需求的研究之外，將加強食草的調查、食性的分析及食草中營養成分的分析。

台南縣境內新化丘陵區之化石地質景觀及基礎地質調查

鍾　廣　吉

(1)研究目的

新化丘陵地區內地質條件相當特殊，濱海條件下堆積的砂岩頁岩互層中埋藏了相當多量且多種類的化石，而且大部份保存相當完好，是教學研究很理想的地區，這些地質材料也是相當珍貴的文化資產，有必要予以調查探討下列問題

(a)脊椎動物群落及生存條件.

(b)無脊椎動物群落及生態條件.

(c)此區之生物群落與台灣其他地區者之比較.

(d)評估此區之化石生物群落之價值.

(e)在文化資產保育的條件要求下建議如何維護這些文化資產.

(f)探討此區教學園區的可行性.

(2)研究材料及方法

本研究工作的材料以化石爲主,化石的來源有三方面,其一是採自野外,以無脊椎動物爲最多,全部的無脊椎動物化石爲來自野外的採集;其二爲來自民間業餘者的提供,此方面以部份的脊椎動物化石爲主;其三爲來自作者以往採集的收藏與菜寮化石館的收藏者,此方面也以脊椎動物化石爲主。

就化石而言 ,無脊椎動物化石可以直接採自野外,仍因爲此類標本民間採集與收藏者尚不多 ,野外露頭的標本尚可予以保存;但脊椎動物的化石由於量少,出現機率低,爲零散分佈之產狀,且其保存之岩層爲棕黃色疏鬆砂岩段,易受雨水沖刷而崩坍,化石即出露,民間收藏者即速前往採集,所以不易保存於地層內。

本研究的方法分爲兩方面進行,一方面赴野外調查將研究地區的地質予以調查清楚,並畫分爲岡林段,虎咖口段,滴水子段,過嶺段,三重溪段和牛食水段,將化石之產地與岩層關係予以建立!一方面訪問民間脊椎動物化石之收藏者,予以拍照存下資料。

將所有的標本一方面予以分類記載其特性 ,一方面與出露之岩層互相配合,找出其分佈狀況。

評估化石地質景觀的價值,一方面就其學術性予以討論,一方面與台灣其他地區的化石產地相互比較,確定其文化資產上所具有的重要性。

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(3)研究結果

此區的地質爲更新世的崎頂層，爲便於研究的需要，將崎頂層畫分爲岡林段，虎咿口段，滴水子段，過嶺段，三重溪段和牛食水段。

此區出現的化石計有：

脊椎動物方面：長鼻類，犀牛，野牛，鹿，貓科，鮫等。

無脊椎動物方面：軟體動物門有腹足類，斧足類，腔腸動物門有珊瑚，節肢動物門有籐壺，棘皮動物門有海膽，原生動物門有有孔蟲。

脊椎動物大都出露在牛食水段，其他的無脊椎動物以岡林段，虎咿口段，過嶺段和三重溪段較多。

(4)結論與建議：

(a)此區的脊椎動物化石群的類別與出現的頻率在台灣爲獨一無二者，應予以珍惜，保護。

(b)無脊椎動物化石之類別與量雖在其他地方如恆春之西方台地的四溝層亦有，但配合岩性地質的變化而有如此的變化者更是唯一者，亦甚具研究探討的價值。

(c)本區的生物化石之保存地層甚富變化，在古生態學的研究上有其價值。

(d)配合附近的菜寮化石館之保存化石，本區應設法列出部份地區予以保護起來。

恆春半島之沈積地質景觀調查

宋 國 城

一.前言

從沈積學，古生物學，以及地體構造的觀點來看，出露於恆春半島上的第三紀岩層過去沈積在歐亞大陸東南邊緣的古大陸斜坡上。由於弧陸碰撞導致的造山運動，使得這些海底沈積物得以浮出成陸。又因構造作用比較緩和，一些大陸斜坡的沈積特徵得以完整地被保留，而構成在台灣地區僅見之地質景觀。這些地質景觀包括海底峽谷，海底河道，深海沖積扇，海底崩移構造，海底泥流等地質現象，此外沈積構造以及生痕化石也是彌足珍貴的地質現象，都應加以妥善保護。

二.研究目的

本研究主要目的在進行恆春半島古大陸斜坡上的沈積地質景觀，從而挑選具有教學意義與保留價值的景觀區，並建議依據文化資產保存法劃設爲自然保留區之可行性。

三.研究方法

綜合過去的地質文獻與野外實地調查的結果，建立恆春半島的古沈積環境模式。再選定能表現沈積環境特徵的露頭，詳細測繪，觀察，記錄，並評估其成爲沈積地質景觀的可行性。

四.研究成果

恆春半島的地質現象係屬於半深海到深海的環境中進行的地質作用所造成的。我們不容易觀察到深海中進行著的地質作用，而類似恆春半島的深海岩相，且尚未受到劇烈地構造擾動者，更屬罕見。我們將指出這些地質現象的特殊性，以及它的景觀要素，作爲我們未來維護這些自然資源的參考。

恆春半島上最具特徵的主題景觀就是斜坡海底河道的沈積了。這類沈積岩層是由厚層的砂礫岩層與砂頁岩互層所組成，呈透鏡狀夾在巨厚的頁岩或泥岩中。砂礫岩的顆粒度與厚度均有向上變細與向上變薄的現象。礫岩之礫石具有頗佳的圓度，並且懸浮於基質之中。也可觀察到正，反級層構造。砂岩則普遍表現正級層，平行紋理，交錯紋理等屬於波馬序列的沈積構造。偶而厚砂礫岩層中夾有單層或數層層序受到擾動的崩移岩層。由於這些厚砂礫岩透鏡體與周圍的泥頁岩比較起來具有抗侵蝕性，因此在地形上多形成突出的山丘，或是孤立的小山。與周遭景物比較，它形成視覺的焦點。造成這類景觀的例子相當多，諸如枋山溪的枋野具，楓港的獅子頭，竹坑溪上游，石門古戰場，大小尖石山，門馬羅山等皆是。

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其次，最能代表大陸坡沈積現象的要算是沈積崩移構造了。在坡度二到六度的斜坡上，尚未固結的沈積物受到重力的牽引而向下滑動。柔軟的沈積物會產生塑性變形，形成緊密的複褶皺，與層層疊置的逆衝斷塊。固結的沈積物會以大小不等的塊體混入泥流中，形成類似墾丁層的傾瀉岩相。這種地質景觀可分爲(1)封閉型的，例如恆春出火附近的傾瀉層，被包圍在山谷中，形成典型的惡地地形，並可觀察大小石塊雜亂無章地排列；(2)全景型的，例如旭海北方兩公里處的牡丹鼻海岸，有一處寬約二百公尺，高約五十公尺的露頭，具有典型的疊置逆衝斷塊。觀察者在驚訝於麻花狀扭曲的堅硬砂岩之外，應可感受到自然現象的奧妙。此外，在統鋪，二重溪，枋山溪，與佳洛水等地都有精彩的露頭；(3)主題型的，例如青蛙石就是傾瀉岩層中的碎塊，因周圍的泥岩被侵蝕殆盡，而形成獨立景觀。

恆春半島最具深海相的岩層就是代表海底沖積扇的佳洛水砂岩了。在佳洛水海邊，由南向北綿延數公里，總厚度達一千公尺以上。厚層的砂岩與薄層頁岩形成向上漸薄與向上漸細的反覆沈積循環。偶而單層或數層沈積崩移岩相將此循環中斷，造成視覺上的反差效果，使得這項地質景觀更具可看性。整體而言，佳洛水砂岩依山傍海，可以構成一個良好的全景景觀。在砂岩中還有許多獨特的沈積構造與痕跡化石，可以證明爲深海濁流的沈積岩相。這些地質現象都可構成值得仔細品味的小景觀。

五.建議

建議下列景觀應妥善規劃保留以作教學及研究的目的：

(1)枋山溪海底河道及崩移景觀。

(2)獅子頭海底河道景觀。

(3)竹坑海底峽谷景觀。

(4)四重溪海底河道及崩移景觀。

(5)東門河惡地景觀。

(6)墾丁外來岩塊景觀。

(7)佳洛水海底沖積扇景觀。

花東海岸山脈地景調查（一）

王　鑫　　曹鴻飛

一、研究目的

花東海岸山脈位於台灣本島東部花蓮市到台東市之間。山脈延伸的方向近乎南北，它的西側是狹長的花東縱谷，更向西則進入中央脊梁山脈地帶。在地質上，它是一個獨立的地質區，與台灣本島的中央山脈、西部平原都有很大的差異；在地形上，也可以獨立成爲一區。這一區的主要大地構造特徵是位於板塊邊緣，擁有板塊活動造成的火山活動和構造運動遺跡。在這海岸山脈地理區中，依據地勢高低又可細分爲三區，分別是花東縱谷區、海岸山脈區、以及海岸山脈東側的海岸地帶。

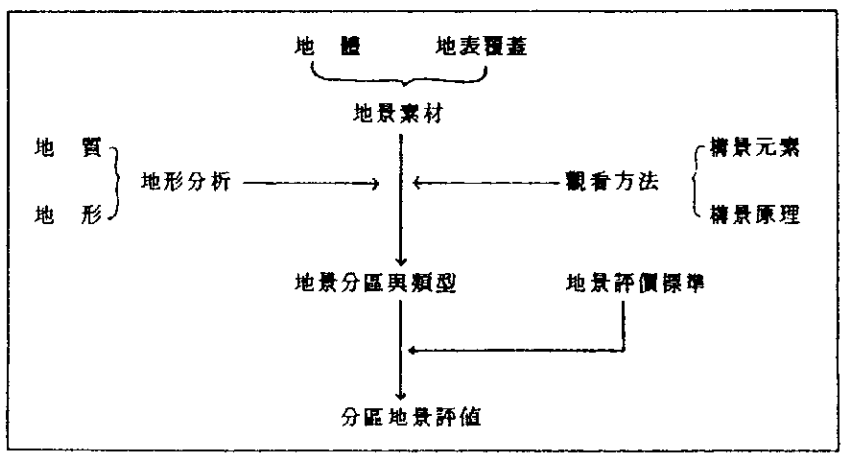
本調查區以海岸山脈北段爲範圍，區域北起花蓮溪口，南至秀姑巒溪下游河段，東界海岸，西接縱谷低地，全境狹長，總面積約 380平方公里。在行政區劃上，本調查區分別屬於花蓮縣的壽豐、鳳林、光復、豐濱和瑞穗五個鄉鎮；海岸地帶另有東部海岸風景特定區的設立。

依據文化資產保存法規定「自然文化景觀…依其特性區分爲生態保育區、自然保留區及珍貴稀有動植物三種。」，「自然保留區，指依本法指定，具有代表性生態體系，或具有獨特地形、地質意義，或具有基因保存永久觀察、教育研究價值之區域…」。本調查計畫之主要目的，即在花東海岸山脈區內選擇有價值的自然景觀，以作爲劃定自然保留區之參考。根據此項目的，本調查研究的內容包括以下四項：a.自然環境概況，b.地形分析，c.地景評價，d.地景分區圖。

二、研究材料及方法

本研究是以大面積之區域景觀爲對象，因此所欲分析的景觀素材是以宏觀地形爲主，而以地表覆蓋爲輔。透過構景元素與構景原理，來確立調查區各區域景觀類型，並依照區劃出的各景觀區域，就其意象美質與景觀生態加以評估（表一）。

表一：區域地景評價架構



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三、研究結果

本調查依據地質和地形的條件，將調查區區分爲不同的自然區，並說明其各自的特性。綜觀而言，除了奇美階地、大灣與水璉海灣之外，一般景觀規模都不大。但是具有特色的主題景觀散佈全區，實屬景觀富麗的區域。

依據區域景觀分析理論，將調查區域的景觀予以分區，並說明其景觀類型。此一以地質、地形條件爲基礎，透過美學與生態面向建立的理論架構，應適用於一般的區域景觀分析。

本調查依據美學原則與生態原則，確立統一性、生動性、繁雜性、稀少性與完整性六項評估要項，以此評估區域景觀（表二）。

表二：景觀美質評估標準說明

區域編號				景觀型態	
評估項目	評價		說明		
統一性	高	✳	景觀型態規模宏大、完整。		
	中	✳	景觀型態規模宏大，但是不完整。		
	低	✳	景觀型態規模不大，而且不完整。		
生動性	高	✳	空間曲折多變化，各景段對比強烈，有生動的自然作用。		
	中	✳	空間略爲單調，各景段層次分明，或有生動的自然作用。		
	低	✳	空間構造單調，各景段層次不明，沒有生動的自然作用。		
繁雜性	高	✳	多樣景觀素材和小規模景觀型態的變化。		
	中	✳	景觀素材或景觀型態略有變化。		
	低	✳	景觀素材和景觀型態單調。		
稀少性	高	✳	有重要的生態資源和特殊的景觀資源。		
	中	✳	無重要的生態資源，但有特殊的景觀資源。		
	低	✳	無重要的生態資源或特殊的景觀資源。		
完整性	高	✳	區內與相鄰區域少有人爲干擾。		
	中	✳	區內或相鄰區域略受人爲干擾。		
	低	✳	區內與相鄰區域多半遭受人爲干擾。		

四、建議

依據調查成果，建議配合現行法規，將要山體、海岸及河段劃歸保留地，並將其周圍高度在300 公尺以上或適當距離之內的地區定爲緩衝區；禁止開發行爲，或限制既有開發活動的規模或強度的擴大。

建議將水璉尾山、六階鼻山、大不岸山、八里灣山、砂荖山、阿巴灣附近的單面山劃爲山體保護區；將水璉以北礫岩區的單面山海岸及其小集水區、水璉海灣、大灣海灣

、石梯坪海岸及北加路蘭、龜庵、親不知、港口和小尖石等山丘劃爲海岸保留區；將秀姑巒溪劃歸河段保留區。

限於理論架構及方法論，未能對社會經濟等人文因素深入掌握，所建議之保留區自當在往後的實質規劃中評估其對社經環境的衝擊，以確立開發與保育之間的實際區界，俾便實踐。

澎湖自然文化景觀調查

郭 金 龍*

一、研究目的

近年來，澎湖沿岸地區的開發利用，以及觀光事業的日益發達，自然環境所遭受的破壞污染，已日趨嚴重。本研究主要的目的是利用實地調查以瞭解澎湖自然文化景觀之全貌，以建立其基本資料供文化資產保存及地方建設之參考。本研究分三年進行，第一年調查馬公澎湖本島及白沙島群地質、地形景觀與野生動物包括鳥類、陸生動物。第二年調查上述島嶼以外的澎湖島群與植物。第三年爲人文史蹟勘查與其他海洋生物調查，以分期建立全縣自然文化景觀之基本資料。

二、研究方法

澎湖群島共有將近一百個的島嶼組成，散佈在長60餘公里，寬40餘公里廣大的區域內。因此若要在各個島嶼一一進行野外實地調查，在時間、經費及效率上都有困難，所以初步的調查方法是利用五千之一的基本地圖並參考過去的文獻資料，找出調查的重點地區與範圍，實地進行野外調查。地質、地形景觀方面，以海岸地區的調查爲主，分爲海崖、岩岸與沙岸三種，並依適當評量指標，評定各種海岸地形景觀之優劣與利用情況。野生動物方面，受天然環境的限制，陸生動物（以兩棲類、爬蟲類爲主）較少；但群島海岸線複雜，潮間帶遼濶，又地處東亞候鳥遷移的中繼站，每年冬、夏有不同的候鳥蒞臨，乃選定若干適合鳥類棲息的地區，按月定點進行野外觀察、記錄。綜合前述地質、地形景觀與鳥類之棲息等生態環境，將具有保留價值的地點建議劃爲自然保留區域或保育宣導區。

三、研究成果

經野外實地調查後，群島海岸線曲折綿長，就上述三種海岸地形，分別根據海崖、岩岸、沙岸的規模、景觀品質、人文活動等因子之考量，再挑選出各種景觀條件較佳的地區，以作爲將來自然文化景觀進一步的調查與經營管理的依據。其中，各島嶼的柱狀玄武岩，構成了規模不一的海崖，經考量選出條件最適宜的柱狀玄武岩出露區，分別位

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(二) 依危險性之理由而認定者：

1.開發行爲，例如：

森林伐採 (logging)

草地或草原之開發 (destruction of grassland)

濕地、池沼或河川之開發 (destruction of wetland)

石灰岩等之採掘 (mining)

水壩建設 (construction of dum for electric and water supply)

道路工事 (construction of road)

其他的開發行爲

2.採集行爲，例如 ：

園藝用途之採集 (collection for horticulture)

藥用之採集 (collection for pharmacy)

3.其他：

植物演替之進行 (succession)

野生化動物之食害 (herbivory by naturalized animals)

不明 (unknown)

二. 保護等級之評定：

各國植物紅皮書中均有其地區性自訂之評級或保護指標，然目前仍以 IUCN 1978年所訂之評級最廣受採用。其通用之評級各說明如下：

1.絶滅 (Extinct, Ex) ：指已不再出現於野外自然生育地者。

2.瀕危 (Endangered, E) ：指族群數目刻已銳減，且自然生育地亦日漸減少。假如構成威脅的原因繼續存在，則將處於可能絶滅危險者。這些植物通常其地理分佈有明顯的侷限性，僅僅生存於典型的地方或出現在脆弱的生育地，可能因爲它們的生殖能力很弱，或它們所據以生長的特殊生育地遭受破壞，被劇烈地改變或已退化至不適其生長；或者由於過度開發，病蟲害等爲害所致。

3.漸危 (Vulnerable, V) ：指因人爲的或自然的原因，如生育地的開發破壞，或其它環境因子所改變等所致，在可以預見的將來，很可能成爲瀕危的種類。

4.稀少 (Rare, R) ：指族群在全球的分佈上很少，然卻無絶滅危機，亦非處於漸危之狀況。如單屬科、單種屬或少種屬的代表種類，或分佈區內只有很少的群體，或是由於存在於非常有限的地區內，可能很快地消失，或者雖有較大的分佈範圍，但只是零星存在著的種類。

5.未定者 (Indeterminate, I) ：指不易於現階段確定係上述何一等級者。

宜蘭縣舊金洋地區台灣山羌棲息地植被分析

陳擎霞

台灣山羌（ Muntiacus reevesii micrurus ）在台灣分佈很廣，從南到北凡二百公尺的山麓到三千公尺的高山，都有其踪跡，但由於丘陵的開發、棲地的破壞、人爲的獵捕，已使其活動範圍逐漸集中在一千到二千公尺之間。由於山羌生性膽小敏感，在野外行動非常隱密、生態研究相當困難，根據全省山產店對山羌利用的資料所顯示，宜蘭地區是山羌重要分佈地，因此本研究擬對台灣山羌在宜蘭舊金洋地區活動環境作一深入之了解，以作爲野生動物經營管理上的參考。

舊金洋地區位於宜蘭南澳鄉，四週高山環繞，地形呈盆地狀，被南澳溪與和平溪的上游所沖貫。樣區則設在盆地中央的比亞毫社，原爲山胞所廢棄的部落台地。此區植相爲暖溫帶山地闊葉林，是常綠之原始闊葉林。但曾經人爲砍伐過，爲恢復後的次生林、有濃密的灌叢及豐富的蕨類植物。

山羌在樣區地的活動範圍多半在山岩下，具有隱蔽性及開闊地的交會區，其對棲息地的選擇以安全爲主，其次以食物豐富度爲選擇要素，並有遊戲、休憩、覓食等不同活動區，其所攝食的植物有24種，以短角冷水麻、廣葉鋸齒雙蓋蕨、山蘇花爲主。

山羌在舊金洋地區捕獵活動在民國78年前頗爲頻繁，捕獵之甚連山胞本身都感受到山羌數量之急劇減少，但由於我不捕別人會捉的心態下，仍持續其捕獵行動，但從78年2月1日宜蘭縣政府全力執行保育工作開始，使宜蘭縣境野生動物捕獵活動稍加收斂，讓山羌在該地得以存活，可見政府法令需在地方政府配合下，野生動物保育法才得以落實。因此建議保育工作需在地方政府上推展。

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台灣野生茶樹種原保存及利用

王兩全[1]　馮鑑淮[2]　林木連[3]　陳右人[4]

前　言

清康熙３６年（西元１６９７年）在〝蕃境補遺〞即有野生茶之記錄，這種茶樹散佈於本省各個山區，先民採摘其嫩芽製茶，號稱仙茶有降火去暑之作用。依據林業試驗所呂勝由先生與楊遠波先生之查考與調查，將之命名爲武威山茶，Camellia sinensis (L) o. Ktze. subsp. buisanensis (Sasaki) Lu & Yang.

研究目的

（一）、瞭解台灣野生茶之分佈情形及自然生態完整性，藉供生態保育之參考。

（二）、提供茶樹育種及國內外專家學者學術研究資源。

（三）、搜集各山區野生茶樹，種植於茶樹種源庫內，永續保存固有遺傳基因。

研究材料與方法

（一）、野生茶樹調查：

分三年調查分佈於本省七處山區野生茶樹之分佈範圍，茶樹密度、生產狀況、植株性狀、病蟲害發生情形、土壤及其他林木與地被植物種類。

（二）、野生茶樹搜集：

搜集野生茶樹種子與幼苗種植與培育，設置種源園，供育種及學術研究之需。

（三）、製茶品質：

採摘眉原山原始林內茶芽，試製紅茶及部份發酵茶，並和栽培種製造之茶葉比較品質。

1．台灣省茶業改良場魚池分揚，台灣省南投縣魚池鄉。

2．台灣省茶業改良場台東分揚，台灣省台東縣鹿野鄉。

3．台灣省茶業改良場，台灣省桃園縣楊梅鎮。

4．台灣省茶業改良場，台灣省桃園縣楊梅鎮。

研究結果

（一）、野生茶樹調查：

野生茶樹之生長與保存以八仙山事業區之眉原山１３５、１３６林班最佳，幾乎保持原始生長狀態，分佈的密度最高每公頃可達１０００株。本區１３６林班２６小班於日據時代曾設有１６．３公頃之保護區，但該保護區因遭森林火災，而重新造林目前已無野生茶樹。其餘六區均有不同程度遭砍伐，或採摘製造茶葉之情形。不過除番路鄉外，其餘地區大致之茶樹上應屬於野生狀態，茶樹多分佈在原始林內，林相與地被植物多保持良好。野生茶分佈的海拔高度，在眉原山爲１３００—１６５０m間，南鳳山爲１４００—１６５０m間，鳴海山爲１１００—１６５０m間，水井山爲７００—８００m間，草山爲９００—１１００m間台東之永康山爲８００—１０００m之間，似乎超過１６００m以上即均無野生茶之生長。取葉片、花果等器官調查結果，各地區葉片性狀略有差異，但與栽培種，無論小葉種或大葉種均不同。以花果性狀分析發現阿里山瀨頭的草山上發現的野生茶似乎與其他地區之差異較爲顯著，可能屬於不同種類。主要病蟲害爲天牛蛀食樹幹及紅頸斑蛾爲害嫩枝葉。

（二）、野生茶樹搜集：

收集各地野生茶樹二百餘株，分別標幟後，種植於台灣省茶業改良場魚池分場及台東分場進行觀察。

（三）、野生茶樹之利用：

茶葉改良場魚池分場利用野生茶樹與阿薩姆種（大葉種）茶樹雜交，經篩選後獲得適製紅茶之系４０—５８品系，目前正準備各項資料申請命名中。

（四）、製茶與製茶品質：

除眉原山外，其餘各地區均有民眾在冬季砍伐野生茶樹，俟其早春萌發新芽時，採其嫩芽製造茶葉銷售，售價頗高。

採眉原山野生茶樹早春嫩芽於茶業改良場魚池分場製造紅茶與包種茶。其茶湯滋味頗佳，但香氣不足。

結論與建議

本省野生茶樹分佈範圍極廣，依其性狀分析，並不同於栽培種。大部份分佈地區雖爲原始森林。但仍應查對林班管理資料，以確定是否爲原生狀態，以決定是否可設立保護區。但由於目前大部份地區已遭致民眾破壞，因此即使非原生狀態，似乎也必須就現有的區域內之野生茶樹，加以照顧，以維護天然資源。

臺灣山毛櫸生態之研究

楊遠波[1]、呂勝由[2]

臺灣山毛櫸又稱水青岡（*Fagus hayatae*）屬於殼斗科之山毛櫸屬，爲臺灣特產種，屬落葉性喬木。目前僅知其分佈範圍在塔曼山及拉拉山間之稜線兩側，往西北延伸分佈到北插天山，再往東北分佈至台北縣之逐鹿山，均分佈在稜線兩側各100公尺範圍內。臺灣山毛櫸林之組成約有維管束植物200種，森林之結構大致分三層，第一層爲臺灣山毛櫸，高可達15公尺；第二層爲喬木及灌木層，高可達2至5公尺間；第三層爲草本層。林中山毛櫸樹齡以70～100年者佔多數，70年以下者甚少，尤其小苗及幼樹，可能與其不耐陰性有關。臺灣山毛櫸林長在氣候冷涼潮濕，但排水良好之山坡，土壤含石率高，呈酸性。每年3月底至4月中旬是花期，爲期2～3週，當年9月～10月果實成熟。雖然每年開花，但不易結實，種子獲得不易，可能爲天然更新不良因素之一。

1，2 台灣省林業試驗所森林生物系

鐘萼木之復育試驗研究

柳　榗[1]、楊遠波[2]、呂勝由[3]

鐘萼木爲鐘萼木科下之單屬種植物，目前僅知分佈於中國大陸華中南一帶，被列爲稀有植物種類之一。本省在民國七十五年經呂勝由等首次報導發現於七星山麓之馬槽及金瓜石附近地區。因爲當時僅知鐘萼木分佈於此兩地點，加以各族群中之個體不多，隨後此種被列爲本省之珍稀植物。因爲它的花朵具觀賞價值，以致迭遭採伐，影響及果實和種子的產量。爲了不使此種植物在人爲或自然環境壓力下日趨減少，而進行本復育計畫。

本計畫之內容有調查鐘萼木之生育地環境、在本省之分佈範圍、花果期、繁殖及栽植試驗。結果顯示：鐘萼木生長於排水良好之土壤上，多處於空曠地或次生林地，具不耐陰之性質。由鐘萼木所在之植被分析，其非次生林之主要組成份子，但偶爾可見由其組成之優勢群落。空曠地上之鐘萼木多數與芒草、栗蕨、柃木混生。

鐘萼木之分佈地點除了前述兩地外，尚發現於候硐、金字碑、暖暖、新山水庫、瑞芳、瑞金公路、九份、十分寮等地區。

鐘萼木在3月下旬至4月上旬萌發新葉，4月中旬至5月中旬開花，9月下旬至12月上旬果實成熟。成熟的果實內平均含2至3粒種子。種皮橙紅色。

去除種皮之種子在常溫下可立即播種，亦可濕砂層積（2～3個月後播種）。常溫下之種子發芽率約爲75%。1至2年生之幼枝扦插成活率約爲70%。植株移植較困難，一旦主根折損則植株無法成活。因此，宜在容器內育苗。

植物體生長快，枝幹易折。主幹折斷後，可由基部萌蘖許多新枝，或由側根萌芽。

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1. 台灣省林業試驗所　集水區經營系主任

2，3 台灣省林業試驗所　森林生物系

大武山自然資源之初步調查

王　鑫[1]　楊遠波[2]　陳擎霞[3]　石　磊[4]
王　穎[5]　呂光洋[5]　李玲玲[6]　趙榮台[7]

前　言

大武山區位於台東及屏東縣境內，屬中央山脈南段兩側地區，中心位置爲北緯22° 35′，東經120° 50′，由於地勢崎嶇甚少開發，植被狀況完整，動物資源豐富。尤其南北大武山爲台東縣內多條主要河流之源頭，集水區的保護對於維護潔淨水源、水土保持、下游地區居民飲用及灌溉用水的安全均十分重要，早在1970年代即被呼籲應加以保護，1980年代又因發現瀕臨絕種之雲豹而引起注意。農委會有鑑於該區之重要性，於1986年12月起補助推動該區之資源調查。

材料與方法

自1986年12月至1990年6月間，陸續有來自台大、師大、輔大、中研院、林試所等單位之八位研究人員前往該區調查動物、植物、地形地質現況，及周圍住民對該區利用之狀況。調查範圍除現在大武山自然保留區之範圍外，尚包括保留區北部及西部之緩衝區域。調查方法在資源部分，主要包括地圖判識、文獻整理及選定調查區域進行現場調查；植物部份採樣區調查，動物部分則採穿越線調查，調查路線以稜線和溪谷沿線爲主，利用目擊、聲音、判識動物痕跡如足跡、糞便、食痕、窩穴等，記錄動物種類及相對數量。此外亦利用鼠夾捕捉調查小型哺乳動物，利用氣味站調查食肉類動物等方式，調查在該區出現之動物種類。人文部分則主要以訪問大武山區周圍住民之調查方式進行。

結　果

調查結果顯示，該區海拔高度在200公尺到3100公尺之間，90 %以上區域坡度小於42°。季候屬於冬乾夏雨，夏季雨量大而集中，本地氣溫隨海拔高度不同變化很大

1. 國立台灣大學地理系
2. 台灣省林業試驗所生物系
3. 私立輔仁大學生物系
4. 中央研究院民族研究所
5. 國立師範大學生物系
6. 國立台灣大學動物系
7. 台灣省林業試驗所森林保護系

。地質方面主要屬於中央山脈西翼地質區的脊樑山脈帶，包括畢祿山層及蕃山層。區內有大南、知本、太麻里、金崙及大竹等五條溪的集水區，水質清澈少污染。植物方面有138科329屬523種，從亞熱帶濶葉林到冷溫帶山地針葉樹林，植被變化很大。動物方面至少有27種哺乳類，74種鳥類，18種爬蟲類，9種兩棲類，6種魚類及28種蝴蝶，其中共有19種特有種及8種文化資產保存法所列瀕臨絕種動物。由於該區資源豐富又具集水區保護等之重要價值，因此於1988年1月正式公告爲自然保留區，面積470平方公里。調查期間，亦多次邀請外籍野生動物研究與保育專家舉辦研討會、講習會，對提昇我國研究人員野外工作及推動保育教育水準助益良多。

現況與建議

爲協助推動大武山自然保留區之經營管理，調查小組成員亦撰寫「大武山自然保留區經營管理計畫」，對保留區實際經營管理工作之進行及實行步驟提出規劃建議。大武山保留區至今雖已設立達三年餘，然而該區仍繼續有濫捕盜獵、遊客進出及其他人爲干擾與破壞，實有待相關單位共同努力解決問題，以使保留區之諸多功能得以充分發揮。

桶后溪石鱝資源之生態調查

林曜松[1]　許嘉恩[1]

桶后溪是南勢溪最大的支流，也是良好的魚類棲地，具有發展爲垂釣魚類經營管理區的潛力。本研究選定桶后溪上游地帶，調查當地魚種，並選取最具有垂釣價值的魚種——石鱝，探討其族群相對量的季節變化、雌雄比例、雌、雄形質比較、體長與體重關係、生殖週期及石鱝棲息地的環境因子。

採集地區石鱝的族群量月變化，受到毒魚影響很大，7月爲毒魚盛季，因此8月時的捕獲量較低。

各月所捕獲的石鱝，其雌雄比例隨季節及魚體大小而有差異，石鱝體形小時，雄魚比例佔多數，隨著體形增大，雄魚比例漸減。春至秋季捕獲的雌魚稍多於雄魚，但在冬季，雄魚明顯多於雌魚。就成熟的石鱝而言，雌魚的標準體長、全長、頭長、頭高等形質均大於雄魚。石鱝的體長與體重有顯著的相關。石鱝的生殖腺成熟度指數變化，顯示石鱝的生殖季是在4～8月，而雄魚比雌魚較早進入生殖季，桶后溪的石鱝的垂直分布與水深有關，在深水區，石鱝留在底層的現象明顯，而在流速愈快的溪段，石鱝出現在底層的機會也增大。

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桶后溪水棲昆蟲之資源及生態研究

楊平世*

前言：

在溪流底棲生物中，水棲昆蟲乃重要成員，在 Dehoney (1983)之報告得知，水棲昆蟲在河川底棲大型無脊椎動物中佔90%之種類，而生物量則佔92%，由此可知水棲昆蟲在溪流中扮演頗為重要之角色。

水棲昆蟲很早就被利用在溪釣方面，但早期未有此方面之學術研究；在1950-1970年代，有關水棲昆蟲之生活史，及生理行為等研究漸多；近期則大多為水棲昆蟲之相關生態研究，例如族群變動，族群密度，水棲昆蟲與其他底棲生物間之關係(Cummins 1979,Vannote 1980,Allan 1986, Hawkins 1982)。此外，探討水棲昆蟲之分佈和食性分類對溪流能量流動(energy flow)中作用(Fishers 1973, Cummins 1979)，和指標生物等(津田 1975,洪 1984,楊 1983,Hilsenhoff 1982,1987,1988)，乃目前較熱門之研究方向 (Bane 1978,Cowell 1980,Cummins 1974,Dehoney 1978,)。另外，儘管水棲昆蟲乃淡水魚類之重要食餌(津田 1962，川合 1985，Healey 1984)，但國內此方面之研究，尚待積極進行。

桶后溪為台灣北部重要溪流，由於未受污染，淡水魚數量頗豐。為建立此溪之水棲昆蟲基本生態資源，本研究擬就桶后溪之水棲昆蟲族群結構，主要種類之年中族群變化，季節消長情形，水棲昆蟲食性分析，溪流水文因子與水棲昆蟲間之關係等，與及水棲昆蟲之於溪流中分布情形進行探討。

材料與方法：

桶后溪位在台北縣烏來鄉，下游與南勢溪會合而成為

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新店溪，最上游幾達宜蘭縣碓溪鄉，支流眾多，中下游支流較小，但在孝義有阿玉溪接入。本調查範圍位在桶后溪之上游處，亦即林務局桶后工作站之上下游區域，共設有四個採樣站，由下往上分別為水潭、急流、欄沙壩下游及上游(圖一)，調查期間為1989年7月至1991年3月，每月定時進行水棲昆蟲採集及水文調查，並對河域現況進行探勘及描述。

1．水棲昆蟲資源調查：

水棲昆蟲採集係以50x50cm之定面積小網在各採樣站作每月一次之定期採集；為避完每次採集於同一地點調查而影響其蟲數之變化，故每一採樣站之調查範圍為50公尺河域，每次在此調查範圍之不同點採集；每站共採3 次，分別為河流兩岸及中央點。標本採集後置於70% 酒精中保存，再攜回實驗室分類及鑑定本分類之依據主要參酌津田(1962)，何及徐(1977)，楊氏等(1980,1986a,1986b,1990a,1990b)，黃(1987)，川合(1985)，Lehmkuhl (1979)，Merritt & Cummins (1984)，Wiggins (1977) 及Harper (1984)，並記錄各種之數量，以獲知各月份蟲數變化、季節消長、年中族群密度及優勢種類等；此外，並探討水棲昆蟲與水文因子間之關係。

2．水質及水文調查：

有關河域物理化學特性之調查項目與方法如下：

⑴ 河寬：以軟尺在各採樣點之固定位置測量。

⑵ 河深：以直尺，每隔1m量其水深。

⑶ 水溫：以溫度計測量各樣站水溫。

⑷ 流速：以Hydro-bios kiel digital flow meter流速計測量，測量點與測量水深位置相配合。

⑸ 酸鹼度：以WTW PH 90/set pH meter測量水之酸鹼度。

⑹ 溶氧量：以Hanna-HE 8543 Dissolved oxygen

meter測定樣站之溶氧量。

(7) 導電度：以WTW LF 90 Conductivity meter測量。

結果與討論

桶后溪位在新店溪上游，道路狀況欠佳，每逢雨季及颱風季節常有山崩塌坊發生，致造成道路封閉不通，此乃本研究調查期間最大之困擾。有關水文調查之結果如下：

(1) 河寬：四個採樣站中河寬之變化如圖二；由圖得知，四樣站中以第3採樣站河面最寬，而較窄之河面為第2站，至於年中之變化，以夏季月份為最寬，冬季者為最小。

(2) 水深：水深以第4站之河塘型(pond)者最深，平均深度為51cm；次深者為第2站，其他各站則無明顯差異，年中變化不大；唯在夏季中各站水深均有增加（圖三），上述河寬及河深之變化係受雨季及降雨量之影響。

(3) 流速：各站間並無明顯差異，僅第4採樣站流速較慢，平均為0.2m/sec，年中流速變化仍以春夏雨季間為較快(圖四)。

(4) 水溫：各站均以冬季之1及2月份為最低，僅攝氏10至13度之間，較高溫度則為8及9月份，均在攝氏22度以上(圖五)。

(5) 酸鹼度：各站間之酸鹼度並無明顯差異(圖六及七)，酸鹼度平均在7.1至7.7之間。年中變化則以冬季為較低，約在7.1之間。

(6) 溶氧量：前3個採樣站在9.3至9.6ppm 之間，但第4採樣站之平均值則為8.9ppm。在季節性變化方面，各站溶氧量在春季5及6月份為最高，而最低月份則為8月份，約在8.1至8.7之間。

(7) 導電度：由圖八可知第2採樣站為較高，平均為66.2 μs／cm，而以第1採樣站為較低，平均55.1 μs／cm，而年中變化中，在8月間各站均有明顯升高，特別是第2站及第4站，分別為119.6及123.6μs／cm。

至於，桶后溪各調查站之環境狀況如表一；由表1可知，第1採樣站之底質主要為細小砂礫(5-10cm)，兩岸並無植物著生，故整個河面是屬於開闊型，遮蔽度差。第2採樣站之底質大多為小型(10-20cm)及中型鵝卵石(20-30cm)，其中一岸有木本植物生長，故遮蔽度普通。第3採樣站之底質為大型鵝卵石(50cm以上)及小型鵝卵石，而一岸有木本及禾本科植物生長，故遮蔽度較上述兩站為好。第4採樣站之底質為泥沙，兩岸均有禾本科及木本植物生長，由於河面不寬，加以兩岸有植被，故遮蔽度十分良好。

桶后溪水棲昆蟲資源，經調查結果發現，此河域之水棲昆蟲極為豐富，共發現8目40科76種水棲昆蟲，如表二。由表二可知，本河域中蜉蝣目為7科21種； 毛翅目12科19種；雙翅目7科15種；積翅目6科12種；鞘翅目4科9種；蜻蛉目3科7種；廣翅目1科2種及鱗翅目1科1種。

如就各站水棲昆蟲種類分析，蜉蝣目稚蟲是以第3採樣站之1069隻為最多，而以第2採樣站之814隻為最少(表三)。在季節變化方面，各站均以冬季為最多，而以夏季為最少，春秋兩季間則無明顯差異。至於種類數及個体數之關係（圖九），在第1採樣站中，種類出現最多月份以12月之20種為最多， 而最少之月份則為8月份之9種。第2採樣站中，以12月份之20種為最多及6月份之8種為最少；第3採樣站是以10及11月份之20種為最多，最少則為6月份之7種；第4採樣站中則以12月份之18種為最多，6月份之7種為最少。此外，蜉蝣目稚蟲是以 Choroterpes sp.TCA之610隻及 Baetis sp.TBA 之447隻為最多，此兩種為蜉蝣目中之優勢種類(表三)。

積翅目稚蟲，以第1採集站之205隻為最多，最少為第4採樣站之152隻(表四)；而在比較各季節間之種類數與個体變化(圖十)；在第1採樣站以12月之9種為最多及6月份之2種為最少。第2採樣站以12月之9種最多，5及6月之3種最少。第3採樣站以12月之10種最多，及6月之2種最少。而第4採樣站仍是以12月之11種最多；2,4及6月等3個月之4種為小少。積翅目稚蟲以Neoperla sp TNA數量為最多，此種乃為該目稚蟲之優勢種類(表四)。

毛翅目幼蟲是以第3採樣站之325隻為最多，而以第1採樣站之184隻為最少(表五)。此外，在各站中仍以冬季之數量為最多，最少之季節則為春季。各站之個體數與種類數變化(圖十一)，在第1採樣站中，種類出現最多月份為10、11及12月，分別為11及13種；而種類最少則為8月份之3種。在第2 採樣站中則是以11月份之14種為最多，最少則是以4月份之6種。第3採樣站中是以10及12月之14種為最多，最少則為5月份之7種。而第4採樣站中種類最多月份為11及12月之15種，而最少則為5月份之4種。各站中毛翅目幼蟲是以Stenopsyche maromorata之231隻為最多，此蟲在每個月份中出現之數目均較其他各種為多，可知此種為此目之優勢種類(表五)。

雙翅目幼蟲以第3採樣站之326隻為最多，而以121隻之第4採樣站為最少(表六)。而各站在各季節中，仍以冬季之個體為最多，最少之季節則為夏季。至於個體數與種類數之變化(圖十二)，第1採樣站中以12月份之13種為最多及7月份之4種為最少。第2採樣站中以11及12月份之14種為最多，最少月份則為6月之6種。第3採樣站中以11月份之15種為最多及以6月之4種為最少；第4採樣站中以12月之10為最多及7月份之2種為少。在雙翅目幼蟲中，以Chironomus sp.TCA之175隻為最多，故此為本目幼蟲之優勢種類 (表六) 。

至於其他各目幼蟲(表七)，鞘翅目中之個體數以第2採樣站之113隻為最多，最少則為第4採樣站之33隻。在各季節間，除第3採樣站是以秋季之47隻為較多外，其他各站均以冬季為較多；數量較少之季節則為春夏兩季。優勢種類是Eubrianax sp.PEA，全年共採獲108隻。在蜻蛉目中，個體數是以第3採樣站之51隻為最多，最少則為第1採樣站之34隻。在各季節間，以冬季較多，夏季較少。優勢種類為Euphaea sp.TEA，全年共獲76隻。廣翅目中，個體數中以第2採樣站之42隻為較多，次為第3採樣站之41隻，最少則為第4採樣站之19隻。而在各季節中，各站並無明顯差異。鱗翅目所採獲蟲數不多，僅有3隻，且採獲地點均在第3採樣站。

自然保育圖書計劃報告

柳 楷[1] . 王 穎[2]

由於以往國內圖書館收藏有關自然保育之資料有限，因此農委會自75年開始進行 "自然保育圖書資料中心 "計劃，擬定以五年的時間著手訂購保育相關期刊及圖書，其目的乃在提供野生動物及自然保育主管機構決策及經營管理時所需之參考資料；並爲相關的學術研究提供服務，以提昇國內自然資源保育工作績效。

本計劃之執行期限自75年12月1日至80年6月30日。在此五年時間內，前四年的計劃工作著重於蒐集自然保育及野生動物管理相關之期刊；其訂閱則參考國外野生動物研究機構所蒐集之期刊目錄及國內學者之建議，選取其中較知名者。其訂閱則委託美國國際期刊訂閱公司(EBSCO)訂購，目前已進入第五年之工作，因受經費所限， 本年則選購與自然保育相關之圖書，目前尙在進行中。

綜合四年來所蒐集的期刊種類，約在90-109種之間，就其訂購的範圍而言，包括生態、環境 、保育 、動物、植物、行爲及演化等學門，其中以與動物相關之期刊最多，歷年皆在40%左右； 其次爲生態、環境及保育之期刊，約在36-38%之間；若以地區的分布來看，其遍布全球，以美加地區最多(42%)，歐洲地區次之(35%)，，其他則包括澳、紐 及亞、非地區。若就出版之時間而言， 其包括有半月刊至年刊等不同刊期之期刊，其中以季刊最多(47%)， 此外，月刊(15%)，雙月刊(12%)及不定期刊物(12%)等次之。

目前由於其他相關學術及研究機構對保育相關資料之逐漸重視，許多期刊已有訂購，然多爲新近訂購者，對許多重要期刊過去出版之刊物則闕如，在整體資料之查詢上造成相當不便，建議若有經費或可購買此類期刊之過去出版品，以建立完整之資料。

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武陵農場魚類教育中心規劃

林曜松[1]　張崑雄[2]

武陵農場的櫻花鉤吻鮭復育中心，其設立的宗旨，原希望以人工孵育的方式，拯救當時數量稀少，面臨滅絕的櫻花鉤吻鮭。然而魚類族群的復育，除了以孵化魚類之方式外，更重要的是應加速從防止人爲干擾，及棲地環境改善等問題著手。因此有關單位考慮擴大櫻花鉤吻鮭復育中心的功能，希望在該中心能推展森林溪流的環境保育教育工作。基於此，本人等進行武陵魚類教育中心之規劃工作。

武陵農場魚類教育中心內環境教育的解說題材，宜包括(1)溪流生態系介紹；(2)大甲溪魚族及水生昆蟲簡介；(3)特殊魚類如櫻花鉤吻鮭詳細生活史的介紹;(4)農業發展與河川污染及優養化之關係；(5)水庫與攔砂壩對溪流生態系的影響。有關解說教育展示方式，建議採用(1)圖片展示；(2)可贈送物品如摺頁與海報；(3)水族箱展示大甲溪的魚類及水生昆蟲；(4)錄影帶介紹櫻花鉤吻鮭的復育工作等。

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英 文 部 份

English Summary

Content

Part 4. Other Resources Investigation and Research Planning

A List of the Nature Conservation Projects Supported by the Council of Agriculture

Council of Agriculture [1]

	Subject of Project in FY1991	Sponsoring Agencies
A.1	Study of Population Ecology of Formosan Landlocked Salmon (2)	National Taiwan University
A.2	Planning of the Education Center of Landlocked Salmon at Wuling Farm	National Taiwan University
A.3	Studies on Parasites of the Formosan Landlocked Salmon and other Fishes in Taichia River	National Taiwan University
A.4	The Residue Control of Pesticides in the Water of Chi-jia Van River	Taiwan Agricultural Chemicals and Toxic Substances Research
A.5	Study on the Ecology and Utilization of Resources of Acrossocheilus formasanus in Ta-chai Stream	National Taiwan University
A.6	The Protection of Land-locked Salmon (Oncorhynochus masou) Habitats	Wu-ling Farm VACRS
B.1	Establishment of Database of the Virgin Broad-leaves Forest in Taiwan	Taiwan Forestry Institute
B.2	Investigation of Plant Communities at Muddy Volcanic Areas(1st year)	National Chung-hsing University
B.3	The Establishment of Data Base on Conservation Research of Butterflies in Taiwan	National Taiwan University
B.4	Wildlife Data Bank of Taiwan (III) Lizards(1)	National Taiwan Normal University
B.5	The Ecological Study of Formosan serow (Capricornis crispus swinhoei)--Feeding habits, Plants and the nutrient changes of feeding Plants	National Taiwan Normal University
B.6	Study on the Population Ecology of Macaca cyclopis(2)	National Taiwan University

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

	Subject of Project in FY1991	Sponsoring Agencies
B.7	Translocation Test and Field Survey of Endemic Species of Agamid Lizards in Taiwan Area (II)	Chinese Culture University
B.8	Study and Management of Formosan Black Bear (II)	Society of Wildlife and Nature R.O.C.
B.9	Study and Management of Formosan Black Bear (II)	National Taiwan Normal University
B.10	Study of the Mammallian Fauna of Mountain Nature Reserve(I)	Society of Wildlife and Nature R.O.C.
B.11	The Study of Provisioning to Taiwan Macaque (Macaca cyclopis)(III)	National Taiwan University Luo-dong Forest Distriction, TFB
B.12	The Social Behavior and Habitat Utilization of Lanyu Scops Owl	Academic Sinica
B.13	Pilot Banding Project of East Asia International Migration Birds	Wild Bird Society of R.O.C.
B.14	Survey on the Resource and Ecology of Aquatic Insects in Tung Hou River(II)	National Taiwan University
B.15	Landscape study of the Coastal Range, Eastern Taiwan	National Taiwan University
B.16	Space Requirement of Confined Wild Animals	Pig Breeding Science Research Institute
B.17	Health Monitoring and Disease Survillance in Exotic Animal of Taiwan	Pig Breeding Science Research Institute
B.18	The Project of Establishing an Inventory System for Endangered Mammals in Captivity of Taiwan	Taipei City Zoo
B.19	Census Project of Birds of Prey of Taiwan	Wild Bird Society of R.O.C.
B.20	Guidelines for Developing Dadu Waterfowl Refuge	Tong-hai Catholic University
B.21	Parasites of Wildfish from Hei-Ts'ui Reservoir and Related Tributaries	National Taiwan University
B.22	Investigation on Concentrated Fossil Geological Landscapes in Liu-chia, Shiu-liu-tung, Tainan Hsian	National Cheng-kung University

	Subject of Project in FY1991	Sponsoring Agencies
B.23	Investigation on Sedimentological Landscape in Hengchun Peninsula	National Cheng-kung University
B.24	Investigation of Macaca cyclopis population distribution and habitation in K.S. Sou Shan Mountain Zone	National Cheng-kung University
C.1	Project of Management and Preservation in Kuan-tu Nature Reserve	Construction Bureau, Taipei Municipal Government
C.2	Planning and Management of Ha-Pen Nature Reserve	Taiwan Forestry Research Institute
C.3	Yuen-yang Lake Natural Area Reserve Protection and Maintenance Project	Department of Forest Development, VACRS
C.4	The Management and Preservation of Ta-wu Mt. Nature Reserve and Buffer Area	Taiwan Forestry Bureau
C.5	The Management and Preservation of Pin-lin Taiwan Keteleen Nature Reserve	Luo-dong Forest Distriction, TFB
C.6	The Management and Preservation of Tan-sui Mangrove Nature Reserve	Luo-dong Forest Distriction, TFB
C.7	The Management and Preservation of the Hoyenshan Nature Reserve in Mioli	Shin-chu Forest Distriction, TFB
C.8	Management and Preservation of Cycas Nature Reserve in Tai-tung	Tai-tong Forest Distriction, TFB
C.9	Management and Preservation of Amentotaxus nature Reserve in Ta-wu	Tai-tong Forest Distriction, TFB
C.10	The Management of Nanao Pond and Hardwood nature Reserve	Luo-dong Forest Distriction, TFB
C.11	Management of Pen-hu Nature Reserve	Penghus County Government
C.12	The Management and Preservation of Taiwan Pleione Nature Reserve	Chiayi Forest Distriction, TFB
C.13	The Management of Cha-tian shan Naturae Preserve	Shin-chu Forest Distriction, TFB
C.14	The Management of Chu-yun shan Nature Reserve	Ping-tong Forest Distriction, TFB
C.15	The Management of Wu-shan-tin Nature Reserve	Kaohsiung Country Government
C.16	The Studies and Management of Heng-chun Natural Protected Area	Heng-chun Branch, Taiwan Forestry Research Institute

	Subject of Project in FY1991	Sponsoring Agencies
C.17	Research on Natural and Cultural Sights in Penghu:1	Makung Senior High School
D.1	Natural Conservation Library	Society of Wildlife and Nature, R.O.C.
D.2	FY 1991 Yuen-yang Lake Nature Reserve	Ilan Branch, China Youth Corps
D.3	Planning Nature Conservation Education	Chinese National Park Society
D.4	Technical Improvement on National Protection Project of FY1991	Taiwan Provincial department of Agriculture
D.5	In Producting of the Beautiful Land Broadcasting Program for Promoting National Culture and Scenery Conservation	The China Broadcasting Station
D.6	The Publicizating Program of Natural and Cultural Heitage	Chinese National Park Society
D.7	FY 1991 Nature Conservation and Environment Protection Work Shop(VI)	China Youth Corps
D.8	The Pilot Publicizing Program of Natural Conservation on Children's Literature	Society of Children's Literature
D.9	Production of Video Tapes on Birds of San-ping Area	Taiwan Forestry Research Institute
D.10	Workshop of Bird Conservation	Wild Bird society of R.O.C.
D.11	Prints of the Pamphlet for Nature Preserves of Taiwan	Taiwan Forestry Reaearch Institute
D.12	A nature Awareness Education Project	National Spiritual Assembly of Baha'i of Taiwan
D.13	Parent-child Scientific Study workshop	Taiwan Provincial Taichung Library
D.14	The Extension and Education of Environmental Greenery and Ecosystem Conservation	Environment Greenery Association, R.O.C.
D.15	Aquatic Ecological Investigation and Streams Conaervation Guideance Handbook Press-Ay-liau and Ching-shan Stream, Pingtung County	Ping-tong Agriculture College National Museum of Natural Science

	Subject of Project in FY1991	Sponsoring Agencies
D.16	Propagation Project of Education on Natural Environmental Conservation in Penghu	Makung Junior Middle School
D.17	Nature Conservation Workshop in Kinmen	Kinmen County Government
E.1	The Natural Resources Conservation in Lien-hua-chih Area	Lien-hua-chih Branch, Taiwan Forestry Institute
E.2	Preservation and Uses of Taiwan Wild Tea Germplasm	Taiwan Tea Industry Improve Research Institute
E.3	Ecological Study of Beech Forest of Taiwan	Taiwan Forestry Institute
E.4	The Mangrove Investigation and Protection on Shin-feng	Shin-chu County Government
E.5	Studies on the Assessment of Rere and Threatened Plant Species in Taiwan	Tong-hai Catholic University
E.6	Studies on the Conservation of Chinese Pangolin Manis pentadactyla pentadactyla(III)	Taiwan Forestry Institute
E.7	A Investigation and Research Plan of Bird Sanctuary in Ilan County	Ilan County Government
E.8	The Bird Protection Project in Ta-tu River Estuary	Changhua County Government
E.9	The Conservation Planning of Fish in the Forest Area	Taiwan Forestry Bureau
E.10	The Protection of Keelung Abrasion Coast	Keelung Muncipal Government
E.11	The Protection of Fish on Ching-shui-gou Streem	Ruey-feng Junior Middle School
E.12	FY 1991 Investigation on Egret Resources in Taichung County	Taichung County Goverment
E.13	FY 1991 Investigation and Protection on Big Trees in Taichung County	Taichung County Government
E.14	The Protection of Fossil Area in Syh-der	Ping-tong Forest District Office,TFB
E.15	Introduced Wildlife (Animals) and Their Ecological Effects	Tong-hai Catholic University

	Subject of Project in FY1991	Sponsoring Agencies
E.16	Project for Strengthening Promotion of Wildlife Conservation in Taipei Municipal City	Taipei Municipal Government
E.17	Project on Strengthing Wildlife Conservation in Ilan County	Ilan County Government
E.18	Project on Strengthening Wildlife Conservation in Nantou County	Nantou County Government
E.19	Project on Strengthening Wildlife Conservation in Taiwan Province	Taiwan Provincial Department of Agriculture & Forestry
E.20	Fy 1991 Project on Strengthening Wildlife Conservation in Taichung County	Taichung County Government
E.21	Fy 1991 Project on Strengthening Wildlife Conservation in Taoyuan County	Taoyuan County Government
E.22	Fy 1991 Project on Strengthening Wildlife Conservation in Kaoshiung County	Kaoshiung County Government
E.23	Fy 1991 Project on Strengthening Wildlife Conservation in Pingtung County	Ping-tong County Government
E.24	Fy 1991 Project on Strengthening Wildlife Conservation in Hwalien County	Hwalien County Government
E.25	Fy 1991 Project on Strengthening Wildlife Conservation in Hsinchu County	Shinchu County Government
E.26	Fy 1991 Project on Strengthening Wildlife Conservation in Taitung County	Tai-tong County Government
E.27	Fy 1991 Project on Strengthening Wildlife Conservation in Changhua County	Changhua County Government
E.28	Fy 1991 Project on Strengthening Wildlife Conservation in Chia-yi County	Chia-yi County Government
F.1	The Symposium of Endemic Mammalian Species in Taiwan	Taipei City Zoo
F.2	International Conference on Wildlife Conservation	Chinese National Park Society

Fiscal Year 1990 Nature Conservation Event, Council of Agriculture (COA) (July 1990 ~ June 1991)

[1]

Council of Agriculture

1990

July — Approvement of fiscal 1991 Nature / Culture Landscapes Conservation Project. Under this project six main subjects and more than ninety detailed projects in total have been covered.

July — Fiscal 1990 Yuen-yang lake nature reserve workshop held by COA and China Youth Corps, more than one hundred people attended.

Jul. 13 — Discussing meeting for management of ivory was convened by COA, the delegates from this Council, public agencies concerned, scholars and specialists were all involved.

Jul. 31 — Prof. Howard T. Odum, the famous international ecologists, made several speech shows at Taiwan.

Aug. 31 — More than 1000 wild animals and two kind of animal products: ivory and rhino horn be publicized as conserved species according to the Wildlife Conservation Law by this Council following the promulgation of Wildlife Conservation Law and the conclusion of CITES 7th membership conference organization.

Sep. 2 — About 1000 tails of live hundred-pace snake which was smuggled and confiscated by police station, Taipei County Government were burned at Ta-tsu-keng garbage ground, keelung city.

Sep. 24 — More than 1000 tails of live hundred-pace snake which was smuggled and be confiscated by military police team, were burned at Nan-liao garbage ground , Shin-Chu city at September 26.

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Mar. 25 The workshop on wildlife conservation work in Taiwan was held on Mar. 25-26, 1991 at Academia Sinica. The workshop was sponsored by Academia Sinica and COA.

Mar. 26 Workshop on the biological resources and information management of Taiwan was held on February 26-28 , 1991 at Academic Activity Center, Academia Sinica.

Mar. 27 The notice on the establishment of wildlife conservation Consulting committe of Council of Agriculture, Executive Yuan have been drow up, and was conveied to this Yuan to examinate.

Apr. 16 The meeting of discussion of the management of land utilized method of formosan trout was held. The delegates from this Council , agencies concerned , scholars and specialists were all involved.

Apr. 16 The meeting of discussion of " The quarantine scheme of wildlife held, the delegates from this Council, agencies concerned, scholars and specialists were all involved.

Apr. 22 The second meeting of discussion of "the notice of the management of breeding wildlife (draft)" was held. The delegates from this Council, public and private agencies concered , owners, scholars and specialists were all involved.

Apr. 24 The examination meeting of the conservation project of dolphin in Peng-hu County.

May 7 Mr. Gordon S. Maxwell, a specialist of mangrove ecology, carrying with his families visited Taiwan for four days. The face to face discussion with internal scholar and specialists,and a field trip on the scene was arranged.

May 7 Workshop of discussion of the problem of Taiwan's marine mammals was held by COA and National Ocean University.

Jun. 3 The 39th joint meeting of the Nature Conservation Committee and the Technical Committee of this Council was held.

Jun. 4 Reviewing the results of research, investigation and management of nature conservation program in FY 1991 was held by this Council at Taipei.

Jun. 24 Two full years workshop for reviewing the execution of Wildlife Conservation Law was held by this Council on June 24, 1990.

An investigations on the consumption of the wildlife resource by the aborigines in Taiwan

Ying Wang [1]

In this study mammals species were selected to investigate their population status and their being used by people. Results obtained will be applied to the future management.

From July 1988 to June 1990, aborigines were surveyed by direct interview to estimate the game harvest and its monetary value. Field trips to the hunting ground were also made to verify the hunting operation. Besides, regional officials who are responsible for local conservation works were also interviewed to learn the potential impact on resource use from economic development.

Within 2 years 14 districts were visited. Results showed that hunting still played an important role in some of the aborigines. The number of professional hunters was few. In most villages the number was under 5. However, the number of amateur hunters was common, yet hard to quantify. In general, the number of hunters in each village decreased as the degree of economic development increased. In the past, hunting was carried out in the traditional hunting ground and only the large game species such as wild boar (*Sus scrofa*), sambar (*Cervus unicolor*), serow(*Capricornis crispus*), and muntjac (*Muntiacus reevesii*) were served as main targets for harvest. On the other hand, leopard cat (*Felis bengalensis*), clouded leopard (*Neofelis nebulosa*), viper (*Agkistrodon acutus*) , and yellow-throated marten (*Martes flavigula*)

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were prohibited from hunting due to their traditional taboos. By now, due to market demandand abandonment of their old tradition , taboos have been disregarded and many of the smaller species have been included in their hunting targets. Furthermore, that many aborigines participated the reforestation works gave them the opportunities to hunt species which they could not formerly access. As a consequence,many of the traditional hunting territories and regulations were affected or even abandoned. Wildlife population and distribution were also strongly affected as a result.

Harvesting of games were mostly taken by snares and steel traps (14 districts). However, dogs (5 districts) and guns (2 districts) were also used to hunt for games. Among species, wild boar, serow, muntjac, gem-faced civet (*Paguma larvata*),mongoose (*Herpestes urva*),monkey (*Macaca cyclopsis*), ferret badger (*Melogale moschata*), hare (*Lepus sinensis*) , and flying squirrel (*Petaurista spp.*) had harvest record in all 14 districts surveyed ; bear (*Selenarctos thibetanus*) in 5 districts; leopard cat and pangolin(*Manis pentadactyla*) in 4 districts. Over 50% of the harvests were sold to the market for profit. Big or rare species such as bear, sambar , yellow-throated marten,and otter (*Lutra lutra*) could fetched a good price from NT$.10,000 to over 100,000. Other species like pangolin, wild boar, muntjac, gem-faced civet, monkey, mongoose, and chinese civet (*Viverricula indica*) sold for a price between NT$. 1,000 to 10,000 , while small and common species such as weasel (*Mustela sibirica*) , hare , flying squirrel , and ferret badger were usually under NT$. 1,000. This game sales provided an important income source for some of the aborigines hunters.

All of the districts visited are based on agricultural economy. Unregulated goat and cattle ranching become more popular (11 districts) in recent years as the market demand increases. As a consequence, habitat destruction and competition between domestic stocks and wildlife

are unavoidable. The impact of this development needs to be monitored in the future .

In conclusions , hunting is still very important to some of the aborigines. To protect our wildlife resources it is suggested that hunting areas and wildlife preserves be designated and the effect of protection and numbers of harvest be monitored.

Wildlife Data Bank of Taiwan (1) Amphibians

K. Y. Lue[1], C. Y. Lin[1], K. S. Chuang[1]

Abstract

This is a project trying to establish the wildlife data bank model of Taiwan by using amphibians as testing animals. Total 7609 amphibians field data collected from 1982 to 1990 were fed into PC and tested by several types of packages. The records were from 289 locslities.

The processing hardware of Data Bank is 640K RAM PC XT turbo with peripherals of monitor, printer, and hard disk ect. Functions of Data Bank are accomplished by program modules of dBase III language under MS-DOS and Pan Asia Chinese system circumstances. Geographical coordinates were standarlized by referring to Taiwan photo-based map of Forest Bureau. Field records were formalized and coded, then keyed in the Data Bank. Distribution and habitat requirements of each species were analysized.

Results indicated that the distribution of amphibians in Taiwan could be separated into three patterns, i.e., island wide, regional and restricted. Among these, species with the restricted distribution all belong to the rare and endangered species. The number of species decreases as the elevation range of 0-500 m, while only one species was found from 3500-4000 m. The distribution pattern, habitat requirement and population status of each species were discussed in detail within the report.

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The Study of Provisioning to Formosan Macaque (Macaca cyclopis)

Ling-Ling Lee[1]

Introduction

Formosan macaques *(Macaca cyclopis)* is the largest species in body size among the endemic species of Taiwan. It is very important to study the behavior, ecology and other biological characteristic of this species, not only for scientific reasons, but also for conservation purposes, because this species is heavily hunted throughout Taiwan. Due to the heaving hunting pressures, the macaques are very shy and easily frightened. Therefore, it is often very difficult to approach them to a reasonably close distance for observation. This and the ruggedness of the terrain make it very difficult for biologist to conduct field study and observation, and the accumulation of its biological information very slow. With the recommendation and assistance of Japanese primatologists Dr. S. Kawamura and Dr. K. Norikoshi, bait stations provisioning with extra food were set up in Jentse, Ilan County, to test if provisioning can attract more macaques to the area around the bait station, and facilitate field observation and data collection. If provisioning is successful, it is also hoped to use the macaques as subjects of nature education to educate the general public who come and visit Jentse how to appreciate wildlife in their natural habitat and the importance of nature conservation.

Materials and Methods

Between December, 1988 and June 1990, employees from Luotung Forestry District Office of the Taiwan Forestry Bureau, visited the bait stations at Jentse 2 to 4 times a week, and provided food, such as apple, banana, sweet potato, peanut, bamboo shoot, passion fruit, kiwi fruit and beans. Each time of provisioning, the amount of food provided and the amount consumed were recorded. Researchers from Department of Zoology, National Taiwan University, and Drs. Kawamura dnd Norikoshi visited Jentse at least once a month, and stayed for 2 day to several weeks to conduct field observation. We surveyed along roads, trails and stream to locate macaques. Each time a macaque troop or individual was located, it was observed and followed until it is out of sight or when it was too dark to continue any further observation. During each observation, we recorded information such as the number of animals seen, sex and age composition, behavior and activity, when and where the animals were sighted, where did it moved to or the direction of movement. If the animals were feeding, we recorded the types of food consumed; and if the animals were eating a plant, we recorded which part of the plant was consumed. Macaque spoors were collected each month along survey routes and brought back to lab for further

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analysis on the diet of the animals.

Results

At least 5 troops of Formosan macaques were identified in Jentse area. These troops are: JR troop with 22 – 31 animals, JL troops with 26 animals, RI troop with 7 – 16 animals, RH troop with 15 animals, and DS troop with at least 5 animals. The locations where these animals were most often found are: forest behind Jentse hotel, forest along roads leading to Jentse and to Taipingshan, forest recreation park across the stream facing Jentse hotel. JR was the troop most often sighted, and appeared to follow a rather regular moving route in summer. The effect of provisioning was poor in the beginning of the project, due to inadequate knowledge about the activity of macaques in the area, and the location of the bait station. However, food consumption at the bait stations gradually increased in the second year. Although squirrels and wasps might have consumed a fairly large proportion of the fruit and food, signs of macaque activity and field observation indicated that some of thd food was consumed by the macaques. However, poaching, disturbance by tourists, and construction of roads and check dams often affect the activity of the macaques and might also affect the effect of provisioning. The macaques troops do not stay around the baiting area when the natural food is scarce.

Conclusions and Suggestions

According to the Japanese experts, it is very important to remove any unnecessary disturbance to the animals to ensure a successful provisioning program. This is also one of the most important factors in deciding how successful the provisioning program can be in the future in Jentse. However, other factors such as the type and amount of food provided, the location and the means how food is provided, and how to avoid the consumption of bait by squirrel and animals other than the macaques are also important. Since there are 5 troops of macaques that stay around Jentse, it is suggested that a long term study on the social biology of the species, such as factors affecting troop composition, sex ratio, intra-and inter-troop interaction, and the ecology of the species, such as diet, habitat utilization, home ranges, etc., is continued so that more information about this social animal can be gathered to help managing this species.

The Decomposition of Formosan Serow's (Capricornis crispus swinhoei) Feces

K. Y. Lue[1], S. I. Huang[1]

Abstract

The aim of this study is to investigate the decomposition rate of Formosan serow's (Capricornis crispus swinhoei) feces, and its nutrient degradation during the process of decomposition in fields. In addition, we observed the dung fungi growed in serow's feces.

In situ, decomposition rates of serow's feces were determined by Nylon Bag method. Droppings we used, were collected from Taipei Zoo and Yuan-foan of Yu-shan National Park seperately in the winter of 1988. Five grams of dry feces were put into a nylon bag with 1 mm mesh, then bags were exposed in fields of various vegetation types, inculding Yuan-foan of Yu-shan (3500 meters), Howuan Shan (3200 meters), Dar-yu-lean (2800 meters), Yang-min Shan (750 meters), Dar-jen Shan (410 meters). Bags with feces were collected from field each month for organic material and nitrogen content analysis. After the one year studying, the decomposition rate showed that the highest rate was obtained from Dar-jen Shan (85 %) and the lowest one was obtained from Yu-Shan (15 %) with droppings collected from field. As for droppings from Zoo, the highest rate was from Dar-jen Shan (80 %) and the lowest one was from Yu-shan (32 %). The decomposition rates were higher in low- altitude regions than in high-altitude regions. The decomposi- tion of these two kind of feces were different in higher altitude regions and similar in lower altitude regions. Organic material decreased during the decomposition. Nitrogen content was fluctuated (0.10-0.33 %) in decomposition.

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Fresh feces was incubated for observation the succession of dung fungi. Up to now, 16 species of fungi were identified, inculding Ascomycetes, Basidomycetes, Zygomycetes and Fungi imperfecti. Sugar fungi (Mucor spp.) appeared first and then the fungi (Sordaria fimicola) used cellulose appeared. Finally, the fungi (Coprinus sp.) used lignin appeared. Evidence shows that Coprophilous fungi is an important factor to the decomposition of Formosan serow's feces.

Investigation on fossil geological landscapes and basic geolgy in Hsin-Hua Hill, Tainan Hsien

Chung, Kuang-Jyi[1]

Purposes of Studying

The geology of the area in Hsin-Hua Hill is very specialy.Very rich and various kinds of fossils are occurred from the sandstone and shale alternation formations which deposit under the condition of shallow water sea and these fossils are preserved very well. This area is a very ideal area for teaching and studying and these geological materials are very valuable cultural properties. They must be investigated . The following topics must be studied.

(1) The vertebrate fauna and their living conditions.

(2) The invertebrate fauna and their ecological conditions.

(3) The faunal correlation between this area and other places of Taiwan.

(4) Evaluating the fossil fauna of this area.

(5) Under the preservation of these cultural properties,giving some proposals to protect and preserve these cultural properties.

(6) Investigating the feasibility of making this ares as a field teaching area.

Materials and Methods of Studying

The main materials for this studying are fossils .There are three methods to get these fossils.(1). They are collected directly from field, mainly for the whole invertebrate fossils.(2). They are supplied by many amateurs,mainly for the most vertebrate fossils.(3).They are supplied by worker's formerly collections or Tsai-Liau Fossil Museum,also mainly for the vertebrate fossils.

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The conditions of fossil sampling are different.The invertebrate fossils can be collected directly from field because these fossils are not collected and preserved by any amateurs and then field outcrops can preserve these fossils very well.But for the vertebrate fossils ,unrich, lower probability of occurrence ,disorderly distribution and being preserved in brownish yellow loosing sandstone which occurring landsliding under the rainfall to outcroping the fossils,then many amateurs can collect and preserve,and these fossils are difficult to preserve in beds.

The methods of studying can be divided into two parts .(1)Field surveying:The geology of this area must be investigated distinctly ,and the geology must be diveded into many members fer convenience. The relationship of the fossil localities and geological beds must be constructed.(2) The worker must visit every amateus who preserved these vertebrate fossils.

This work classified and recorded the characters of these fossils and then coicided with the geological strata,then the distribution can be worked out.

This work must evaluate the fossil geological landscape.The evaluating works must be included the scholarship and correlation with other places and determine their importance in the position of cultural properties.

Results of Studying

The geology of this area is of Chiting Formation of Pleistocene. For the studying convenience ,the Chiting Formation is divided into six members as Kang-Lin Member,Hu-Yu-Kou Member,Di-Shui-Tzu Member ,Kuo-Ling Member, San-Chung-Chi Menber and Niu-Shih-Shui Member.

The fossils occurred in this area include as following:

Vertebrata: Proboscidea, Rhinoceros, Bison, Felis and Shark etc.

Invertebrata: Gastropoda and Pelecypoda of Mollusca, Coral of Coelenterata, Barnacle of Arthropoda,Echinoidea of Echinoidermata and Foraminifera of protozoa.

Generally,the Vertebrate fossils are all occurred in Niu-Shih-Shui Member,but all other invertebrate fossils are distributed in Kang-Lin Member,Hu-Yu-Kou Member, Kuo-Ling Member and San-Chung-Chi Member.

Conclusions and Proposals

(1)The kinds and occurrence frequences of vertebrate fossils in this area are the most in Taiwan. They must be considered as very precious and properly protected.

(2)The kinds and richness of invertebrate fossils are very high not only in this area but also in other places in Taiwan such as Su-Kou Formation in Heng-Chung West Hill. But this area is the only one of high variation of fossils combined with geology.These conditions are very well topcis to study.

(3)The characters of strata preserved fossils are very changeable. It is very valuable in the palaeoecological study.

(4)Combining the fossil preservation in Tsai-Liau Fossil Museum,this area must be demarcated partial area to be protected.

Investigations on the Sedimentological Landscapes in the Hengchun Peninsula

Quocheng Sung[1]

1. Introduction

From the viewpoints of sedimentology, paleontology and plate tectonics ,the late Neogene series in the Hengchun Peninsula may be deposited at the continental slope to the base of slope on the passive margin off southeastern Asia.Although the late Neogene series has been subjected to folding and thrusting caused by the Arc-continent collision,the major features of the continental slope are relatively well preserved and become valuable geological landscapes.These sedimentary features include submarine channels and canyon,deep-sea fan ,subaqueous slumping ,subaqueous debris flows ,and sedimentary structures as well.Thess landasapes are deserving of protection.

2.Purposes

The purpose of this study is to investigate the sedimentological landscapes of the Negone series in the Hengchun Peninsula,which is assumed to be deposited on the continental slope during the period from middle miocene to Pleistocene.Landscapes valuable of educational purposes as well as scientific researches are carefully studied.And some of them will be recommanded to be classified as natural reserve districts according to the Cultural Property Preservation Law。

3.Method of investigation

Sedimentary models and paleo-environments of the Neogene series in the Hengchun Peninsula were established by field mapping and compilation of geological data collected in the previous years. Outcrops of particular en-

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Regional Landscape Evaluation in the Coastal Range; Northern Area

Shin Wang
Hong-Fei Lei

The Coastal Range of Eastern Taiwan is characterized by active tectonic movement with rapid uplifting, longitudinal buckling and strike slip movement. The mountain range is part of the Phillipine sea plate which separates from the Central Backbone Range of Taiwan by a rift zone entitled the Longitudinal Valley.

Rapid uplifting and river cutting create high relief, rugged topography which are barely accessible and hence, most of its primitive landscape preserved.

In this study, the northern one-third of the Coastal Range is studied. Firstly, land classification based on geology and topography was done. The study area was divided to different landscape units characterized by their uniformity in visual experience and their topographic enclosure. Each landscape unit was evaluated by considering their aesthetic criteria, namely unity (or harmony and continuity), vividness (or intensity and imageability), variety (or diversity and richness), scarcity and intactness.

The study was maded by using aerial photographs, contour maps, and supplemented by field mapping techniques.

It is clear from the study, that lithological and structural control are dominating.

Resistant rocks, such as the volcanic breccia, almost always form ridges. Conglomerate and thick-bedded sandstone form lower level hills. Whereas the shales form rolling lowland. Faults which cut through stratigraphic sequence and bring together rocks of different competency are clearly reflected by topographic discontinuity.

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The result of this study is presented on a landscape unit map and a series of tables which evaluate and describe its landscape esthetics.

In conclusion, 3 types of landscapes are recommended to be classified as conservation area. They are the mountain landscape conservation area, the coastal landscape conservation area, and the river landscape conservation area.

Survey on Natural and Cultural Sights in the Penghu Islands

Kuo Chin-lung

Purpose

In recent years in the Penghu Islands, natural environments have been seriously damaged and polluted due to the exploitation of this area and the prosperity of the tourist industry. The main purpose of this study is to understand this area's natural and cultural sights by fieldwork so as to establish some basic data. The data are expected to be offered to the authority for the reference of resources preservation and local construction. This study is conducted in 3 years. This survey includes the area's geology, geomorphology, wild animals and plants, together with marine living things. Ancient remains were also surveyed.

Method

The Penghu Islands are comprised of nearly 100 islets of all different sizes. They occupy 60 km long and 40 km wide. It is rather difficult to do fieldwork in so many islets. I selected from the past data some important places to do fieldwork. The investigation of geology and landscapes was chiefly about sea cliffs, coasts, and seashores. The coastline is full of variety and there are different kinds of migratory birds every summer and winter. Some places suitable for migratory birds' stay were surveyed and documented once a month. The data gathered will be analyzed and assessed to evaluate the possibility of selecting some places as natural resources santuary and publicity areas.

Results

After careful fieldworks, it is discovered that the coastline is wide and irregular. columnar basalt in different islets various sea cliffs. Important columnar basalt exposure lies in Pai-sha Yu, Niao Yu, Yuan-pei Yu, Chi-shan Yu, Tien-kou Yu. These five islets are suggested to become the columnar basalt sanctuary. (Shin Wang, 1989)

There are many abrasion platforms along north and west Penghu, Paisha islet, and Chung-tun islet. There are rugged coastlines, peninsulas, and bays. They are traditional fishing grounds for fishermen and acttvity spots for Charadriidae, Scolopacidae, and other sea birds. The building of fishponds and poisoning of fish have seriously damaged the ecology of this area for the last few years. The facts are worthy of notice.

Furthermore, Shih-li Beach, the coast of Shan-shui, the seashore of Lintu Park, the shoal of Hsien-chiung Yu and west Chih-Pei Yu deserve careful planning and preservation.

Many migratory birds and a few stationary ones have been found all over Penghu proper. The birds on southeast and north unpopulated islets belone chiefly to Laridae.

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Abundant birds have been found around the fishponds of Tsaiyuan and Chinlou, and Hsingjen Reservoir. These places are suitable for the observation of birds because of their convenient transportation.

On off-islands, I have found summer migatory birds of Laridae family, including Little Terns, Common Noddies, Bridled Tern, and Black-naped Terns. The breeding grounds are scattered around unpopulated islets. There are black-naped Terns on Little Pai-sha Yu, Bridled Terns and Black-naped Terns on Chi-shan Yu and Tien-kou Yu. The number of Comman Noddies and Bridled Terns on Cat-islet is especially large. The above birds are listed as rare birds and deserve preservation.

Conclusion and Suggestions

Penghu is situated between Taiwan proper and Mainland China. Its geology and sights are very particular and full of variety. There are also many migatory birds. In order to preserve these natural sights I make the following suggestions.

1. Besides columnar basalt sanctuary, the scope of preservation should be expanded, such as beaches and shoals.
2. Primary breeding grounds for migratory birds should be preserved.
3. Less important places or sights should be regulated as publicity areas.

CRITERIA AND MEASURE FOR ASSESSING RARE AND THREATENED PLANT SPECIES IN TAIWAN

Ming-Jou Lai*

Rarity and danger degree are the two major factors to be considered for identifying the rare and threatened plant species.

Criteria for assessing the rarity could be examplified by :

1) Relics, remnants or disjuncts
2) Narrow endemics
3) Species on the edge of their range
4) Small population species

Criteria for measuring the danger degree could be categorized as :

1) Development such as logging, destruction of grassland, destruction of wetland, mining, construction of dum for electric and water supply, construction of road.
2) Collecting such as for horticulture or for pharmacy.
3) Others, such as succession, herbivory by naturalized animals, or unknown.

The IUCN Red Data Book categories Ex, E, V, R and I are used for designating the protection index of the rare and threatened plant species.

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Habitat Analysis of Formosan Reeves' Muntjac at the Jiou-Jeng-yang Area, I-Lan County

Chen Ching-Hsia

Formosan Reeves' Muntjac (Muntiacus reevesi micrurus) prevail in the hill and mountain area, 200 to 3000 meters in elevation. Its range extends from northern to southern Taiwan. However, major activities of this species are now mainly between 1000 to 2000 meters in elevation due to extensive hill exploitation, habitat destruction and hunting activity. Ecological studies of this species are very difficult because they are timid and sensitive. Study (Wang, 1988) based on the questionaries form the mountain food store throughout Taiwan indicated that I-Lan area was the main center of distribution. This investigation was proposed to analyze the habitat of this species near the Jiou-Jeng-Yang Area in order to provide baseline information needed for the management of this wild animal species.

Jiou-Jeng Yang Area, located at the Nanau, I-Lan, is a basin surrounded by high mountains. The vegetation of the whole area is composed of native temperate, evergreen broad-leaved forest. Plots were established at the Bee-Yar-Hou-Sir, the center of the area. Subforest regenerated after damage by the aboringines is riched in many shrubs and ferns.

Activity areas for the Formosan Reeves' Muntjac in the study areas are in ectone, Where rocks and opening place mix together. The first selection are alway safety, followed by food abundance, and different places for play, resting and eating. Twenty-four plant species are ultilized as food sources, among them the most important ones are Pilea brevicornuta ,Diplazium dilatatum and Asplenium antiquum.

Extensive hunting in Jiou-Jeng-Yang Area before 1989 resulted in severe reduction in population size. A protection and management movement was initiated by the Government of I-Lan in Feb. 1, 1989. Hunting were stopped by the Law and governor's hard working, and the Formosan Reeves' Muntjacs survived in these areas. It is evident that the Protective Wild Animal Law and the local goverment enforcement are needed to result in effective conservation and management of wild species.

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Preservation and Application of Taiwan Wild Tea Germp plasm

Lian-Chan Wang[1] Chan-Hoai Fong[2] Mu-Linen Lin[3] Iou-Zen Chen[4]

Introduction

The first recorded report on wild tea in Taiwan should date back to 1697 B. C. Around that time the wild tea trees distributed mostly in mountainous areas. People knew how to use the tea leaves for use as a cooling medicine to effectively cure fever problem. Acoording to Lu and Yang of Taiwan Forest Research Institute, the scientific name for the Taiwan wild twa is Camellia sinesis (L.) D. ktze. subsp. buisanensis (Sasaki). Lu and Yang.

Objective

1. To survey the distribution areas and its ecological condition of Taiwan wild tea.
2. To use wild tea as a new plant material for tea breeding program.
3. To preserve current wild tea distribution areas.

Material and Method

1. Survey on wild tea

Seven wild tea areas were surveyed within three years. The character investigated included plant distributin, plant density, plant characters, pest problem, soil status and accompanied plants inhabited.

2. Collection of wild tea plants.

Young plants as well as seeds were collected from wild tea distribution areas. Currently, there are 200 wild tea plants in total growing at Yeechi and Taitung Substations of the Taiwan Tea Experiment Station.

3. Made-tea quality of wild tea

Succulent tea shoots were plucked from Mei-Yan mountain to process black tea and semi-fermented teas. Sensory evaluation was applied to judge the made-tea quality.

1. Yeechi Substation of Taiwan Tea Experiment Station
2. Taitung Substation of Taiwan Tea Experiment Station
3. Taiwan Tea Experiment station
4. Taiwan Tea Experiment station

Result

1. Distribution survey on wild tea

Growth and preservation conditions of the wild teas in Mei-Yan were much better as compared to that of other wild tea areas. Most of the wild teas still remains in its original condition, with a plant density over 1000 plants/ha and trunk diameter greater than 20 cm. During the Japanese occupation stage, there has been 16.3 ha of wild tea protection area. Unfortunately, the area was destroyed by fire. Of the seven areas surveyed recently, six areas were suffered from different degree of human destruction, especially the fact that in some case trees were cut down for plucking tea shoots. Moreover, wild tea growing condition in most areas is existent in its virgin condition except that of Fan-lu area. The altitudes of wild tea growing mountains are as follows: 1300-1650m, Mei-Yan: 1400 -1650m, Nan-Feng; 1100-1650m, Mirng-Haai; 700-800m, Shueei-Jiing; 900-1000m,Tsaau ; 800-1000m, Yuan Kan. Plant characters such as leaf, stem, root, flower and fruit were compared among different areas. The results showed that the shoot character had less variation among the areas tested. However, the flower and fruit characters of the wild tea plants grown in tsaau mountain were quite different if compared to that of the wild plants in other mountains.

2. Collection

Two hundred plants were collected and transplanted to the TTES.

3. Uses of wild tea tea:

Based on the hybridization between Assam and wild tea clones, offsprings of 40-85 lines with good black tea quality have been selected.

4. Tea manufacture and evaluation of made-tea quality

Tea shoots were collected from the wild tea areas except Mei-Yan mountain to manufacture black tea and semi-fermented tea. Based on the sensory evaluation all the tea made had pretty good taste in spite of no impressive aroma and flavour. The market value of the teas made from the wild tea plants is rather high probably because of the scarcity of the tea.

Conclusion and Suggestion

Wild tea plants are wildly distributed in Taiwan, with characters quitely different from that of commercial tea cultivars. Although the plants are existed in native forest areas, checks on management inforamtion of forestry units to see whether the wild tea plants are indigenous one or not are pretty necessary. This can be used as a decision-making for setting up wild tea preservation areas. However, most of wild tea areas have been suffered civil damage and become an unnatural condition, In fact, to protect our wild tea plants is something means to protect our natural resources.

Ecolological Study of Beech Forest of Taiwan

Yuen-po Yang[1] and Sheng-you Lu[2]

The Taiwan beech, which belongs to the family Fagaceae and is endemic to this island, is a deciduous tree species. Currently, this species is distributed at the northern part of Taiwan, and dominates the forests within 100 meters of both sides of the main ridges from Ta-man-shan to La-la-shan, northwestward to Pei-chia-tien-shan, and then northeastward to Chu-lu-shan. The Taiwan beech forests consist of about 200 vascular plant species and are generally in a three-layered structure.. The first layer, tree layer, is around 15 meters in height; the second layer, shrub layer, from two to five meters; and the third layer is herbaceous layer. The age of many plants of Taiwan beech is from 70 to 100, and seldom plants are less than 70 years old. Seedlings and saplings of Taiwan beech are scarcely found in the Taiwan beech forests. It is likely that this fact may attribute its shade-intolerance. The weather of the Taiwan beech forests are cool and high humidity. The soils are usually well-drained and acidic. The Taiwan beech blooms from the end of March to mid-April. and fruit ripes in September and October of the year.

1, 2) Taiwan Forestry Research Institute.

Study on the Restoration of *Bretschneidera sinensis*

Tsing Liu[1], Yuen-po Yang[2] and Sheng-you Lu[3]

The species *Bretschneidera sinensis* which belongs to the monotypic family Bretschneideraceae is currently recognized with a distributional range in the southern and the central areas of mainland China and Taiwan. In 1986, plants of this species were reported being found at two localities, Ma-chau and Ching-kua-shih (Lu et al, 1986). The species were then declared as an endangered species of this island in 1988 because its individuals were rather rare and its flowering branches were collected in a large amount for decoration. The purpose of this project is to restore this species to prevent its extinction.

The habitat, distribution range and phenology of this species on this island were investigated. Propagation of the plants were also studied. The results revealed that the plants of the species grow on well-drained soils of open areas or secondary forests. The species is not dominant in most secondary forests. In open area, this species may grow with small shrubs and some herbs such as *Miscanthus*, *Histiopteris*, and *Eurya*.

In addition to the two localities mentioned above, plants were also found at Hou-tung, Ching-tze-pei, Luan-luan, Hsing-shan reservoir, Ruei-fang, Chiu-feng, and Shih-feng-liau. All these areas are in Taipei county.

1, 2, 3) Taiwan Forestry Research Institute.

Young leaves start to sprout from mid-March to the beginning of April; flowers bloom from mid-April to mid-May; fruit ripes from the end of September to the beginning of December. Fruit usually contain two to three seeds with orange color seed-coat.

Mature seeds are ready to germinate after collection. They can be stored by cold stratification for no more than three months. After storage, germination rate of the seed at room temperature is 78%. Mortality of cuttings of young shoots, which were planted without any treatments, is 30%. Transplanting young seedlings or saplings must be carefully done, otherwise a broken taproot will cause the death of the plant. Therefore, growing plants in a container is recommended.

Fast growing of this species causes branches to break easily. However, it can still survive by immediately sprouting from stumps and/or roots.

Preliminary Investigation on Natural Resources of Tawu Mountain Area

Sing Wang[1], Yuen-Po Yang[2], Ching-Hsia Chen[3], Lei Shi[4],
Ying Wang[5], Kuang-Yang Lue[5], Ling-Ling Lee[6], Jung-Tai Chao[7]

Introduction

Tawu Mountain area covers the mountainous area of the southern Central Mountain Range in Pingtung and Taitung Counties. The area, especially the part in Taitung County, is very rugged and has been little developed, the vegetation little disturbed, and the wildlife resources abundant. Most major streams in Taitung originate from both the North and South Tawu Mountain. The protection of these watersheds is particularly important for the water and soil conservation in Taitung, and the security of safe and clean drinking and irrigation water for local people. Due to its importance in protecting the watersheds, the biological diversity, and the natural resources of Taiwan, Tawu Mountain Area was proposed to be protected in 1970s'. In 1980s' the importance of the area was again mentioned when a general survey indicated that this area may be one of last strongholds of many endangered wildlife species, including the Formosan clouded leopard, the biggest and a nearly extinct cat species in Taiwan. Council of Agriculture, therefore, supported and promoted the survey of the natural resources in this area.

Materials and Methods

Between December, 1986 and June, 1990, a team of 8 researchers from National Taiwan University, National Taiwan Normal University, Fu-Jen University, Academia Sinica and Taiwan Forestry Research Institute, investigated the fauna, flora, geology and topography of Tawu Mountain area, and the ethnozoology of how local people utilize the resources and affect this area. The survey covered both the area of the Tawu Mountain Nature Reserve, established in January, 1988, and the northern and western buffer zones. Surveys were conducted by identifying survey plots and survey routes from aerial photo maps, and field work of vegetation survey by plot sampling, and wildlife wurvey by checking and recording animal sightings, and animal signs such as tracks, spoor, nests, feeding marks, and vocalization along trails and transects. Scent posts on track pads of sifted dirt, small mammal trapping,

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fish netting were also used in the survey. The ethnozoology part was done by interviewing local residents in villages outside of the reserve and buffer zones.

Results

The results indicated that the elevation gradient in the area ranges from 200 to 3100m, More than 90% of the area is less than 42° slope. It is rainy in summer and dry in the winter, and the temperatures vary greatly with elevation. The geology of the area consists of three basic geological formations, including the schists from the late Paleozoic and Mesozoic, the Pilushan Formation from the Eocene, and the Lushan Formation from the Miocene. Five watersheds, including Tanan, Chipen, Tamali, Chinlun, and Tachu rivers, are little or not polluted. The vegetation ranges from subtropical broad-leaved forests in the lowland to temperate coniferous forests at higher elevations, and 523 plant species of 138 families and 329 genera were identified. The fauna of the area consists of at least 27 species of mammals, 74 species of birds, 18 species of reptiles, 9 species of amphibians, 6 species of fish, and 28 species of butterflies. Among them 19 endemic species and 8 species listed as endangered according to the Cultural Heritage Preservation Law. During the survey period, internationally renowned experts in wildlife research and conservation were invited to give training workshop, seminars and to participate field work, which helped train more local field staff in conducting field work and helped promote conservation education tremendously.

Current Situation and Suggestions

After the designation of the Tawu Mountain Nature Reserve, the survey team has drafted 'A Management and Conservation Strategies for the Tawu Mountain Nature Reserve', which can provide the government agencies a set of recommendations and schedule for managing and protecting the reserve to its fullest extends. However, poaching, uncontrolled visitation and many other types of disturbance remain and continuously threaten the integrity of the reserve. It is hoped that the government agencies understand the importance of properly managing the reserve, and work together to solve the problems of disturbance so that the reserve can bring us the most benefits it can provide.

The ecology of *Acrosssochelius paradoxus* at Tunghou stream

Yao-sung Lin Jia-en Sheu

Tunghou Stream , one of the larger tributaries of Nanshyh Stream, is a good fish habitat and has a great potential to become a well managed fishing areas. The study area is located at upper section of Tunghou stream. The species composition, relative abundace, sex ratio, breeding season and habitat requirement of *Acrosssochelius paradoxus* were surved.

The seaonal abundance of *A. paradoxus* was greatly influenced by illegal poison fishing, which occurred most frequently in July. Consequently the population is lowest in August. Sex ratio of *A. paradoxus* varied with size of the fish and the season. Male dominated over female in the small-sized class, but the reverse was true in the large-sized class. The male was the majority in the sampling areas from spring to Fall , but the female seems to be more abundant in the winter. Adult female was larger than adult male in terms of standard length, total length, head length and height. The relationship between body length and weight is significant. The breeding season of *A. paradoxus* lasted from April throughout August, however the male enter breeding season earlier than the female. *A. paradoxus* prefer to stay in deeper water and they were observed more frequently at the deep areas when the water velocity is high.

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Ecological Study and Resources of Aquatic Insects in Tung-Hou Stream

Ping-Shih Yang, Kwok-Ching Wong

Abstract:

It was studied that the aquatic insects fauna and related hydrological apparatus from Oct., 1987 through Sep., 1990 in Tung-Hou Stream. The aquatic insect community (no. of individuals (%) and no. of taxa (%)) was comprised of mayflies (Ephemeroptera) 3685(52%),21(24.4%)., stoneflies (Plecoptera) 742(10.5%), 12(14.0%)., caddisflies (Trichoptera) 1033(14.7%), 19(22.1%)., dipterans (Diptera) 993(14.1%), 15(17.4%)., (Coleoptera) 307(4.4%), 9(10.5%)., and others (dragonflies and damselflies (Odonata), dobsonflies (Megaloptera) and grass moths (Lepidoptera)) 302(4.3%), 10(11.6%). Dominant species at sampling sites, Choroterpes sp.TCA (mayfly), Neoperla sp.TNA (stonefly), and Stenopsyche marmorata (caddisfly).

Four sampling sites, neither mean density nor numbers of taxa of each season, winter was the most abundant at all sites., the second was autumn, spring and summer had no significant different. According to the feeding functional groups, collectors and predators were the dominant groups in Tung-Hou Stream. On the other hand, the distribution patterns of feeding functional groups were accordance with the River Continuum Concept. At last, it was found that Tung-Hou Stream is still an oligosaprobic zone, not only based on the hydrological data, but also on the species of aquatic insects.

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Natural Conservation Library

Valiant Tsing Liu[1] and Ying Wang[2]

During past years, library collection of periodicals and books about natural conservation was very limited. Thus, the Council of Agriculture launch a 5 year plan to establish a library collection on natural conservation publications. The aim of this plan is to provide information and reference on natural conservation for both governmental and academic use.

The 5 year plan started on 1st Dec. 1986 and will end on 30th Jun. 1991. During the first 4 year period periodicals were the collection item. They were purchased through the subscribed agent (EBSCO) to facilitate the working process. However, books will be purchased instead in the 5th year as a result from limited budget.

Within those 4 years, the number of perodicals subscribed varied between 90 and 109. The field of subject included journals from ecology, environment, conservation, zoology, botany, animal behaviour, and evolution. Among them, journals of zoology were the most common one, which varied around 40% of the total journals subscribed during different years. Journals of ecology, environment, and conservation were next, which varied between 36 and 38% . The geographic distribution of these journals published was worldwide, including countries from the US, Canada, Europe, Australia,New Zealand, Africa, and Asia, but most of the journals were form the US and Canada (42%) and Europe (35%).

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Finally, the numbers of issues published from journals varied from biweekly to annual publication. Among them, the quarterly publications were the most common one (47%) next to it were monthly (15%), bimonthly (12%) and irregular publication (12%).

By now, many periodicals from natural conservation are subscribed by different research and academic institutions as the importance of natural conservation are recognized by the public. However, due to limited subscription time, the collection of these periodicals especially the back issues are severely limited. It is suggested that the collection of back issues be very important and needs to be carried out promptly if funding is available.

Preliminary planning of the eductional center at Wuling Farm

Yao-Sung Lin[1] and Kun-Hsiung Chang[2]

To avoid extinction of the Formosan landlocked salmon in Taiwan, a hatchery station was established at Wuling Farm in 1985. To decrease human impact on the stream and improve fish habitat , an educational planning is need to provide the Fish Conservation Program at Wuling Farm. The preliminary plainning ,an educational center, should provide informations on (1)stream ecosystem ; (2) fish and insect fauna in Tachia river (3) life history of the Formosan landlocked salmon;(4) the relationship between agricultural development and water pollution and eutrophication (5) Enviromental impact of reservoir and sand-retentation dam on the stream . The proposed presentation methods included (1) slide and poster shows on the stream and fish ;(2) aquarium exhibition of living fish and insect; (3) video shows on conservation of the Formosan landlocked salmon (4) pamphlets .

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