

MONITORING FOR ENVIRONMENTAL CHANGE
THE EARTHWATCH EUROPE S'ALBUFERA PROJECT

A summary report of the tenth season's work, 1998

by NICK RIDDIFORD

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Report of tenth season's work

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MONITORING FOR ENVIRONMENTAL CHANGE

THE S'ALBUFERA INTERNATIONAL BIODIVERSITY GROUP REPORT

1. INTRODUCTION

Project S'Albufera is a long-term programme of research into biodiversity and environmental change at the Parc Natural de S'Albufera, Mallorca. This report summarises the tenth year of fieldwork, carried out at the Parc Natural de S'Albufera, Mallorca by teams of ecologists and volunteer fieldworkers. After nine years of support from Earthwatch, organisational and structural changes were required as we entered our tenth year, but this did not detract from the effort and quality of work carried out. Our spring commitment was assured by a relay of regular members of the Project scientific team, ably supported from 26th April to 2nd May by members of the Peterborough Trust for Conservation Volunteers. There was a return to a more traditional structure for the autumn team, which was supported through the Earthwatch Europe/European Union funded African Programme. Autumn fieldwork ran from 25th October to 8th November. We were pleased to welcome Spanish volunteers during the spring and autumn fieldwork periods. As in previous years, a number of additional monitoring tasks were carried out by Park staff and resident Mallorcan volunteers outside the designated Earthwatch Europe sponsored fieldwork periods.

Details of the establishment of the Project and choice of site were given in the first season's report (Newbould & Riddiford 1990) and its first nine years' progress in Newbould & Riddiford (1990), Riddiford & Newbould (1991), Riddiford (1991), Riddiford & Perring (1992), Riddiford (1993), Riddiford & Wells (1994), Riddiford (1995a), Riddiford (1996), Riddiford (1997a) and Riddiford (1998).

The objectives of the Project were

- a) To assemble full & detailed ecological data, including climate, hydrology, soils, pollution past & present land uses & cultural influences and reconstruction of past conditions to reach an understanding of composition, functioning and dynamics of major ecosystem types.
- b) To provide standardised comparative data for evidence of local, regional & global change, to be reconciled with aerial photography & space sensory data and to be re-recorded at intervals of time; to provide a model for other global monitoring stations.
- c) To afford material for application in further research & reserve management at S'Albufera and in general conservation practice.
- d) To provide resources for comprehensive interpretive programmes & dissemination in all appropriate forms.
- e) To serve as a focus for education of residents & visitors of all age-groups & levels and to help in creating environmental awareness & commitment.

In spring 1998 a total of 11 scientists and 9 volunteers were present for varying amounts of time between 28th March and 5th May. The autumn team comprised 8 scientists and 5 volunteers from 25th October to 10th November. The volunteer composition by country was 8 from the United Kingdom, 3 from Kenya, 2 from mainland Spain and 1 from Uganda. Project scientists came from the United Kingdom (10), Mallorca (2) and mainland Spain (2).

As in all previous years, the teams were afforded the support of, participation by or advice from: members of the Universitat de les Illes Balears (UIB, particularly its Departments of Earth Sciences and Biology) and the Institut d'Estudis Avançats de les Illes Balears; visiting scientists; members of the Park staff; and the Park's director, Sr. Joan Mayol. The overall responsibility for planning and supervision was assumed, as normal, by the Project's Principal Investigator, Nick Riddiford. Details of all participants are given in Appendix 1.

2. PROJECT S'ALBUFERA FIELDWORK IN 1998

The project was established to undertake long-term monitoring, and the monitoring work described previously (Riddiford 1994a; Riddiford 1997b) has continued. Both the monitoring work, and additional studies and programmes continued or initiated during 1998, have been in response to the original objectives set in 1989. To place each activity into its overall context, a summary of 1998 fieldwork is given below in relation to the Project objectives. A summary, by activity, is also given in section 3.

First objective: to assemble full and detailed ecological data to reach an understanding of composition, functioning and dynamics of major ecosystem types.

Studies were continued in the following fields: vegetation re-colonisation of an area of coastal sand dune destroyed by fire; reedbed utilisation by small mammals; the composition of aquatic invertebrate communities in relation to water condition and quality; bird, mammal and butterfly transects; a study of butterfly and dragonfly activity and occurrence in relation to habitat and ambient conditions; and the collection of new records for flowering plants, fungi, moths and butterflies (lepidoptera), grasshoppers and crickets (orthoptera), lacewings and ant-lions (neuroptera), hymenoptera and a range of aquatic invertebrates. In addition, biodiversity studies were extended to include spiders (arachnida), flies (diptera) and beetles (coleoptera).

Second objective: to provide standardised comparative data for evidence of local, regional and global change; and to provide a model for global monitoring stations.

The moth (lepidoptera) light trap study continued and with the help of the Natural History Museum, London a box of moths, collected at the Albufera des Grau Natural Park in Menorca, was identified and labelled to act as a reference for comparative work at that site. It included 11 specimens of a species new to science. It is hoped that co-operative studies between the two sites will continue, to maintain the momentum of new discoveries and to assess whether future changes in species occurrence or composition are the result of local or more universal factors.

The co-operative study established in August 1997 between the Project and the Tour du Valat Biological Station, Camargue, France to study the vegetation structure and long-term functioning of reedbeds continued throughout 1998. Measurements of water table and quality were taken once every two weeks in each of four reedbeds using a standard methodology also applied in a number of reedbeds in southern France and at one site in Greece. Details of the first year's work have been published by Mauchamp (1998a, 1998b).

A new collaboration in 1998 was the collection, in October, of plants of *Potamogeton* and *Ruppia* for a Europe-wide study on long-distance seed and ephippia transport by migratory waterfowl. This was in relation to a European Union funded Lakes project and was at the request of the head of that project, Dr Luis Santamaria Galdon, Department of Plant-Animal Interactions, Netherlands Institute of Ecology.

Third objective: *to afford material for application in further research and reserve management and general conservation practice.*

Studies particularly targeted towards assisting with the design or planning of management activities included: census studies of the wetland orchid *Orchis palustris* population dynamics and the impact of livestock grazing; sampling of aquatic invertebrates at the Park's water chemistry monitoring sites to assess invertebrate communities in relation to water quality; study of the rate and types of vegetation re-population within a 3.5 hectare area in the southernmost part of Es Comu coastal dunes following fire in 1994; and study of the effects of heavy erosion in the Es Comu coastal dunes on the internationally significant population of the prickly juniper *Juniperus oxycedrus macrocarpa*. This last study concentrated in 1998 on regeneration by the juniper and the impact of public use on dune vegetation and pathways. One additional study was introduced in November. This comprised a baseline survey of the Albufera endemic fungus *Psathyrella halophila*. Information was also gathered of agricultural practices and local patterns of human use to assess their impact on the Park environment.

Considerable work was done on the structure of the Project's Biodiversity model in 1998. This culminated with the preparation of a Biodiversity Catalogue, listing 2400 species from 50 plant or animal groups in December. This is an increase of over 1000 on the list published in 1993. The new Catalogue was prepared for the Balearic Government's Environment Ministry as part of their biodiversity commitment. The document is scheduled for publication in 1999. The document will form the basis of further biodiversity study in the Park and act as a model for similar work at other sites in the Mediterranean.

Fourth objective: *to provide resources for comprehensive interpretive programmes and dissemination in all appropriate forms.*

Jo Newbould (text) and Dinah McLennan (artwork) made excellent progress during 1998 in their preparation of a guide to the wayside flowers of the Park. They made extended visits in spring and autumn to obtain fresh material for the artwork. A new initiative was begun in 1998 to prepare a guide to the commonly encountered birds of the Park. Nick Owens visited in late March-early April to write the English text. He is working closely with Pere Viçens

who is writing text for Catalan and Castilian versions. Mike Wood is taking responsibility for the artwork.

We were also able to apply our knowledge and expertise in supplying advice and illustrative material for an exhibition, entitled *Biodiversitat, les mil i una formes de la vida (Biodiversity, the thousand and one forms of life)*. The exhibition, which has a strong educational message, is at the Finca Agrícola Experimental de sa Canova, near Sa Pobla from 15th November 1998 to 31st May 1999.

Fifth objective: *to serve as a focus for education of residents and visitors of all age groups and levels and to help in creating environmental awareness.*

The Project continued to be very active at the local and international level. We were pleased to continue our sponsorship of young Spanish scientists, conservationists and environmentalists, welcoming two as volunteers to the Project during the fieldwork periods. It is also pleasing to note that a growing proportion of our scientific team is Spanish, both from the Peninsula and the Balearic Islands. There were Spanish representatives of our scientific teams throughout the spring and autumn fieldwork periods. Their participation is considered a key part of the programme. It has the dual benefits of allowing them the opportunity to obtain hands-on experience of a range of practical field techniques and ensuring local involvement, awareness and knowledge of both the Project and conservation issues generally. Environmental awareness and education are also being achieved through the interpretation initiatives described above.

The international theme included an African Fellowship team in the autumn. This is the fourth consecutive year that we have been able to run such courses, in 1998 comprising three Fellows from Kenya and one from Uganda. The two women and two men were all of exceptional quality and deserved this opportunity to experience conservation and ecological fieldwork methods away from their home country. The African Fellowship Scheme was established by Earthwatch Europe and is sponsored by the European Commission and the Darwin initiative of the UK government. This form of volunteer participation is extremely worthwhile because it integrates the ecological research with the training and education aspects of the Project. We are seeking to expand it in the future.

3. FIELDS OF RESEARCH IN 1998

The following is a summary, by category, of research studies by Earthwatch Europe's Project S'Albufera in 1998.

Ecosystem studies

Vegetation repopulation after fire. Re-population by vegetation of an area of Es Comu coastal dunes destroyed by fire in 1994 was monitored in April. It was carried out by identifying plant species, vegetation cover and proportions of bare ground in a series of one-metre quadrats – the same methodology as employed in the springs of 1995-1997. Grass species dominate, as in 1997 but with increasing cover of shrub vegetation, e.g. *Pistacia lentiscus*. The methodology and a summary of the first season's results are presented in Annex 3 of Riddiford (1996).

Water quality and aquatic invertebrate communities. The study of aquatic invertebrate communities in relation to water quality, using standard sampling techniques and combining Park water chemistry data was repeated during the spring and autumn 1998 fieldwork periods. Sampling demonstrated some areas of good diversity but others where the invertebrate community was under stress prompting concern over water quality conditions. A report of 1996 fieldwork is presented in Annex 3 of Riddiford (1997a); and the methodology and first season's results are presented in Annex 9 of Riddiford (1996). Details of previous aquatic invertebrate work are given in Riddiford (1993) and Riddiford & Wells (1994).

Reedbed vegetation structure and water quality. This long-term study, introduced in August 1997, was continued throughout 1998. The aim is to achieve an understanding of the relationship between reedbed structural evolution and aspects of water quality and hydrology. The four S'Albufera sites are: a mature *Phragmites* reedbed in brackish water at Es Cibollar; a mature, long-undisturbed *Phragmites* reedbed in fresh water at Es Colombar; the reedbed of tallest *Phragmites* in the entire Park, and close to agricultural land, at Es Forcadet; and a *Cladium mariscus* bed with high plant diversity, also close to agricultural land, at Son Carbonell. Water levels and conductivity were measured at each site at fortnightly intervals throughout 1998. Details of vegetation structure were collected in autumn, with the assistance of the African Fellowship team. The results were disseminated to our collaborators, and designers of the study, the Tour du Valat Biological Station, Camargue, France. They are using the same methodology in a number of reedbeds in southern France. The S'Albufera study, including the fortnightly measurements, is being coordinated and undertaken by a Mallorcan member of the Project S'Albufera team, Carolina Encinas. The establishment and initial fieldwork for this Mediterranean reedbed study are described in the Tour du Valat Annual Report for 1997 (Mauchamp 1998a, 1998b); and the methodology employed is summarised in Annex 2 of this report.

Reedbed utilisation by small mammals. Rob Strachan joined the African Fellowship team in autumn 1998 to further his investigation into the utilisation of habitats, populations and inter-specific relationships for three species of mouse at S'Albufera. The main part of his study comprised systematic live trapping at Es Colombar and the Camí d'en Pujol. Results of his initial study are given in Annex 12 of Riddiford & Wells (1994).

Seed production of aquatic macrophytes As part of an international collaboration with an EU-funded Lakes project, collections of *Potamogeton* and *Ruppia* were made for the assessment of seed production. The collection was made in October. Plentiful *Potamogeton pectinatus* was found, but *Ruppia* was only represented by small fragments of detached material at Es Cibollar. The material was sent to Dr Santamaria Galdon in Holland for analysis, but preliminary investigation by ourselves suggested that little or no seed production had occurred in our samples. This Europe-wide study has been prompted because seeds from these aquatic macrophytes are an important food source for winter waterfowl. Dr Santamaria reported that seed production at his field site had been particularly poor in 1998. Our findings perhaps indicate a widespread crop failure.

Impact studies

Coastal dune erosion. Work done in 1998 included further study of the increases in number and width of tracks and investigation of the distribution and level of regeneration occurring among Pricky Juniper *Juniperus oxycedrus macrocarpa* plants within the Es Comu coastal dunes. Plans were discussed with the Balearic Environment Department in the autumn on practical measures for protecting the beach-head vegetation and reducing erosion of the fore-dunes. It is hoped that conservation measures will be enacted from 1999. The results of the public use survey are presented in Annex 7 of Riddiford (1998) and a description of the initial juniper regeneration study in Annex 8 of the same report (Riddiford 1998).

Juniper regeneration in the coastal dunes. See *Coastal dune erosion* above.

Biodiversity studies

Species inventories. With numbers of species known to occur at S'Albufera increasing annually and for an increasingly wide range of plant and animal groups, it was appropriate to up-date the Biodiversity Catalogue first produced in 1993 (Riddiford & Nicholson 1993). This work took two forms. The first was to collate all the data held in our files, on specimen labels and in publications. The second was to target a series of species groups based on gaps in our knowledge. These activities led to a list of approximately 2400 biota, an increase of 1000 on the 1993 list. In collaboration with the Balearic Government's Ministry of the Environment, Biodiversity Service, we were able to prepare an annotated list, based on the scientific name but including local and English names where known, complete with reference to specimen, publication, observer, collector and/or identifier. As the list was being prepared for imminent publication, time did not allow status to be given for all species. However, indication of Park and national/international status was given for notable species within the list – including several endemics and species new to science described from S'Albufera. The Biodiversity Catalogue is scheduled for publication in 1999.

Lepidoptera. The lepidoptera fauna attracted to light at S'Albufera is now well known, at least for the spring and autumn periods. Inevitably, therefore, new species are less frequent – but are still occurring. Focus has been increasingly on some of the smaller species, whose

distributions and life cycles are often poorly known. The most notable new species in 1998 was a very small, but attractive moth *Alucita grammodactyla*. The species had not previously been recorded in the Balearic Islands. It was identified by Martin Honey of the Natural History Society, London, one of a number of advisors who assist us willingly with expert identifications (and see Appendix 5 of this report). Systematic moth trapping in autumn 1998 produced some unexpected results. The components, in species and range of abundance, were very different from those trapped at the same period in previous autumns. Most of the “usual” species were infrequent or absent, and these were replaced by a suite of rarely encountered species. These included probable African migrants such as the Convolvulus Hawk-moth *Agrius convolvuli* and several Scarlet Speckled (or Tutti Frutti) *Utetheisa pulchella*. The reasons for this variation are not currently clear.

Diptera, Hymenoptera, Neuroptera, Orthoptera, Arachnids. We expanded our knowledge in all these groups, with the help of advisors Paul Lupton (Diptera and Hymenoptera), Colin Plant (Neuroptera) and Chris Haes (Orthoptera). A collection of spiders was made in April by Peterborough volunteers, Tony Serjeant and Pam Hill. A report of a baseline study for wetland diptera and hymenoptera undertaken in 1997 is given in Annex 10 of Riddiford (1998).

Fungi. The discovery, for the second consecutive year, of fruiting bodies of *Psathyrella halophila* at Son Carbonell prompted us to undertake a baseline survey of its distribution and habitat preferences. This was done in November 1998. The species was described for the first time six years ago (Esteve-Raventos & Enderle 1992) and is still only known from S’Albufera. The survey reinforced the 1997 findings that it is associated with the reedbed plant *Cladium mariscus* and is found in non saline conditions. It appears to be very restricted in range, and may require drier, raised areas such as paths between the permanently wet marshland. Further investigations are required to understand its habitat associations fully. Details of fungi studies in 1997 are given in Annex 9 of Riddiford (1998).

Butterflies and dragonflies. Chris Donnelly, Rob Strachan and Charlie Rugeroni were involved in further field trials of methodology designed to collect biodiversity data in relation to Biodiversity database development. The initial field trial, conducted in 1996, is described in Annex 8 of Riddiford (1997a).

Reference materials. The same comments apply as in previous years. The herbarium of flowering plants was maintained and further plants added. Further work was done to cross-reference the Project’s collection of flora photographs, established as an adjunct to and extension of the herbarium. Responsibility for the herbarium, botanical references and plant species list remains in the careful hands of Jo Newbould. The reference collections of insect groups were expanded. Further work was required to reorganise the Lepidoptera collection as more material became available, including boxes of identified specimens, returned after expert examination in Britain. Of the other insect groups, the Orthoptera collection is the most comprehensive, though further additions are expected. Additions were also made to the Diptera collection, best represented by the Syrphidae group.

Data management. Chris Donnelly led a working group of scientists and volunteers in the development of a structure for the biodiversity model. The biodiversity catalogue, summarised above, is just one part of the overall model. Chris also continued to develop a

system using the relational database *MS Access* to link the numerous individual studies into various applied aspects of the Park's ecology, and biodiversity.

For further details of the structure and other aspects of the S'Albufera biodiversity database and the development of data management systems see Annex 14 of Riddiford & Wells (1994), Annexes 4 to 7 of Riddiford (1995a) and the description of the Project's biodiversity model in the UK review document *Biodiversity Assessment, A Guide to Good Practice* (Jermy *et al.* 1995).

Monitoring studies

Birds. Two bird transects, conducted annually since 1989 and 1990 respectively, were again carried out in 1998 during the spring and autumn fieldwork periods. The transects have been designed to obtain temporal and longer-term fluctuations of breeding and migrant birds in a range of habitats. For details of the bird transect methodology see Riddiford & Perring (1992).

David Hanford led small teams in November 1997 and February 1998 to develop the constant-effort monitoring programme for reedbed birds piloted in August 1997. Poor weather curtailed his ringing activities in February, but his November visit produced some interesting results. These are summarised in Annex 4 of this report.

Mammals. The mammal transect, established in 1991, and reactivated in 1995 in response to a new development, the arrival from the mainland of a virus which attacks and kills rabbits *Oryctogalus cuniculus*, indicated that the rabbit population remains depressed. Further observational data were collected for this and a range of other species. Rob Strachan's continued investigation into the utilisation of habitats, populations and inter-specific relationships for three species of mouse at S'Albufera is described in *Ecosystem studies* above. He also continued to monitor the bat community roosting at Cova de San Marti. Despite signs of human disturbance, the bats continue to use the cave and numbers in November, particularly, were encouraging. The cave supports at least four species including the nationally endangered Long-fingered Bat *Myotis capaccinii*. Two males of that species, roosting in the cave in November, had been ringed on 26th March 1998 at Can Sion, Pollensa, 8.5 km away by a team led by Juan Quetglas Santos of the Institut Menorqui d'Estudis.

Butterflies. Two transects designed to monitor butterfly habitat preferences and population variations, the first established in 1989 and the second in 1991 and both repeated annually thereafter, were conducted regularly in 1998 during the spring and autumn fieldwork periods. For further details of butterfly transects, including methodologies, see Riddiford & Perring (1992).

Moths and other insects attracted to light. Standard insect light traps were used on most nights during fieldwork periods in 1998. As usual, new faunal records were not restricted to moths. Among the interesting species recorded in 1998 were the bush-cricket *Phaneroptera nana*, which may have been a migrant and a lacewing of the genus *Megalomus*. The lacewing was a female and thus not possible to identify to species. There are four *Megalomus* species

in the region, but none has been recorded from the Balearic Islands before.

Hydrology and hydrochemistry. The Park continued to collect water regime and water chemistry data throughout the year from sample sites throughout the Park. We are most grateful to the Park staff and authorities for doing this. The suite of information which results is essential for understanding how the Park functions and to help guide conservation management measures. It is also a vital resource for a range of Project monitoring and ecosystem studies. The sampling technique and equipment used to obtain water quality measurements are described in Annex 3 of Riddiford (1995a).

Meteorology. As in all previous years, meteorological data were collected daily by Park staff and made available to the Project and its scientific team.

Park management

Orchis palustris population. Monitoring of the marshland orchid *Orchis (laxiflora) palustris* is undertaken annually by Project teams. This year the survey, which comprises counting and mapping flowering plants, was done in late April. The most important site in recent years has been the grazed “fire-break” zone bordering the Camí des Polls along the western perimeter of the Park. However, in 1998 the population crashed. It was proposed in last year’s report (Riddiford 1998) that the species benefits from domestic stock grazing of its habitat prior to the flowering season, but does poorly if grazing, at least by cattle and horses, is maintained immediately prior to and during the flowering period. This hypothesis was tested in 1998 because cattle, removed in the late winter in 1997, were left to graze throughout the spring in 1998. The result was a decline from 1690 flowering spikes in 1997 to just 35 in 1998, a catastrophic loss of 98%. The Camí des Polls is popular with cyclists and other more adventurous visitors to the Park. They very much appreciate the expanses of *Orchis palustris* in flower and it seems fully justified to manage this zone for the orchids and for the visitors who enjoy them. We recommend that the previous grazing regime, so successful in promoting the *Orchis* population, be reinstated.

Coastal dunes. A study of vegetation repopulation in the coastal dunes after fire is described under Ecosystem studies above. For further details of dune studies, see also Wood (1991), Riddiford & Newbould (1991), Riddiford & Perring (1992) and Riddiford (1993).

Interpretation and education

Botanical interpretation material. During extended spring and autumn visits, Dinah McLennan and Jo Newbould collected further information on the distribution and flowering periods of plants for their S'Albufera flower guide for Park visitors, and Dinah continued to paint plates for it. The guide is well advanced, but two visits are planned in 1999 to seek early spring and early summer plants to describe and paint.

Birds of S'Albufera. A new initiative was begun in 1998 to prepare a guide to the commonly encountered birds of the Park. After a spring visit, Nick Owens rapidly produced a first draft of the English text and by the end of the year there was a revised draft in English and a text in

Catalan, written by Pere Viçens. Mike Wood is doing the illustrations.

Biodiversity exhibition. Nick Riddiford acted as advisor and Mike Wood produced illustrative material for a new and imaginative exhibition on Mallorcan biodiversity. The exhibition, entitled *Biodiversitat, les mil i una formes de la vida (Biodiversity, the thousand and one forms of life)*, devised and mounted by Miquela Roig, explains in non technical terms what significance biodiversity entails to the world's people. It has a strong educational message and succeeds in making biodiversity accessible to the general public. The exhibition, supported by Sa Nostra and the Universitat de les Illes Balears, is on show at the Finca Agrícola Experimental de sa Canova, near Sa Pobla from 15th November 1998 to 31st May 1999.

For further details of interpretative work, see Annex 16 and Annex 17 of Riddiford & Wells (1994).

Programme development

S'Albufera Biodiversity Database. See *Database management* above.

Functions and values. The Institute for Environment and Climate Studies, Wageningen Agricultural University continues to maintain a close interest and to develop their model of functions and socio-economic values of natural ecosystems and protected areas using S'Albufera as a model. A description of the pilot study is presented in Annex 7 of Riddiford (1996) and summaries of subsequent studies in Annexes 1-5 of Riddiford (1998). In addition Macarena Mata, who undertook the initial study on which Wageningen's more recent work has been built, spent a week in April collecting information on agricultural practices and patterns of human use in the zone as a preliminary to assessing their impact on the Park environment.

For further details of fieldwork studies undertaken by the Project, see Wood (1989, 1991), Newbould & Riddiford (1990), Riddiford & Newbould (1991), Riddiford & Perring (1992), Riddiford (1993), Riddiford & Wells (1994) and Riddiford (1995a, 1996, 1997a, 1998). A description of Project S'Albufera research planning for 1998-2000 is given in Annex 6 of Riddiford (1998).

4. PROGRESS AND FUTURE PLANNING

Project S'Albufera currently has no sustainable funding support. Nevertheless, the momentum generated by ten years of detailed, quality fieldwork, coupled with the commitment, dedication and generosity of all people involved, ensures that the Project goes

on. Thus, a full programme of work is planned for 1999. As I write, we are still at the planning stage. However, it is hoped that we may be represented at S'Albufera through much of the year. At the moment, our plans include group fieldwork and visits by individual scientists. The first visit is likely to be by Jo Newbould and Dinah McLennan, in February to locate and paint small annuals for their flower guide. Martin Honey of the Natural History Museum, London hopes to use the new Casa de las Universidades Europeas in March as a base for extending our Biodiversity knowledge for early Lepidoptera and to work with our reference collection. Jeroen Veraart of the Institute for Environment and Climate Studies, Wageningen, wishes to make an extended stay from March to August to undertake a Master's study of ecosystem functioning in the wetland. He may be joined in spring by two others from the Institute. Emma Whittingham of Newcastle University's Coastal Management Department, UK, hopes to undertake a Master's study of human impact, conservation management and ecosystem functioning of the littoral area and bay, visiting in May-June. There will be two teams in spring: the Enfield Lock Conservation group from 4th-11th April; and Peterborough Trust for Conservation Volunteers group from 13th-27th April. Several members of the Project scientific team will be in attendance. Members of the scientific team will also lead an advanced student group from St Gregory's High School, Harrow, London, in the second half of August. Finally, another African Fellowship Scheme team is planned for the autumn, dates to be confirmed.

These teams are additional to any which may arise from a proposal to WWF (UK) for the establishment of International Training for Biodiversity. The proposal which is subtitled "a proposal for WWF to support international biodiversity training and establish a model centre at S'Albufera Natural Park, Mallorca" was submitted to WWF by Earthwatch Europe. The plan is to take advantage of the expertise that the Project has accumulated over the last ten years to develop a training programme for biologists and conservationists from all over the world, and particularly from developing or under-resourced countries. It also takes advantage of the excellent accommodation and laboratory facilities offered by the new Casa de las Universidades Europeas, built over 3 years and finished on 30th September 1998. The proposal is for three years and has the backing of the Balearic Government. A decision is expected in the early spring.

As Project S'Albufera no longer has patronage of Earthwatch Europe for the majority of its activities, and to recognise the increasingly important role of the Project's loyal scientists, the Project team has adopted the title of The Albufera International Biodiversity Group. This title emphasises the site, the increasing international composition of the team and the biodiversity studies which constitute an important (though not exclusive) part of our work.

The current Project S'Albufera plans for 1999 are given in Appendix 2.

5. ACKNOWLEDGEMENTS

I would like to thank the Balearic Ministry of the Environment's Conservation department for granting permission to operate, Earthwatch Europe for its support, the parc staff for their friendship and help and our many friends for their encouragement and commitment. They

include: Joan Mayol, Conservation Director of the Balearic Conselleria de Medi Ambient, Ordenació del Territori i Litoral; the Conselleria's Minister, Director General Santiago Sainz and administration; Biel Perelló and all the staff of P.N. S'Albufera; Pat Bishop and her late, much missed, husband Dennis; Max Nicholson, still beavering away behind the scenes in support of the Project; all members of the Project S'Albufera scientific team; Mallorcan members of that team, Carolina Encinas and Inmaculada Mateo for their year-round fieldwork commitment and help; Earthwatch Europe staff; the sponsorship benefits of the European Union and the Darwin Initiative; Dr Dolf de Groot and his team from the Institute for Environment and Climate Studies, Wageningen; scientists from several departments of the University of the Balearic Islands; the Balearic Institute for Advanced Studies; our Mallorcan supporters, including the Friends of S'Albufera, Nicole Smith, Marga Roig and many other individuals; and the Project's special scientific advisors, Steve Brooks, Barry Goater, Paul Lupton, Rod Stern, Chris Haes, Colin Plant and Martin Honey in the UK, Xisco Lillo and Jaume Servera in Mallorca. They all deserve a huge vote of thanks for their help in so many ways. But, as always, my final and biggest thanks go to the wonderful band of volunteers, whose quality and enthusiasm has been such an enrichment to the Project.

To everyone above, and advisors, helpers and supporters inadvertently omitted or overlooked, I give my sincerest thanks; which are extended to all participants in, and visitors to, the Project detailed in Appendix 1 below.

APPENDIX 1 - List of Participants, 1998

Principal Investigator

Nick Riddiford

Parc Natural de S'Albufera Advisor to Project

Joan Mayol (Balearic Director of Biodiversity)

Parc Natural de S'Albufera Liaison Officer to Project

Biel Perelló (Conselleria de Medi Ambient, Ordenació del Territori i Litoral)

Project scientific visits, late winter and spring

| | |
|--|--|
| Dave Hanford & R Evans (constant effort bird ringing) | 21 st -24 th February |
| Nick Owens (ornithological research and interpretation): | 28 th March-3 rd April |
| Jo Newbould (botanical studies and interpretation): | 31 st March-5 th May |
| Dinah McLennan (botanical illustrations and interpretation): | 31 st March-5 th May |
| Nick Riddiford (Principal Investigator) | 17 th April-5 th May |
| Macarena Mata (environmental impact of agriculture) | 18 th -25 th April |
| Palmer Newbould (botany, conservation management) | 22 nd -29 th April |

Peterborough Conservation Volunteers Team (26th April-2nd May)*Scientists*

Nick Riddiford (PI), Michelle Chapman (aquatic invertebrates), Chris Donnelly (coastal dune studies), Michael Wood (ecological studies; logistics), Rachel King (ecological studies, entomology, botany), Carolina Encinas (reedbed studies), Inmaculada Mateo (reedbed studies)

Volunteers

Bob Johnson, Anne Green, John Green, Tony Serjeant, Pamela Hill, Martin Smithhurst, Charlie Rugeroni, Roger Orpin, Diana del Palacio

Earthwatch Europe African Fellowship Team (25th October-8th November)*Scientists*

Nick Riddiford (PI), Chris Donnelly (logistics, biodiversity studies), Rob Strachan (small mammals), Michelle Chapman (aquatic invertebrates and water quality), Diana del Palacio (biodiversity studies), Charlie Rugeroni (butterfly studies), Carolina Encinas (reedbed ecology)

and the visiting advisor:

Max Nicholson (New Renaissance Group and Founder, Project S'Albufera)

Volunteers

The Earthwatch Europe/EU African Programme Fellows, Dorice Agol. Immaculate Nduma, Michael Ngoa (Kenya), Jackson Efitre (Uganda); and Parc Natural nominated volunteer, Juan Cervantes Sanchez (Spain)

Additional scientist and volunteer contributions

Carolina Encinas and Inmaculada Mateo (fortnightly water height and salinity measurements for reedbed monitoring study)

Identification advisors in UK

Steve Brooks, Natural History Museum, London (Ephemeroptera & Odonata)

Barry Goater (Lepidoptera)

E. C. M. (Chris) Haes (Orthoptera/Dictyoptera/Dermaptera)

Martin Honey, Natural History Museum, London (Lepidoptera: moths)

Paul Lupton (Diptera & Hymenoptera)

Colin Plant (Neuroptera: lacewings)

Rod Stern (Bryophytes)

Visitors to the Project*Spring*

Robin Sharp (Trustee, Fauna & Flora International; Chairman, New Renaissance Group)

Autumn

Pat Bishop, Claire Bishop & Professor Donald Trelford (Friends and Supporters of Project S'Albufera)

and, regularly

Representatives of Friends of S'Albufera and the Grupo ornitologico Balears

Staff, Parc Natural de S'Albufera

Joan Mayol - Director

Gabriel J. Perelló - Technical Assistant

Joan Gelabert - Chief Warden

Alexandre Forteza - Reception Centre

Pilar Lacalle - Reception Centre

Pere Viçens – Ornithologist/Guard

Martí Solivelles - Guard

Ramón Valero - Guard

Manuel Coello - Maintenance

Viçens Lillo - Maintenance

APPENDIX 2 - 1999 programme details**Project Title**

Monitoring for biodiversity and environmental change at S'Albufera, Mallorca.

Research Site

Parc Natural de S'Albufera, Mallorca, Spain.

Principal Investigator

Nick Riddiford

Team Dates in Field

| | |
|---------------------------------------|---|
| TEAM I (scientists & volunteer team) | 4-11 April 1999 |
| TEAM II (scientists & volunteer team) | 13-27 April 1999 |
| TEAM III (scientists & students team) | c16 th -30 th August 1999 |
| TEAM IV (Earthwatch Europe team) | autumn - to be confirmed |

Team Composition: integrated teams of Scientists, Balearic/Spanish and UK Conservation Volunteers in spring; Scientists, St Gregory's School, Harrow, students and Balearic/Spanish Volunteers in August; and Scientists, Earthwatch Europe and Balearic/Spanish Volunteers in autumn.

Fields of ResearchHuman and Management Impact studies

1. Aquatic invertebrate communities in relation to water quality (Michelle Chapman).
2. The impact of human activities on the conservation of the Coastal zone (Emma Whittingham, Newcastle University).
3. Functions and values of S'Albufera wetland (Jeroen Veraart, Wageningen Institute for Environment and Climate Studies).
4. Eutrophication and biodiversity conservation (Sarian Koster, Wageningen Institute for Environment and Climate Studies).
5. The impact of agricultural practices on the Park environment (Macarena Mata).

Biodiversity studies

1. Arachnid [spider] studies (Tony Sargeant).
2. Taxonomy of *Ischnura* damselflies (Rachel King).
3. Herbarium development and curation (Jo Newbould).
4. Lepidoptera and habitats (Martin Honey).
5. Insect reference collection (Martin Honey; Juan Cervantes).
6. Marine diversity and sediment types (Emma Whittingham).
7. Bird associations with habitat (Chris Donnelly).
8. Biodiversity catalogue extension (Rachel King; Diana del Palacio).

Ecological and Monitoring studies

1. Bird population studies - transects (Nick Riddiford).
2. Butterfly and dragonfly transects (Charlie Rugeroni; Rob Strachan).

3. Niche partitioning by 3 reedbed mouse species (Rob Strachan).
4. Bat monitoring (Rob Strachan).
5. Mammal transects (Nick Riddiford).
6. Reedbed vegetation monitoring (Carolina Encinas; Inmaculada Mateo).
7. Reedbed bird monitoring (David Hanson).
8. Systematic light trapping for moths (Nick Riddiford).

Park management

1. Abundance and distribution of *Orchis palustris* (Rachel King).
2. Ecology of the Albufera endemic fungus *Psathyrella halophila* (Charlie Rugeroni).

Interpretation and education

1. Plant Illustrations/Preparation of botanical interpretation material (Dinah McLennan and Jo Newbould).
2. Bird Illustrations/Preparation of ornithological interpretation material (Mike Wood, Nick Owens and Pere Vicens).

Programme development

1. Biodiversity program development for standardised data processing and storage (Chris Donnelly).

International collaborations

1. Reedbed monitoring (collaborating with Tour du Valat Biological Station, France).
2. Seed production of *Potamogeton* and *Ruppia* (collaborating with Luis Santamaria, EU Lakes project, Holland).

APPENDIX 3 - LIST OF PUBLICATIONS

Details of Project S'Albufera-generated publications are given below. Note that a single asterisk (*) prefixes publications which have appeared since the last Project S'Albufera report.

ALOMAR, G. 1995. Anotacions al Catàleg de la Flora del Parc Natural de s'Albufera de

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- ALOMAR, G. 1995. Apunts sobre la flora del Parc Natural de S'Albufera de Mallorca. *S'Albufera de Mallorca: Monografies de la Soc. Hist. Nat. Balears* 4: 79-88.
- ALOMAR, G. 1997. Noves anotacions al Catàleg de la Flora del Parc Natural de s'Albufera de Mallorca (II). *Butlletí del Parc Natural de s'Albufera de Mallorca* 3: 95-96.
- ANON. 1994. Conclusions de la Primera Reunió nacional sobre la Cel.la marbreca, *Anas angustirostris*. *Butlletí del Parc Natural de s'Albufera de Mallorca* 1: 79-80.
- ASSOCIACIÓ BALEAR D'AMICS DELS PARCS (ed.). 1990a. *Seguiment de l'avifauna del Parc, agost 1989-juliol 1990*. Palma.
- ASSOCIACIÓ BALEAR D'AMICS DELS PARCS (ed.). 1990b. *Parc Natural de S'Albufera de Mallorca: ornithological overview, August 1989-July 1990*. Palma.
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- BARRINGTON, R. 1993. Mediterranean secret. *Country* 94 (August 1993): 21.
- BENNASSAR TORRENDELL, P., MAS CIFRE, J. & MAS REINDERS, R. 1997. Seguiment i control de la qualitat de les aigües de s'Albufera de Mallorca. Primers resultats. *Butlletí del Parc Natural de s'Albufera de Mallorca* 3: 69-78.
- BONNER, H. 1994. S'Albufera: display materials for the new Visitor Centre. *Earthwatch Europe S'Albufera Project Rep.* 5 (1993): 150.
- BORDOY, M. & PERELLÓ, G. 1995. Parc Natural de s'Albufera. Base de dades bibliogràfica. *Butlletí del Parc Natural de s'Albufera de Mallorca* 2: 93-106.
- BORGGREVE, C. 1997. *Biodiversity conservation in S'Albufera Natural Park: an analysis of main relevant functions, (potential) land-use conflicts and related policies*. Graduate thesis, Centre for Environment and Climate Studies and Department of Terrestrial Ecology and Nature Conservation, Wageningen Agricultural University.
- *BORGGREVE, C. 1998. Biodiversity conservation in S'Albufera Natural Park: an analysis of main relevant functions, (potential) land-use conflicts and related policies - summary. *Earthwatch Europe S'Albufera Project Rep.* 9 (1997): 43-44.
- BOWEY, K. 1993. Mammal Studies at the Parc Natural de S'Albufera, October 1992. *Earthwatch Europe S'Albufera Project Rep.* 4 (1992): 146-155.
- BOWEY, K. 1995. Apparent female Moustached Warbler singing. *British Birds* 88: 113.
- BOWEY, K. & RIDDIFORD, N. 1992. Mammal studies, 1991. *Earthwatch Europe S'Albufera Project Rep.* 3 (1991): 142-143.
- CHAPMAN, M. 1996. Aquatic invertebrates and water quality at S'Albufera. *Earthwatch Europe S'Albufera Project Rep.* 7 (1995): 72-88.
- CHAPMAN, M. 1997. A Further Study of Water Quality and Aquatic Invertebrate Communities at S'Albufera, Mallorca in the Spring, Summer and Autumn of 1996. *Earthwatch Europe S'Albufera Project Rep.* 8 (1996): 69-84.
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- DE MANUEL, J. 1995. Aportació de la fauna de rotífers de les aigües de S'Albufera de Mallorca. *S'Albufera de Mallorca: Monografies de la Soc. Hist. Nat. Balears* 4: 113-118.
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Annex 1: Management of the Parc Natural de s'Albufera by Professor Palmer Newbould

[*Editor's note:* Professor Newbould has extensive, international expertise in management strategies for natural areas. His comments were written with the view of advising and assisting future management planning for the Park, and have been passed on to the Park Directorate for their consideration]

Parc Natural S'Albufera is a wonderful place and the survival of its ecosystems is a tribute to the Balearic Government and to people like Joan Mayol, Pat Bishop and Max Nicholson. It provides an excellent opportunity to combine conservation of biodiversity and public enjoyment. People, but I have no idea how many, come from other countries simply to visit Albufera. Others, who have come to Mallorca anyway, are more likely to return if they have an enjoyable experience. Many local people treasure it. Albufera also contributes to extending the tourist season. It has a considerable economic value to the island, and this should ensure that adequate resources are allocated to its management. It has also acquired a very good reputation as a conservation site where management is supported by scientific data.

It is a complex site to manage and it is vital that there is a detailed management plan which is fully implemented. Computerised systems make this easier than it used to be. The Plan, obviously, must be agreed by the Conselleria and must be acceptable to the various interests involved in the Park (ICONA, SECONA, Muro, perhaps GOB, the RAMSAR organisation, etc.). I am not sure if there is an advisory committee. The Plan, preferably on a five-year rolling basis, would set out the tasks to be implemented each year, and would record whether or not they were implemented.

The main tool of conservation management is grazing. Our general impression is that the Park is currently over-grazed. Many of the Wildlife Trusts in Britain are becoming skilled at drawing up grazing agreements, often accepting relatively low rents in return for limiting densities and seasons of grazing. Animal welfare is a sensitive issue, conservation management requires the animals to eat some of their least favourite foods.

It seems that sometimes the public are excluded from grazed areas. This should not be necessary. It should be possible to allow much more public access to Albufera, on foot and bicycle, but it needs suitable gates, stiles etc. It should be easier to bring bicycles in and out at Pont des Anglesos when the gates are closed, and at Pont Blau at all times. It should be possible to bring them in and out at Cami den Pep (opposite Alcudia Pins), perhaps also at Es Murterar and the Park entrance at Amarador. While you can wheel a bicycle over the cattle grid at either end of Cami des Polls, a bicycle gate would be better. The rectangular walk (Cami den Pujol and back along Cami de Ses Punes) should be available to pedestrians. There should be easier pedestrian access around Canal Ferragut and to the field at Es Colombar. Having, over the last year, visited a number of nature reserves and parks in Britain, it is perfectly possible to combine public access with grazing, using self-closing gates, kissing gates, stiles, etc. At least there is no problem with dogs on Albufera. There should, where possible, be a presumption in favour of disabled access. Some funding bodies, including EU, may require it.

Proper conservation management is a necessity but visitor satisfaction is also very important. Most of the signage, using symbols is excellent, effective but not over-obtrusive. There are still a few scruffy, sometimes temporary, notices. The new fences and gates are excellent. The exclusion of cars on Saturdays and Sundays seems very successful.

For the interest of the visitors, it is important to allow trackside plants to flower. Cutting regimes could involve cutting each side in alternate years, cutting early or late in the year but not during the flowering seasons. When the Dinah McLennan/Jo Newbould guide to the plants becomes available, it will be necessary for those using it to see the flowers. Visible (and noisy) strimming of the vegetation may tend to devalue it in the eyes of the visitors. However, control by hand-pruning of *Pistacia lentiscus*, *Rubus ulmifolius* and similar species will continue to be necessary to keep the tracks open. Maintaining biodiversity means all the plants and animal species, not just endemics and rarities. Many of the flowers support pollinating and plant-eating insects.

It is not acceptable that the displays in the visitor centre are increasingly failing to function, that the Tower Hide is not usable, and that the hide near Canal Ferragut is not operational. It creates the wrong impression for the visitors and is bad for staff morale.

I feel that visitor satisfaction would be greatly enhanced by proper interpretation of the history of the Albufera, both in the interpretative centre and more especially on the ground. Probable a self-guiding history trail would be preferable – artefacts to be numbered on the ground and leaflets in different languages explaining their significance. Now we have the Bateman Centre and the Bateman Garden, does it explain anywhere who Bateman was and what he did? Meson los Patos could form part of the interpretation to the mutual benefit of the Park and the restaurant. The Power Station is part of the history of the Park – the pylons, both one-legged and two-legged, seem to me a triumph of environmentally sensitive engineering.

Professor Palmer Newbould
29th April 1998

Annex 2: Monitoring of vegetation structure and evolution in relation to water depth and conductivity at the Parc Natural de s'Albufera: a collaboration between Tour du Valat Biological Station and Earthwatch Europe Project S'Albufera by Nick Riddiford, Carolina Encinas (Project S'Albufera) and André Mauchamp (Tour du Valat Biological Station)

Following the pilot visit by André Mauchamp in August 1997, the following protocol was established for the vegetation structure and evolution of the four S'Albufera reedbeds selected for long-term collaborative monitoring. The protocol is as follows:

Management Structure

Coordinator: Andre Mauchamp (Tour du Valat Biological Station)

Manager: Nick Riddiford (Project S'Albufera)

Field Team: Carolina Encinas & Inmaculada Mateo (Project S'Albufera)

Activities

1. establish 150 m transects in reedbeds/marshland vegetation at sites of different conductivity and vegetation structure at widely separated sites within the Park.
2. collect information about species abundance and vegetation structure along each transect, data to be collected once a year.
3. collect information about water levels and conductivity from piezometers sunk into the marsh at one end of each transect, data to be collected twice a month.

Specifics

1. Transect sites. Four were selected. They were:
 - i) ***Es Cibollar*** - old undisturbed *Phragmites* bed inundated all year, in brackish [currently saline] water.
 - ii) ***Es Colombar*** - old undisturbed *Phragmites* bed, normally shallowly inundated all year; fresh water.
 - iii) ***Es Forcadet*** - relatively recently disturbed [burnt], very tall *Phragmites* bed [tallest in Park]; periodically inundated; fresh water; at edge of farmland and thought to receive nutrient enrichment - hence height of reeds.
 - iv) ***Son Carbonell*** - relatively recently disturbed [burnt], *Cladium mariscus* bed but with considerable additional plant species including [surprisingly] the matorral species *Pistacia lentiscus*; periodically inundated but often dry; fresh water.

2. The following vegetation information is collected:
 - i) ***within 25 x 25 cm quadrat***: for *Phragmites* - number of live stems; number of dead stems; number in flower; height of tallest stem; height of live *Phragmites* stem nearest the left near side of quadrat; width of same stem at base. 70 samples taken at 2 m intervals beginning at 2-metre mark along transect (all measurements taken from left-hand side of transect).
 - ii) ***within 50 x 50 cm quadrat***: identify all species; record % cover for all species, entering "P" for present for those species contributing less than 1% cover. 30 samples taken at 4 m intervals beginning at 2-metre mark along transect (all measurements taken from left-hand side of transect).

3. The following water level and conductivity information is collected:
 - i) ***water levels***: water height inside piezometer (in relation to surface level - known by prior measurement of depth each piezometer buried in soil - can be a plus or minus figure); water level immediately outside piezometer (can only be a plus or zero figure)
 - ii) ***conductivity***: conductivity measured using probe dropped inside piezometer; a further measurement taken immediately outside piezometer using same probe. Conductivity measured in mS/cm; only possible outside piezometer if immediate area inundated.

Note: the piezometer tube is emptied of water after water level and conductivity measurements completed (using sponge on a piece of string).

Annex 3: The Mallorcan thrill by Esther Fondo

[Editor's note: Esther Fondo came to the Project in spring 1997 as an African Fellowship volunteer. In the following article, extracted from the Bulletin of the East African Natural History Society Volume 28 (1) April 1998, she assesses the value of that experience.]

I was happy when I received the Earthwatch Fellowship to Mallorca, Spain. The location for the project was S'Albufera Natural Park where the Earthwatch team was involved in the monitoring of biodiversity. A great deal of work was done during the project which covered various fields of research: ecosystem studies, biodiversity studies, monitoring, park management, interpretation and education, and programme development. We also managed to establish a baseline of the marine biota of the park. Many of the activities overlapped and the various fields of research were interconnected. The project had a holistic programme which fitted into the objectives of the S'Albufera Natural Park. Each volunteer had a chance to participate in each activity.

Description of the project activities

The following is a brief account of the work done, which I personally participated in:

Mammal population studies (leader: Rob Strachan)

The team members assisted in setting traps and making records of captured animals. This formed part of the ecological studies of small mammals.

*Abundance and distribution of the orchid *Orchis palustris* (leader: Nick Riddiford)*

This involved counting the number of *O. palustris* to determine the density. A very high density of approximately 700 individuals in the park was recorded.

Herbarium development and curation

We assisted in changing the herbarium material in the plant presses as required.

Bird transect counts (leader: Nick Riddiford)

This was usually done in the early morning. We covered four 25 m transects, each covering different habitats. The bird species were identified and counted using either sightings or calls.

Microlepidoptera studies (leader: David Agassiz)

Moth caterpillars were collected from white poplar trees *Populus albus*, and other plants to monitor the emergence of moths and parasitoids and also study the relationship between the moths and parasitoid populations.

Distribution and abundance of Odonata in relation to habitats (leaders: Rob Strachan, David Agassiz and Nick Riddiford)

On the calm and sunny days we did dragonfly and butterfly counts along 5 m wide transects (six or nine transects in different habitats within the park).

Aquatic invertebrate communities in relation to water quality (leader: Michelle Chapman)

This involved collecting water samples from 15 different sampling points in the park and then identifying the invertebrates present. This was a way of assessing water quality.

Marine biota baseline (leader: Emma Whittingham)

The different types of marine flora and fauna were collected randomly at the marine site to establish a baseline of the marine biota found in the area around the park.

Systematic light trapping for moths and insect reference collection (leaders: David Agassiz and Nick Riddiford)

Moth traps were usually set out at night and different species captures were counted and new species mounted in the reference collection.

Participating in all these activities reminded me of my MSc Biology of Conservation course, but done in two weeks!

Knowledge I gained from participation in the project

This was my first time to travel out of my country. A number of the things I did during the project were also firsts for me, e.g. cycling (before going I had to learn to ride a bicycle) and mountaineering. Some of the activities I had expected, but some I had never imagined.

The project was quite helpful as I am also in the team of researchers at the Kenya Marine and Fisheries Institute that has been doing an inventory of the Mida Creek biodiversity. This project, funded by the Kenya Wildlife Service (KWS) is aimed at providing vital information for the management of the Watamu Marine Park of which the Creek is part. During the project I improved on identification of birds, insects, plants, etc. The identification of marine biota and aquatic invertebrates covered my area of work as a marine biologist and has greatly improved my working skills. I will share this knowledge with my co-researchers, e.g. using aquatic invertebrates in water quality assessment.

There is no doubt that my appreciation for nature has increased and on any excursions I will encourage those accompanying me to appreciate nature too. I have also gained confidence in working with people from other countries and improved my international relations.

Other experiences from the project

While on the project I was able to make new friends and contacts with the team members, park staff and visitors residing both inside and outside S'Albufera park. I was glad I met them and it was quite interesting to hear about their countries, and I was happy to exchange stories with them about Kenya. Everyone was quite helpful and entertaining, I never felt a stranger and was very at home. The park staff were also kind and caring and made us feel at home - I even had my first ever horse ride on the park horse "Brullo". The weather was most of the time just like home - sunny.

During our excursions, which I enjoyed very much, we visited the beautiful Monasteries and had spectacular views of the sea and country up the mountains. The mountaineering was exciting, especially when we went up the mountains searching for the midwife toad and even managed to find the tadpoles - I was thrilled! The sheep and goats with bells round their necks and the countryside covered with olive trees and pinewoods were intriguingly different from Kenya. Our visits to the markets (in Sa Pobla and Alcudia) were exciting too, with such a variety of things; I had a good time shopping and met other people from Africa.

The meals we had were all delicious and I was able to taste some of the Spanish and traditional Mallorcan food. I even managed to copy some of the recipes. I learnt a few Spanish words, even species names. Our encounters with the tourists were interesting too as they had many questions to ask and I learned some German words too.

On the second day after our arrival we were lucky to have a journalist to interview the Principal Investigator, Nick Riddiford and the man who started the idea of the park, Max Nicholson. For the first time I had my name and photograph in a newspaper.

At one time Rob had a mystery for us to solve. One day when he came from the mammal traps, he found that one mouse had gone into the trap, but five came out! One of the captured mice had delivered in the trap! This was amazing.

There were other adventures as well, like watching owls at night, visiting bat caves and many more wonderful things - truly thrilling experiences.

Evaluation of the project

I must say that there was nothing I did not like about the project. The only disappointment was when some of the team members had to leave early. Otherwise, I enjoyed every moment working on the project (and I was sad when it was all over). It was excellent and everything was well organised and ran smoothly. The right moment, right place and right team - it was great!!!

I was highly impressed by the immense knowledge of the Principal Investigator, Nick Riddiford and about the park and conservation issues. I was impressed by all the other scientists and volunteers in the team, too.

Participating in the project was one of the best things to happen in my life.

Annex 4: Bird Ringing at S'Albufera, November 1997 and February 1998 by D. M. Hanford, H. F. Coats, R. Evans and R. H. Rigdon

Early in 1997 we approached Sr. Gabriel Perello of the P.N. S'Albufera staff to enquire if we could help in any bird ringing projects occurring in the Park. He put us in touch with Nick Riddiford who is the Principal Investigator of an Earthwatch Europe project in the Park. This project was established in 1989 and is involved in research into all aspects of the ecology of the park. Nick said that it could provide useful data to ring at that time of year as that period had been little covered in the past. He was particularly interested in monitoring body fat levels and general fitness (measured by bulk of pectoral muscles) of Moustached Warblers *Acrocephalus melanopogon* through the winter period. Another question that our ringing effort could possibly help to answer was the strategy of Chiffchaffs *Phylloscopus collybita* in November: are they settling in to winter territories or are they late migrants still going south? And yet another query? Do both adult and juvenile Moustached Warblers show site fidelity into and through the winter months?

For the November 1997 visit a net ride was prepared parallel with the Gran Canal at the southern edge of Columbar Gran. Five 18 metre mist nets were set in one continuous line

from 0700 hrs to 1200 hrs for the five days 9th-13th November. The following table shows species trapped and ringed; the data for the retrapped birds, i.e. those birds already ringed prior to our visit, is not yet at hand. All the birds in the table were caught at the ringing site except for the Moorhens *Gallinula chloropus* which were caught in a walk-in cage trap. The table shows the relative abundance of the different species at this time of the year.

| <i>Species</i> | <i>Number ringed</i> | <i>Number retrapped</i> |
|--|----------------------|-------------------------|
| Moustached Warbler <i>Acrocephalus melanopogon</i> | 38 | 11 |
| Chiffchaff <i>Phylloscopus collybita</i> | 38 | |
| Cetti's Warbler <i>Cettia cetti</i> | 4 | 9 |
| Moorhen <i>Gallinula chloropus</i> | 2 | |
| Blackbird <i>Turdus merula</i> | 2 | |
| Robin <i>Erithacus rubecula</i> | 2 | |
| Sardinian Warbler <i>Sylvia melanocephala</i> | 2 | |
| Little Bittern <i>Ixobrychus minutus</i> | 1 | |
| Stonechat <i>Saxicola torquata</i> | 1 | |
| Reed Warbler <i>Acrocephalus scirpaceus</i> | 1 | |
| Goldfinch <i>Carduelis carduelis</i> | 1 | |
| Great Tit <i>Parus major</i> | | 1 |

Table 1. Species and numbers ringed and retrapped at Columbar Gran in November 1997

The February 1998 plan was to carry out three 5-hour ringing sessions at exactly the same site with the same nets during the weeks commencing 21st February. The team for the visit was reduced to RE and DMH. Graham Hearl had kindly volunteered to 'scribe', i.e. do all the book work. The five nets were erected by 0700 hrs on 21st and within minutes there was a large catch of birds. The welfare of the birds is always paramount, so with the limited man power available we decided that some should be released without being bagged for ringing. We ringed 60 and released a further 40 or more at the nets. These comprised equal numbers of Moustached Warblers and Chiffchaffs and a couple of Cetti's Warblers.

The next day we erected just two nets. A total of 27 birds were ringed or processed before we were forced to cease ringing at 0900 hrs because of very strong winds.

The weather for the rest of the week was very inclement, allowing us to operate on just one day, 24th February, and this for only 20 minutes before torrential rain forced closure of the nets. The resultant captures were restricted to 2 Reed Buntings *Emberiza schoeniclus* and a Chiffchaff.

The table for the February session follows:

| <i>Species</i> | <i>Number ringed</i> | <i>Number retrapped</i> |
|--|----------------------|-------------------------|
| Moustached Warbler <i>Acrocephalus melanopogon</i> | 24 | 14 |
| Chiffchaff <i>Phylloscopus collybita</i> | 31 | 2 |
| Cetti's Warbler <i>Cettia cetti</i> | 2 | 3 |
| Reed Bunting <i>Emberiza schoeniclus</i> | 2 | |

Table 2. Species and numbers ringed and retrapped at Columbar Gran in February 1998

The original ringing data for those retrapped in February was available. The details for Moustached Warbler are given in Table 3.

| <i>Ring number</i> | <i>Date ringed</i> | <i>Age at ringing</i> |
|--------------------|--------------------|-----------------------|
| 297512 | 29.02.92 | adult |
| 597921 | 25.10.93 | adult |
| 597967 | 27.10.93 | adult |
| 697841 | 14.05.94 | adult |
| 721080 | 19.11.95 | not aged |
| 772751 | 13.03.96 | adult |
| 912706 | 22.08.97 | adult |
| 912711 | 22.08.97 | adult |
| 912743 | 09.11.97 | first autumn |
| 912744 | 09.11.97 | first autumn |
| 912765 | 10.11.97 | first autumn |
| 912791 | 12.11.97 | first autumn |
| 912792 | 12.11.97 | adult |

Table 3. Original ringing data for Moustached Warblers retrapped in February 1998

One re-capture is missing from the above list. This comprised a bird with a ring number not issued to S'Albufera and thus comprising a 'control', a bird ringed elsewhere. Information on the original ringing data is awaited. A small, but useful series of retraps related to the November 1997 ringing effort. These comprised four ringed in November as first-winter birds (i.e. hatched in 1997) and one as an adult (i.e. hatched before 1997). This demonstrated a degree of site fidelity for adults and first-years, at least between November and February.

One November 1997-ringed Chiffchaff retrapped in February, plus another from a pre November 1997 date, was the only evidence of Chiffchaff winter fidelity to the locality.

We hope to repeat these winter ringing studies at the Park in November 1999 and February 2000 when we shall be able to look at the data in much greater depth. Thanks are due to Srs. Gabriel Perello and Pere Vicens for all their help and encouragement, to Nick Riddiford for the same and to Graham Hearl, especially for his assistance in February.

Annex 5: Recent Lepidoptera discoveries by Martin Honey

For the last ten years Lepidoptera have been studied at S'Albufera de Mallorca, as a part of a research project led by Nick Riddiford and supported by Earthwatch Europe. To date, over 400 species have been identified from the reserve, including 60 that are probably new to the Balearic Islands fauna (Cuello 1981), three that are new to Spain, one that is new to Europe (Karsholt & Razowski 1996) and one that appears to be new to science. In order to extend our knowledge of the Lepidoptera fauna of these important wetland areas some additional work has also taken place on Menorca, at S'Albufera des Grau in particular. In June 1996, some moth trapping was undertaken there and on Illa d'en Colom, Menorca. Some of the specimens from that collection were eventually passed to Martin Honey, The Natural History Museum, London, for identification when it was found to contain a series of 11 specimens of a small, unrecognized pyralid moth (Lepidoptera: Pyralidae). The specimens appeared to match two worn specimens in the Museum's collection of an unidentified species taken in 1913 in Morocco. Discussions with colleagues in Britain revealed that the same species had also been taken recently in Portugal, at a bird reserve and field study centre at Cruzinha, Mexilhoeira Grande, Algarve (Martin Corley, pers. comm.). The first Portuguese specimen was taken in June 1994 and further specimens in 1995, 1996 and 1997. Research is currently being undertaken by Martin Corley and Martin Honey to confirm if, as is suspected, the species is undescribed, and a description of the species is being prepared for publication. Nothing is currently known about the biology of the species apart from the flight period, from May to October, which would suggest at least two generations. Research will be undertaken

in spring 1999 on Mallorca to discover if the species occurs there and concerted efforts will be made to discover more about its biology in some of the areas where the species has been found previously. It is perhaps surprising that such a distinctive species can have remained undiscovered but it does highlight the need for further research into the Lepidopterous fauna, even in western Europe where the fauna has been studied for a long period.

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