HUMAN RESOURCES AND MOBILITY (HRM)
ACTIVITY

MARIE CURIE ACTIONS
Host fellowships for Early Stage Research Training (EST)

"HOTSPOTS"
(020561)

CALL IDENTIFIER FP6-MOBILITY-2

Understanding and Conserving Earth's Biodiversity Hotspots - HOTSPOTS

The HOTSPOTS EST involves a consortium of training institutions designed to provide the ESRs with both the multidisciplinary training necessary and the relevant field experience essential for their future careers in biodiversity and/or conservation.

There are 9 core-partners, 2 NGOs (1 responsible for providing two summer schools, the other one for some data preparation/lecturing), and 4 other organisations in FP6-third countries that have a key role in the training of the ESRs located at the core partners, but do not themselves ask for funding.

Table 1. List of Participants

No	Partner Organisations	Countries
1	Royal Botanic Gardens, Kew, Jodrell Laboratory	United Kingdom
2	Natural History Museum London, Department of Entomology	United Kingdom
3	University Montpellier II, IFR119 Continental, Mediterranean, and Tropical Biodiversity	France
4	Imperial College, University of London, Department of Biology and NERC Centre for Population Biology	United Kingdom
5	University Paul Sabatier (Toulouse III), Evolution and Biological Diversity Laboratory (UMR CNRS 5174)	France
6	Royal Botanic Garden Madrid (CSIC), Department of Biodiversity and Conservation	Spain
7	University of Lausanne, Department of Ecology and Evolution	Switzerland
8	University of Helsinki, Dept of Biological & Environment Sciences	Finland
9	University of Göttingen, Department of Geobiology and Centre for Biodiversity and Ecology	Germany
10	Tropical Biology Association	United Kingdom and Kenya
11	University of La Réunion, Department of Chemistry	France
12	BirdLife International	United Kingdom, The Netherlands, Belgium
13	University of Johannesburg, Department of Botany	South Africa
14	National Centre for Scientific Research (CNRS Guyane)	French Guiana
15	National Centre for Documentation and Scientific Research (CNDRS)	Comoros

B1 SCIENTIFIC PROJECT

B1.1 OVERVIEW

The Earth's biodiversity is threatened by human activities yet the sustainable use of biodiversity is fundamental to the future development of humanity. Because financial and human resources for nature conservation are limited, it is appropriate to focus efforts on the richest and most threatened reservoirs of biodiversity. About 25 such biodiversity hotspots have been recently proposed based on available data on plant and vertebrate species richness, endemism and threat status (www.biodiversityhotspots.org). While there is a wide consensus on the choice and geographical delimitation of hotspots, the dynamics of biodiversity in these hotspots and the ecological impacts of predicted biodiversity loss are still only poorly understood (e.g. Local endemism within the western Ghats-Sri Lanka biodiversity hotspot. *Science 306*, 2004). In collaboration with partners in FP6-third countries, the European **HOTSPOTS consortium will work towards increasing the knowledge and understanding of biodiversity hotspots, including the Mediterranean Basin and some European overseas territories**. Applying field, molecular and bioinformatics approaches to flagship plants and animals, **HOTSPOTS will train a new generation of multidisciplinary biologists in state-of-the-art methods of evolution, ecology, and conservation**.

B1.2 RATIONALE AND WIDER SOCIETAL ISSUES

There is a shortage of researchers with the combination of skills necessary to deal with the scientific issues that now need to be addressed and the development of a rational approach to the conservation of globally significant biodiversity hotspots.

Although our scientific knowledge on biodiversity has increased exponentially, we are losing biodiversity at alarming rates. The HOTSPOTS research training project will tackle this paradox and develop strategies to reduce biodiversity loss, by integrating the growing information and providing better access to data sources:

(a) Assuming that no drastic changes in human behaviour occur and given predicted climate changes, we can expect important modifications to the biosphere within the next few decades. This will threaten the survival of our own species (Prospect for Biodiversity. *Science 302,* 2003), and may cause the extinction of 1/3 of species on Earth by 2050 (Extinction Risk from Climate Change. *Nature 427,* 2004).

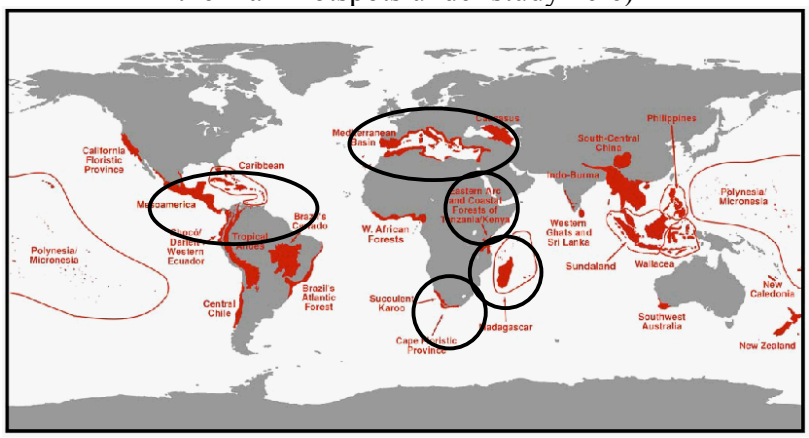
(b) Fifty years since the discovery of the DNA double-helix, expansion of scientific knowledge has increased drastically. With the revolution of molecular biology, genomics, and computer sciences, models can assess ecological health, predict patterns of disturbance, and devise conservation priorities and plans for species survival and for sustainable use of ecosystems by humankind.

(c) Surveys of global species diversity have established that biological richness on Earth is distributed very unevenly. **Twenty-five biodiversity hotspots contain 44% of all plant species and 35% of all vertebrates, but these areas comprise only 1.4% of all land surface of the globe**. Their protection should have highest priority, and may represent an efficient way of preserving a large proportion of the world's biodiversity in a minimum of area. **Yet, our understanding of the diversity in these hotspots remains very poor and often does not go far beyond species counts of a few key groups of fauna and flora**. This hampers any rational approach to their conservation and indeed questions any strategy that protects them as a surrogate sample of total global biodiversity.

HOTSPOTS will train a new generation of *Early Stage Researchers (ESRs)* in the latest developments, among others, of phylogenetics, bioinformatics, conservation and ecological modelling. The ESRs in HOTSPOTS will undertake a cohesive set of research projects that will provide an ecological-evolutionary understanding of biodiversity in the most species-rich areas on Earth, testing the validity of hotspots across a range of organisms and establishing the causes of their existence. This information will be used to evaluate sustainable conservation strategies as a prerequisite for reversing the decline of biodiversity.

Biodiversity hotspots are at the heart of the scientific literature on conservation, e.g. Biodiversity hotspots for conservation priorities, *Nature 403,* 2000; Habitat loss and extinctions in the hotspots, *Conservation Biology 16,* 2002; Hotspots and the conservation of evolutionary history, *PNAS USA 99,* 2002; Marine biodiversity hotspots and conservation priorities for tropical reefs, *Science 295,* 2002; Local endemism within the western Ghats-Sri Lanka biodiversity hotspot, *Science 306,* 2004; etc.

Fig 1. World map of 25 biodiversity hotspots based on plant, vertebrate and level of threat data; source = Conservation International; note that other areas could deserve hotspots status **(**circles indicate the main hotspots under study here)



Timeliness/Urgency:

(a) Madagascar and Indian Ocean Islands: 96% endemism among trees and 78% among vertebrates, 80% of original forest cover has disappeared during the past 2,000 years

(b) The Cape Floristic Region has >5,600 endemic plant species; only 24% of the original vegetation is pristine, threatened by invasive exotic species, grazing, and too frequent fires

(c) The Mediterranean basin contains 25,000 plant spp, 50% are endemic and >10% are endangered

(d) Mesoamerica's spectacular diversity includes jaguars, quetzals, howler monkeys, and 24,000 plant species; the region is also a critical migration corridor for birds and monarch butterflies, etc

B1.3 Research Project Objectives: Towards an 'e-Atlas' for Biodiversity and Conservation

HOTSPOTS will produce, compile and link biodiversity data and will emphasize new approaches for visualising, presenting and analysing biodiversity data:

(a) HOTSPOTS will develop a database and analytical tools for evaluating biodiversity at the level of populations, species and ecosystems. **It will create a novel type of biodiversity information system (the e-Atlas) based primarily on DNA sequences, evolutionary trees, population networks and taxonomy databases linked to ecological traits, geographic distributions and habitat/climate data**. These will be produced in a coherent way for a range of key animal and plant taxa and for different hotspot areas of the globe. The e-Atlas will also act as a retrieval system for fast taxonomic identification (DNA barcodes).

(b) Interdisciplinary teams within HOTSPOTS, **will work closely to perform comparative meta-analyses of the e-Atlas and input a battery of new and existing software for analysing the evolutionary and ecological causes of hotspot biodiversity**, providing a uniform platform for a subset of Earth's hotspots. Comparisons among several hotspots will allow generalisation of findings.

(c) **Finally, HOTSPOTS will link these novel data to predict some of the potential future threats, establish the severity of the extinction process at the level of populations, species and ecosystems, and establish conservation priorities**. Ultimately, findings of generalities or differences in the evolutionary causes of hyper-diversity will form the basis for rational conservation programs of biodiversity hotspots.

B1.4 RESEARCH METHODS

HOTSPOTS will make use of new opportunities for combining ecological and DNA sequences on a very large scale for an unprecedented study of biodiversity hotspots. Specifically, HOTSPOTS will:

(a) Survey diversity at the DNA level in several hotspots, using selected lineages from diverse taxonomic groups. The database will be obtained through data mining of existing sequence data, newly collected DNA sequences and genetic fingerprinting (gap filling), and incorporation of wider sequence data within (hotspots) and outside (coldspots) the focal areas as a backbone for the analysis. Sequence data, fingerprints and DNA barcodes will be used to construct phylogenetic trees (i.e. branching diagrams of evolutionary relationships), calculate genetic diversity indices and build population networks.

(b) Compare the causes of diversity across different regions and different taxa. The DNA tree/network database will be used to explore the causes of species richness in hotspot regions. Are hotspots 'special' in the way biological diversity is distributed? Is hyper-diversity the result of increased speciation rates, greater species persistence, greater levels of genetic and population subdivision, and/or ecological and topographic diversity and stability? Comparisons of age and genetic composition of lineages, rates of diversification, phylogeographic reconstruction and population history will establish the principal differences in the tempo and mode of diversification in hotspots versus other areas. HOTSPOTS will test the main hypotheses proposed for hyper-diversity (energy balance, climatic constancy, area, etc.).

(c) Predictive analyses of extinction processes: linking DNA and ecological data. The e-Atlas will be used for broad scale diversity modelling. To date, predictive models of extinction are based on climatic distribution alone in the light of anticipated change, but these ignore evolutionary and ecological differences between groups. Which groups are likely to be affected by climate change and by disturbance such as landscape fragmentation, and how? In each group, what is the chance of range movements, persistence in situ in an altered landscape, or complete extinction of populations, species or clades? How will predicted extinction affect the shape of the trees, i.e., evolutionary legacy? The results will indicate the importance of hotspots relative to other areas and feed into predictions about specific extinction risk, wider effects on entire ecosystems and conservation strategies.

B1.5 INNOVATION AND MULTI/INTERDISCIPLINARITY

(a) Ecological modelling: Diversity assessment has relied on simple species counts but these are problematic. Here we provide a much deeper understanding of the causes of diversity using state-of-the-art molecular and ecological modelling methods. No previous study has made a concerted effort to explore the interface between ecological attributes and evolutionary patterns in biodiversity hotspots on such a large scale. This is particularly relevant when a new *Unified Neutral Theory of Biodiversity and Biogeography* (SP Hubbell, 2001) provides a unique opportunity to develop innovative quantitative models in community ecology.

(b) Evolution and molecular phylogenetics: *Nothing in biology makes sense but in light of evolution* (T Dobzhansky). Phylogenetic trees and population networks have become powerful tools to explore the factors that generate biodiversity and are also increasingly applied to conservation. By generating replicate, high-resolution data, HOTSPOTS will be the most comprehensive study to date on the use of phylogenetic data for conservation management.

(c) Conservation biology and inter-sectorial component: The problem of nature conservation relies on putting theory in practice, especially when countries rich in biodiversity often are poor in resources. HOTSPOTS will focus on ESR with the aim of producing excellent scientists to drive forwards biodiversity research in Europe and beyond. HOTSPOTS will not restrict itself to research and training in academia. Instead, using the expertise in legal and practical issues (e.g. partner 10), we will develop action plans for the sustainable use of biodiversity, with significant transfer of knowledge - both ways - with third bio-diverse countries.

B1.6 SCIENTIFIC OUTCOMES AND IMPACT

HOTSPOTS project outputs will range from documenting the state of biodiversity at genetic and eco-community levels, uncovering mechanisms for the historical development of the most species-rich areas of the world to evaluating alternative conservation strategies. At least 50 high-profile publications (journals with impact factor > 2) will be written to demonstrate European excellence in science. Raw data, methodologies, scientific discoveries and all by-products of HOTSPOTS will be assembled GRID-like, and be core-maintained and available via the internet to maximise their use and impact for long-term research, training and conservation.

Table 2. Indicators

Key indicators of success	Measures	Targets
Surveys, collections and sampling of species	No of spp reference collection established, DNA sequences	>3,000 species, 2 million DNA bp submitted to GenBank/EMBL
Computer-based databases of ecology/population traits/maps	Total no of computer-based databases	>1 per species group but utilising common structures
Conservation assessments	Management plans produced	>2 per ESR
Compilations and distribution	Hits on HOTSPOTS website	e-Atlas online and visited by peers
International collaborations	Total no of contact days with international collaborators	At least 8 month person plus conferences
Excellence in scientific production and impact	No of papers accepted in high-profile journals (imp. fact > 2)	3 per ESR; plus supervisors; total min 50 papers (target 100)
Higher education	Total number of people attaining PhD qualification	PhD degrees completed and ESRs in high demand on job market

B2 QUALITY OF TRAINING ACTIVITIES

B2.1 RESEARCH TRAINING ACTIVITIES OF HOTSPOTS PHD PROGRAMME

All fellows will be enrolled in the HOTSPOTS PhD programme in mid-year 1. PhD degrees will be obtained upon satisfaction of the PhD programme and after a formal upgrading viva 15-20 months from starting date and a final PhD viva at the university host; **PhD degrees will be recognised and harmonised among all partners, and formal EuroPHDs will be set up as necessary**. In addition to local seminars, journal clubs, etc, the *Research Training Activities* will include four strongly integrated elements:

(a) **PhD experimental work** supervised by the partners in research institutes and universities (each student will have one supervisor and at least one other tutor with whom he/she will interact on a daily/weekly basis). All students will also have a co-supervisor at another institution, with whom they will interact at least twice yearly, including a formal progress meeting at the summer school.
(b) **University scientific training modules** (3 two-week compulsory academic modules provided by the HOTSPOTS members; additional short courses will be available but not compulsory).
(c) **Training in practical fieldwork and conservation** (summer schools led principally by partner 10, including 6-week periods in Africa with conservation practitioners, compulsory).
(d) **Training in complementary skills** (personal development and business).

Each researcher will have a *Personal Career Development Plan* agreed with their supervisors, identifying core training and additional needs, and attending courses both at their host institution and jointly within the network. The complementary skills training will include project management, team leadership, IPR procedures and management, proposal writing and research ethics (see also 2.5 below).

B2.2 PHD EXPERIMENTAL WORK

Table 3. PhD Activities

Phase	Activities	Duration
1	Experimental design to set up details of PhD projects and literature survey	3 months
2	Fieldwork to collect species samples and data (e.g. ecology), preparation of samples for reference collections (e.g. voucher specimens)	3-6 months
3	Molecular biology laboratory-based work to produce DNA sequence/fingerprint data, including training on Automated DNA Analyzers.	6-12 months
4	Data compilation from literature and online databases (EBI/EMBL, NASA, Flora & Fauna Europae, IUCN, etc). Finnish fieldwork as necessary.	6-12 months
5	Computer-based analytical work, statistics and model design incorporating ecological, evolutionary and climatic data and set conservation plans	6-12 months
6	Dissemination of results via oral presentations and written papers to make the bulk of each PhD thesis with a general introduction/conclusion.	6 months

Each ESR will conduct his/her own challenging and high-impact research project, writing up their own results as scientific papers to complete their PhD. Each partner has been a main supervisor for 2-10 successful PhDs in the last 5 years; several of these students have received prestigious awards for their PhD (e.g. *Ernst Mayr Prize* from the international Society of Systematic Biologists in 2003, partner 1, *CHENE award* for best young researcher for nature and environment, partner 3). **HOTSPOTS will also be more than the sum of its parts: researchers and supervisors will combine their data into meta-analyses to meet global scientific objectives**.

Table 4. Hotspots will produce nine PhD theses (Hosts = main supervising hosts; first number is the partner who will hire the ESR; **ESR: please check trans-national mobility requirements**)

Titles for individual PhD theses	Focus	Hotspots	Hosts
Biotic interactions and species diversification in southern Africa	Ecological modelling and evolutionary constraints for plant-pollination/herbivory relationships	Southern Africa	**1**, 4
The causes of insect endemicity with the example of Madagascar	DNA barcoding and macroecology for beetles differing in global diversity patterns	Madagascar	**2**, 5
Vicariance and trans-oceanic dispersal in mammals and plants	Detecting evolutionary patterns and ecological adaptation in mammals (primates, rodents) and angiosperms	Caribbean, French Guiana, Africa	**3**, 9
Global assessment of mammal, bird and amphibian extinction risk	Determining biological and anthropogenic correlates of extinction risks using compiled IUCN, GIS, etc	Global	**4**, 8
Species diversification and differentiation in Madagascar and Indian Ocean Islands	Identifying causes for variation in ecomorphological disparity in lineages sharing distribution ranges	Madagascar and Indian Ocean Islands	**5**, 2
Contrasting evolutionary patterns between Mediterranean floristic regions	Population genetics and phylogeography, especially from the species-rich families	Mediterranean and Africa	**6**, 1
Spatial distribution modelling for biodiversity hotspots	Predictive ecological modelling of distributions for plants, insects and mammals	Global	**7**, 3
Disjunction, dispersal and temporal patterns of insect distribution	Phylogeography, ecological genetics and molecular dating, beetles	Global	**8**, 2
Hotspots status assessment in marine Mediterranean fauna	Evolutionary and phylogeographic patterns, endemism and invasive species in marine invertebrates	Mediterranean	**9**, 6

B2.3 UNIVERSITY SCIENTIFIC TRAINING MODULES

HOTSPOTS will set up a **new course of three 2-week modules** taught by the members of the consortium to train ESRs in core skills for their PhD research and future activities in conservation science and its applications. **The new modules will be integrated in the postgraduate programmes of the partner universities after the funding period as courses open to external students**. HOTSPOTS supervisors are all experienced teachers for postgraduates as well as recognized senior researchers with international visibility: e.g. HOTSPOT supervisors at partner 4 direct two MSc courses with 50 students per year, plus Advanced Courses on Ecological Modelling. To promote synergy in teaching, new training materials and all lectures (e.g., powerpoint presentations) will be made available to students from all institutions through posting on the HOTSPOTS and university websites. The content of these courses, plus material from the summer schools (see below), **will be edited as a Handbook, 'Biodiversity Analysis for Conservation', to be published and widely distributed** jointly by IUCN and academic publishers. The modules will include lectures, computer hands-on and short thematic presentations/debates:

(a) **Biodiversity Patterns, Ecological Modelling & Statistics** (Toulouse, 2006), include Neutral and Niche Theories of Relative Abundance of Species, Biogeography, Biodiversity and Ecosystem Processes, Species-Area Relationships, Fundamentals of Ecological Statistics, GIS, Computer Simulations and Hands-on Exercises;

(b) **Evolutionary Processes, Molecular Tools & Bioinformatics** (Helsinki, 2007), include Phylogenetics, Speciation, Metapopulation and Metacommunity Dynamics, Dispersion, Adaptive Radiations, Conservation Genetics and Molecular Markers, Data-mining;

(c) **Conservation Science in Action** (Göttingen, 2008), include Measures of Biodiversity, Applications of Genetic Data, Legal Issues, Policies, Global Initiatives and Targets (CBD, CITES, etc);

In addition, each researcher will attend one or more existing courses (e.g. Molecular Systematics, Advances in Ecology, UK; Phylogenies and Genealogies, Molecular Approaches in Conservation Biology, Spain; Molecular Phylogeny: Methods and Applications in Evolution, Quantitative Genetics, Evolutionary Biology and Conservation, France; 3rd cycle in Biological Sciences: Ecology, Switzerland; and others).

B2. 4 SUMMER SCHOOLS: TRAINING IN PRACTICAL FIELDWORK AND CONSERVATION

Summer schools will provide practical training in fieldwork and conservation, and also serve as a platform where all researchers and supervisors will meet for informal exchanges:

(a) May 2006: 10-days summer school between the Eden Project (a registered charity and centre of excellence for research and teaching in conservation and science communication, www.edenproject.com; located in Cornwall - EU Objective 1 Region in the UK) and the Cornish coast (Marine Biology Station). This summer school will **launch HOTSPOTS and introduce core fieldwork skills**: rapid inventory, sample and experimental design, collecting material for DNA, museum collections, biological recording and associated legal issues.

(b) **July 2007 (Madagascar): 3-week course dedicated to tropical ecology and conservation**, organised by partner 10, which has been running these courses for over 10 years (36 courses in 5 countries for >800 trainees, of whom 1/3 now work in conservation, 1/3 are in academia and 1/3 in other sectors, with >90% of them still in contact with partner 10). Madagascar's forest has undergone high rates of deforestation and fragmentation; the first field course will study aspects of the forest ecosystem and introduce regional research and conservation programmes. Students will take part in a joint project on rapid inventory across the range of taxa, written up as a team effort.

(c) **July 2009 (Uganda).** The second 3-week school in tropical ecology and conservation (also organised by partner 10) will be held in Kibale Forest National Park at the Makerere University Biological Field Station, and will also include a visit to savanna habitat in the nearby Queen Elizabeth National Park. Kibale forest is a mid-altitude tropical moist forest with a spectacular array of species and a long established programme of ecological research. The school will bring together students and

conservation scientists and practitioners from local areas, to integrate experiences and discuss practical strategies for conservation in the region. Participants will also undertake a small 10-day research project, presented as a paper at the end of the course.

These courses will be unique because they bring together students, academics and conservation practitioners from Africa, Europe and elsewhere: biologists from different countries will share ideas and make contacts, the ESRs will benefit significantly from the experience of practitioners in Africa, and scientific expertise will be transferred between Europe and Africa.

B2.5 TRAINING IN COMPLEMENTARY SKILLS: PERSONAL DEVELOPMENT AND BUSINESS

Many of the host institutions offer extensive training in transferable skills and personal development: these will be available to all researchers. The training methods use short presentations, hands-on exercises, ice breakers and role plays: (a) Health and Safety at Work, (b) Recruitment Interviewing, (c) Business Report Writing, (d) Performance Management, (e) Scientific Report Writing, (f) Making the Most of Meetings (g) Presentation Skills, (h) Time Management, (i) Managing Relationships at Work, (j) Project Management and Logframe. Open learning facilities will also be available to all fellows on various topics including 10 foreign languages. In addition, all researchers will participate in one joint training course on Scientific Computing (including databases, programming and web design), and follow at least training courses (a) and (b) above. Partners have received awards for the quality of the training in complementary skills, e.g. partner 1 received in 2003 the *Investor in People* status, which is the highest recognition in Britain for best practice in training and managing human resources, and its current Head of Education received in 2002 the Queen's award MBE for services to education.

B2.6 ROLE OF EACH TEAM

An excellent multi-disciplinary team of world-class scientists will integrate effort and share knowledge to train nine researchers in a mixed research institute – university – NGO environment.

Partner 1, a world-leading centre of excellence for plant and fungal research and conservation, will act as co-ordinating and managing institute, building on its experience with previous FP6 grants (hosting several Marie Curie Fellows, co-ordinating ENSCONET and partner in SYNTHESYS access to infrastructure schemes). Partners 1 and 2 also have long-term conservation partnerships with governments overseas, and currently they have signed memoranda of understanding with institutions in >50 countries (including Madagascar and South Africa). Partners 3 and 5 combine strong expertise in theoretical and field ecology, population genetics, and also benefit from great experience in tropical biodiversity and ecology (e.g., partner 5 belongs to FP6 PAN-AMAZONIA, whose aims include training researchers from Amazonian countries in state-of the-art techniques for monitoring biodiversity, carbon dynamics and ecosystem function), whilst partner 4 is the largest British 5* department for teaching conservation biology. Some partner's strength is area-orientated (partner 6 for Mediterranean basin or in marine ecosystems for partner 9). Partner 7 is specialised in ecological modelling whilst partner 8 is in ecological genetics. The table below presents the share of duties in HOTSPOTS; in addition partners 1-9 will each be the main host for one PhD. Partner 10 (www.tropical-biology.org) will be mainly in charge of practical training in fieldwork and conservation: it is a non-governmental, not-for-profit organisation working in partnership with environmental institutions throughout Africa; its head office is located in Cambridge, UK. Established through funding from the British Darwin initiative, it is supported by collaborative programmes from government and non-government agencies and the private sector, including the EU (Environment and Tropical Forests Budget Line B7-6200/01/0370/ENV). It has a subscribing membership of >40 universities and conservation institutions, which form the basis of its governing council. Its unique feature is to bring together biologists and conservation practitioners from Europe and tropical countries for relevant and up to date field training, as it will be the case during the HOTSPOTS summer schools, building skills and understanding rather than simply accumulating factual information. Finally, partners 11-15 will share expertise, be advisors and help with the PhD experimental works.

Table 5. Training Activity Schedule (D = duration in weeks; Resp = main responsibilities)

Activities	**2005-6**		**2006-7**		**2007-8**		**2008-9**		**D**	**Resp**
Launch Research Training Activities									12	All
Set up Personal Career Development Plans w/ researchers									12	All
Supervise PhD projects									141	1-9
Prepare training material									8	Rotation
Training module Biodiv & Ecology									2	5, 3, 6
Training module Evolution									2	8, 1, 2
Training module Conservation									2	9, 4, 7
Training in complementary skills									4	1-3
Summer school in Cornwall									2	1
Summer school in Madagascar									3	10
Summer school in Uganda									3	10
Evaluate Research Training Activities									4	All

B2.7 Appropriateness of Research Training Activities

Many problems in biodiversity and conservation require a global and taxonomically broad perspective, in line with current international programmes such as the Global Biodiversity Information Facility (www.gbif.org), Barcoding of Life (www.barcodinglife.org), Global Species Assessment (www.redlist.org), Millennium Ecosystem Assessment (www.millenniumassessment.org), etc. However, research progress is seriously hampered by a skills gap, with many researchers being trained much more narrowly. This gap is most acute at early career stages, but is also true in more senior positions. Students are themselves aware of the tremendous importance of the broad training proposed here (e.g. partner 4 recently started a new MSc course on biodiversity and 14 self-funded students applied in this first year). There is indeed massive student demand for training in this area. However, while several academic programs exist, very few can offer the global perspective, range of expertise and modern training in conservation science that our project will do. It is clear that students in receipt of such training will be highly competitive in the job market. Apart from the global programmes mentioned above, there is also an ever growing number of national and regional initiatives in need of skilled conservation scientists, whether in academia (e.g. new Professorships) or in governmental (e.g. Environment Policies) and private sectors (SMEs/NGOs). For example, during in Sept-Dec 2004 the *Evoldir* Evolutionary Directory advertised >50 postdocs and >50 jobs suitable for HOTSPOTS researchers (http://life.biology.mcmaster.ca/~brian/evoldir.html); similarly GBIF/UNESCO have opened chairs in biodiversity informatics, and in Nov-Dec 2004, 115 jobs in conservation/ecology/evolution were posted in *Nature* (naturejobs.nature.com). In addition, because of its unique joint expertise, our consortium will deliver major scientific outputs and, as it will finish in 2009, also make a very significant contribution to monitoring our progress towards the target, adopted by the Convention on Biological Diversity (CBD) and endorsed by the World Summit on Sustainable Development, of decreasing the rate of biodiversity loss by 2010, as part of the United Nations Environment Programme (www.biodiv.org).

HOTSPOTS will in fact not only train nine excellent and very competitive early-stage researchers, but will also create a fantastic network of collaborative inter-disciplinary/sectorial scientists across the globe, starting with six European countries and expanding to overseas territories and third countries throughout Africa and the Americas - and beyond.