# *Darwin Initiative for the Survival of Species*

# *Final Report*

## 1. Darwin Project Information

| | |
|---|---|
| Project Reference No. | 162/13/013 |
| Project title | Establishing biodiversity monitoring networks to inform Estonian coastal wetland management |
| Country | Estonia |
| UK Contractors | Earthwatch Institute (Europe) and University of Brighton |
| Partner Organisations | Läänerannik (Estonian NGO) and Estonian State Nature Conservation Centre (Estonian Government) |
| Darwin Grant Value | 177,765 GBP |
| Start/End date | 1st April 2004 – 31st March 2007 |
| Project website | Http://vormsi.lk.ee/darwin |
| Author(s), date | Silvia Lotman, Elle Puurmann, Chris Joyce, Roger Mitchell & Nat Spring – July 2007 |

## 2. Project Background/Rationale

The project was focussed on three Baltic coastal wetland areas in western Estonia: Vormsi Island, Silma Nature Reserve and Matsalu National Park. Each of these three study areas is designated as an Important Bird Area (IBA) and registered on Estonia's Natura 2000 list; Matsalu is also a Ramsar site. Prior to this project, ecological monitoring of these internationally important sites had been sporadic and inconsistent. Dissemination of information had been poor despite significant threats caused by grazing abandonment and changes in land ownership. In consequence, the project partners in Estonia and the UK identified the need for a substantial expansion and much better co-ordination of wetland monitoring in provide a firm basis of data and information to inform effective wetland conservation in Estonia. As a result, practical conservation management is now being informed by the stakeholders through: the identification of key ecosystem indicators for monitoring and comparing change in managed and neglected coastal wet grasslands; demonstration of integrated monitoring methods; and the production of practical monitoring plans for management planning. This information has been disseminated through the project's stakeholder network, the World Wide Web, conferences, educational material and publications.

## 3. Project Summary

The project's purpose was to establish a network of coastal wetland monitoring sites, and associated stakeholders, to inform and promote management and environmental policy for the sustainable use of biodiversity in coastal wetlands in west Estonia and elsewhere in the Baltic States. To support this, additional objectives were to: increase the capacity for wetland monitoring in Estonian institutions; improve understanding and awareness of wetland biodiversity issues in Estonia and other Baltic states; establish monitoring sites for long-term use by all stakeholders beyond the life of the supported Darwin project; promote wetland management and monitoring for the Estonian Ministry of Environment and Ministry of Agriculture's development of agri-environmental policies; enhance the network of public and private sector stakeholders and facilitate information exchange; and train Estonian scientists in wetland monitoring skills (e.g. data acquisition/collation, reporting).

The project has contributed to the implementation of two of the three over-arching objectives of the CBD: conservation of biodiversity and sustainable use of biodiversity. By establishing a network of monitoring sites and related stakeholders to inform management planning and policy for sustainable use of coastal wetlands, and through associated training, this project particularly supports the implementation of Article 7 & 12 (20% each) and 10, 14 & 17 (10% each), as well as 5, 6, 8j,13,18 & 22 (5% each) . This is set out in more detail in Appendix I. In addition, the project is particularly relevant to the following crosscutting themes: agricultural biodiversity, biodiversity and tourism, climate change, ecosystems approach, indicators, coastal biodiversity, protected areas, public education and awareness, sustainable use and traditional knowledge, innovations and practices.

The latest project log frame (2005-6) is included as Appendix V together with updated achievements and lessons learned from the project. The project met all of its objectives, which were not modified during the project. Despite some stakeholders (e.g. absentee landlords) proving extremely difficult to engage, this has resulted in the provision of a strong foundation for a coordinated programme of biodiversity monitoring, As a result, monitoring is to be implemented more widely and consistently in Estonia, including for wet grasslands for European Union's Natura 2000 reporting. Recommendations and findings from this Darwin project were disseminated to the Estonian Ministry of Environment officials to inform their development of policies that affect wetlands. Monitoring information and recommendations were fed directly into revisions and developments of the management plans for study areas, negating the need for new management guidelines. The system of key ecosystem indicators identified has been disseminated, including in peer-reviewed publications. Results have also been used to inform and stimulate the restoration and conservation management of important wet grasslands in west Estonia that has been reintroduced during the project period.

## 3. Scientific, Training, and Technical Assessment

### Research

The science was directed at identifying key ecosystem indicators for effective monitoring and comparing change in managed and neglected coastal wetlands to inform their sustainable management. Field work was undertaken by Darwin Fellows and trainees (including Lotman, Berg, Lillepruun, and Valker) and other project staff (including Joyce, Burnside, Puurmann and Mitchell) as well as Earthwatch volunteers in Estonia during all three years to collect research and monitoring data. Baseline ecological conditions were established by mapping habitats for approximately 450ha of coastal wetland. Plant community variation was quantified using a series of 2m x2m quadrats; some 250 were sampled and analysed to develop a classification of coastal wetland communities and their indicators in relation to management based upon multivariate analysis (Table 1). This is the first classification that describes western Estonian wetland vegetation in relation to grazing abandonment; this was published in a peer-reviewed, international journal (Burnside et al., 2007).

**Table 1. Phytosociological classification of coastal wetland communities in west Estonia.** OP = open pioneer; CS = club-rush swamp; RS = reed swamp; LS = lower shore grassland; US = upper shore grassland; TG = tall grassland; SW = scrub and developing woodland.
Frequency scores show how often a species was found on moving from one sample to another, irrespective of how often that species occurred in a given sample: 1-20% = I; 21-40% = II; 41-60% = III; 61-80% = IV; 81-100% = V. Abundance scores show the extent to which a species occurred in that sample, based on percentage cover of the species using the Domin scale (*sensu* Rodwell, 1991-2000): <4% with few individuals = 1; <4% with several individuals = 2; <4% with many individuals = 3; 4-10% = 4; 11-25% = 5; 26-33% = 6; 34-50% = 7; 51-75% = 8; 76-90% = 9; 91-100% = 10. For example, *Agrostis stolonifera* was found in 81-100% of all samples classified as lower shore grassland with an abundance in those samples ranging from <4% cover (with many individuals) to 50% cover.

| **Species** | **OP** | **CS** | **RS** | **LS** | **US** | **TG** | **SW** |
|---|---|---|---|---|---|---|---|
| *Bare (+5%)* | V (7-9) | V (4-8) | V (1-8) | V (1-5) | III (1-4) | III (1-5) | V (1-7) |
| *Suaeda maritima* | V (1-6) | | | | | | |
| *Juncus gerardii* | V (1-3) | | | V (4-9) | IV (1-5) | I (1-3) | |
| *Litter* | IV (1) | V (3-5) | V (3-8) | V (3-5) | V (1-7) | V (3-6) | V (3-5) |
| *Agrostis stolonifera* | III (1-7) | I (2-4) | II (2-4) | V (3-7) | IV (3-7) | III (3-5) | IV (3-4) |
| *Triglochin maritimum* | III (1-4) | IV (1-5) | II (1-4) | V (1 -5) | V (1-4) | II (1-4) | I (1) |
| *Bulboschoenus maritimus* | II (1-5) | V (4-7) | II (1-3) | I (1-5) | I (1) | | |
| *Salicornia europaea* | II (1-2) | | | | | | |
| *Glaux maritima* | II (1) | I (1-4) | I (3-5) | V (1-7) | IV (1-4) | II (1-3) | I (1) |
| *Plantago maritima* | II (1) | I (1) | I (4-5) | V (1-5) | V (1-7) | II (1-5) | II (1-4) |
| *Schoenoplectus lacustris* | | IV (4-8) | I (4) | I (1) | I (1) | | |
| *Eleocharis palustris* | | II (1-8) | I (1-3) | III (1-5) | II (1-7) | | |
| *Phragmites australis* | | I (1-3) | V (5-9) | III (2-5) | I (1-3) | IV (1-5) | III (1-4) |
| *Elytrigia repens* | | | II (2-4) | | I (3-4) | V (3-8) | II (3-5) |
| *Galium palustre* | | | II (1-5) | III (1-3) | II (1-4) | III (1-5) | II (1-4) |
| *Festuca rubra* | | | I (1-3) | V (3-7) | V (4-8) | V (3-7) | III (3-5) |
| *Peucedanum palustre* | | | I (1-2) | | II (1-5) | III (1-4) | III (1-3) |
| *Vicia cracca* | | | I (1) | | I (1-4) | IV (1-4) | III (1-4) |
| *Potentilla anserina* | | | I (1) | II (1-4) | II (1-4) | V (1-5) | III (1-4) |
| *Moss* | | | | II (1-4) | IV (1-3) | III (1-5) | III (1-7) |
| *Leontodon autumnalis* | | | | II (1-3) | V (1-4) | II (1-4) | II (1-3) |
| *Molinia caerulea* | | | | I (3-5) | II (1-7) | I (1-8) | III (4-7) |
| *Carex nigra* | | | | I (1-4) | II (1-5) | I (1-3) | I (1-4) |
| *Centaurium littorale* | | | | I (1-2) | II (1-3) | | II (1-3) |
| *Carex distans* | | | | I (1) | II (1-6) | II (1-6) | I (1-5) |
| *Galium verum* | | | | I (1) | I (1) | II (1-4) | IV (3-5) |
| *Trifolium pratense* | | | | I (1) | II (1-3) | III (1-4) | II (1-4) |
| *Juniperus communis* | | | | I (1) | I (1) | | IV (1-7) |
| *Carex glareosa* | | | | | I (1-4) | | |
| *Valeriana officinalis* | | | | | | IV (1-5) | III (1-4) |
| *Festuca arundinacea* | | | | | | III (3-7) | I (1-5) |
| *Achillea millefolium* | | | | | | II (1-5) | III (1-5) |
| *Angelica palustris* | | | | | | II (1-3) | I (1-3) |
| *Centaurea jacea* | | | | | | I (1-4) | |
| *Frangula alnus* | | | | | | I (1) | II (1-8) |
| *Pinus sylvestris* | | | | | | I (1) | III (1-8) |
| *Orchid spp.* | | | | | | | I (1) |

Three field research experiments in different vegetation types were established to assess plant community change following abandonment and the reinstatement of management. These involved establishing and sampling replicated quadrats (in fenced exclosures to prevent disturbance by cattle and other large grazing animals) with treatments represented by vegetation manipulation (e.g. cutting, abandonment, plant litter removal). Vegetation was sampled at least annually over the three years of the Darwin project. Results from the plant community experiments show differential species responses to the experimentally reinstated management. Species characteristic of abandonment in tall grassland decreased after three years of cutting management, notably the 'invasive' grasses *Elymus repens* and *Phragmites australis* (Figure 1). Litter, which characteristically increases as succession in grasslands proceeds, also decreased. By contrast, cutting management resulted in an increase in the grasses *Festuca arundinacea*, *Festuca rubra,* in the forb *Valeriana officinalis, and in bare ground,* compared to unmanaged grassland (Figure 1). In lower shore grassland, cut plots showed greater cover of *Juncus gerardii* and *Plantago maritima,* as well as extent of bare ground, after three years compared to unmanaged plots (Figure 2). As in tall grassland, the later-successional grass *Phragmites australis* was reduced, as were *Agrostis stolonifera* and *Glaux maritima* (Figure 2).

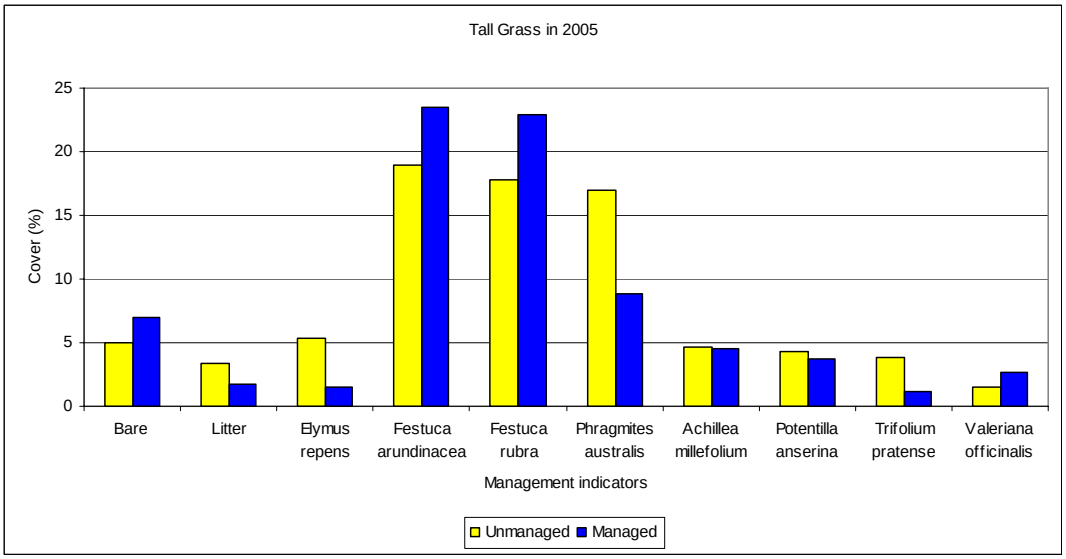


**Figure 1. Mean (*n*= 8) % cover of key species of tall grassland in unmanaged and managed plots.** Managed plots have been cut annually for 3 years.

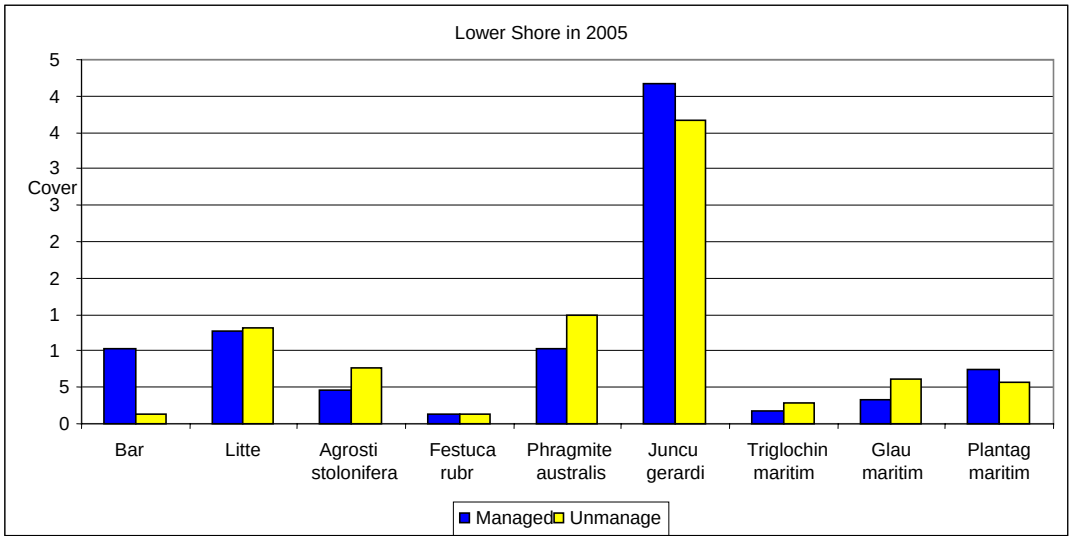


**Figure 2. Mean (*n*= 8) % cover of key species of lower shore in unmanaged and managed plots.** Managed plots have been cut annually for 3 years.

Bird surveys, using transects for breeding birds and point counts for migrating birds, were used to identify indicator appropriate taxa for effective wetland monitoring. Approximately 45 transects and 70 point counts were undertaken each year by the project team and Earthwatch volunteers. This produced a total of over 10,000 bird observations of 81 species. Multivariate analysis of bird point count data demonstrates the effects of abandonment upon characteristic birds of wet grasslands. Figure 3 shows that wading bird species of conservation interest, such as Snipe, Redshank and Wood Sandpiper, are most closely associated with coastal wetland sites in west Estonia where short grassland is dominant (e.g. Tahu). This type of habitat, along with tall grassland, also supports typical open grassland associated species such as Meadow Pipit and Skylark. All of these birds are positively related to management intensity defined by grazing type and history, indicating that grazing is beneficial for many birds of conservation concern. By contrast, scrub-dominated sites such as Hullo centre are characterised by Red Backed Shrike and Yellowhammer, while swamp and mosaic wetlands typically support Reed Bunting, Reed Warbler, Sedge Warbler and Willow Warbler (Figure 3). These finding are currently being prepared for two scientific papers that will be submitted to peer-reviewed journals.

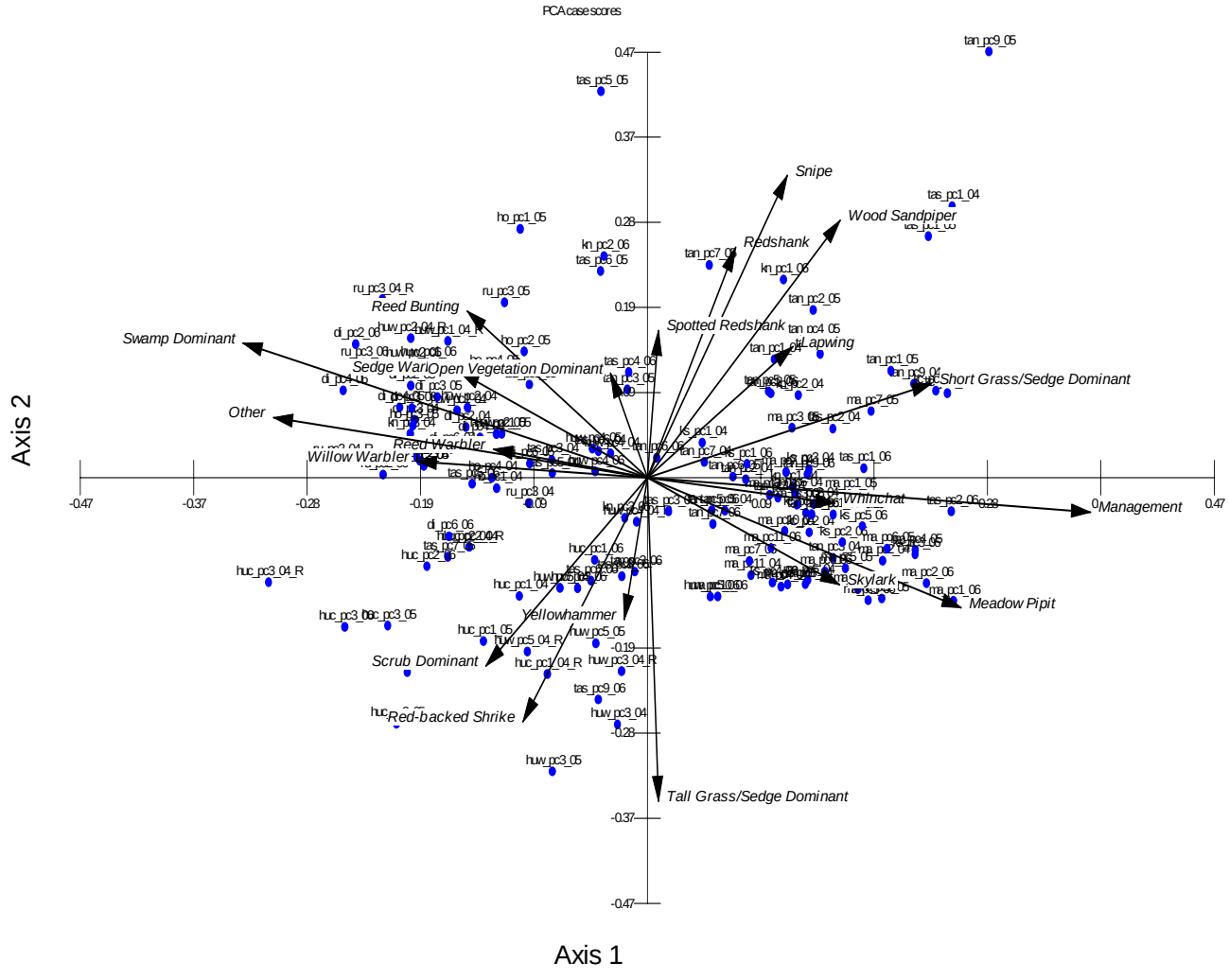


**Figure 3: Principal Components Analysis of key bird species and vegetation composition at the west Estonian study sites 2004-6.** Each dot represents one bird count.

Through this project stakeholder and site networks for monitoring biodiversity in coastal wetlands were established for the first time in west Estonia – an initiative that will hopefully serve as an example to other Baltic states. Four internationally important wetland sites in the three study areas were equipped with instrumentation to produce long-term monitoring data to inform management decisions. This includes two continuous water table loggers and soil moisture recorders at each site, and a total of 144 permanent vegetation quadrats across all four wetlands, comprising a total of eight integrated monitoring stations. Monitoring stations will remain *in situ* to serve as demonstration sites and educational resources beyond the Darwin project; Estonian stakeholders have been trained in their use and maintenance. Data are stored and disseminated in a GIS that has been co-developed and managed in cooperation with the Estonian stakeholders.

Estonian partners were fully involved in developing and monitoring the capacity-building and training programmes during the Darwin project. Capacity-building began with the appointments of the full-time Estonian Darwin Fellow (Silvia Lotman) and UK/Estonian researcher (Maureen Berg) in 2004; both appointed at post-graduate level following a competitive application and interview process. Both were mentored throughout the project in the host country and the UK by the Estonian and UK project team as well as receiving training to support their particular roles. Further Estonian staff were appointed to provide part-time outreach, field, and technical support (e.g. web design) in the host country. These were also mentored by others in the project team as well as receiving targeted training/capacity building (e.g. Valker received education resources training; Lillepruun participated in coastal wetlands seminars). Also a number of undergraduate students were trained through engaging in field research elements of the project. A full list of undergraduate and other students receiving training is given in Appendix VI.

**Training and capacity-building activities.**
Training and capacity building took place in the host country, the UK and in other countries through a series of conferences and workshops. Training topics were selected and developed to meet the needs of the trainees during the project. In Estonia, field-based training took place during the summer (June-August) each year, including three annual training courses of 12 days each, supported by two Darwin workshops during the project (April 2005 in Matsalu; February 2007 in Vormsi) and several short courses. Six training courses for Estonian trainees took place in the UK at the University of Brighton, Earthwatch offices in Oxford, and via workshops in the UK. The course contents were agreed by consultation with the Estonian partners,and included: research skills and information retrieval; the use and applications of Geographic Information Systems; web site development; networking; the Conservation Management System database; field equipment installation and maintenance; environmental education; and project funding skills. Where appropriate, content was consistent with the University of Brighton undergraduate or post-graduare educational material, such as using module resource packages for GIS, information retrieval, and skills in research. In addition, capacity-building involved site visits to managed wetlands in southern England and Wales, and participation in conferences, workshops and seminars in Estonia, the UK, Germany, Lithuania, and Australia.

## 4. Project Impacts

The project's legacy is the enhanced capacity of the Estonian partners and other stakeholders to monitor the biodiversity of key wetlands using the established network of monitoring stations, equipment, methods and information. The eight monitoring stations, which were designed for effective and efficient maintenance and operation by the host country, are now being managed by the Estonian State Nature Conservation Centre who allow free access to collected data by interested stakeholders and other parties. The monitoring stations also serve as demonstration/education sites for the Baltic States; knowledge of their locations and function has been disseminated through the stakeholder database.

Monitoring plans for the study sites were produced (an example for the Rumpo site is given in Appendix VIII) and added to the Estonian Nature Information System (EELIS), being the national database for biodiversity information. Through EELIS, the monitoring plans are available as examples to all officials in Estonia whose work is related to nature conservation.

The stakeholder network generated during the project is further evidence of the extensive impact and outreach of the project: Appendix VI lists 100 people who have been involved in the project activities. This includes policy makers and government officials who were invited to participate in key aspects of the project, such as workshops and demonstrations of monitoring sites, as well as representatives from non-governmental organisations, the Earthwatch Institute volunteers and a variety of international contacts.

Project outputs were disseminated amongst the stakeholder network during workshops, site visits and on the project web site. Further outreach during the project was achieved via scientific papers, publicity, and organisation of, and participation in, international workshops and conferences. For example, evidence of the identification of ecosystem indicators for effective monitoring is contained within the peer-reviewed paper by Burnside et al. (2007) while five publicity releases in the host country not only described the project but also discussed the need to conserve coastal wetlands through sustainable management. An additional, unanticipated, output was the production of educational sheets for school children designed to help them identify coastal wetland biodiversity (examples for birds and invertebrates are in Appendix VII), based on the information on ecosystem indicator species identified during the project.

The two Darwin workshops organised in Estonia contributed to the establishment of a network of scientists and officials dealing with coastal wetlands (see Appendix VI). Collaboration between UK and host country partners has helped expose Estonian policy making (e.g. the Rural Development Plan and Nature Conservation Action Plan for Estonia) to new research and monitoring information. Engagement with the Baltic Environmental Forum (BEF) by the Darwin team during the project facilitated better cooperation with the Estonian Ministry of Environment, which led to the Darwin project inputting to Estonia's reporting to the European Union for Natura 2000 monitoring. Thus, plant and bird indicators will be included as part of a revised monitoring programme for Estonian coastal grasslands in response to their European Union commitments under the Natura system. Agri-environmental initiatives have been used to restore practical management to three of the Darwin wetlands, including reed clearance and grazing management.

In social terms the project has given benefit to local tourism on Vormsi island and in west Estonian rural areas by identifying wetlands of interest. For example, knowledge gained during the Darwin project was used by a local eco-tourism operator at Matsalu to inform a series of ecologically-sensitive wildlife tours for visiting overseas tourists. Also, local school children and villagers from Vormsi took part in a coastal ecology monitoring workshop on Vormsi island and benefited from the discussions and educational material produced.

Evidence of the lasting impacts of the project is also found in the ongoing commitment of Darwin Fellow trainees to biodiversity conservation:-

**Silvia Lotman** contributed to all field-based research work and training, and to the organisation of the two Darwin workshops in Estonia. She also took part in the following training outside Estonia: January 2005 (GIS training in Brighton University), September 2005 (attending British Ecological Society annual meeting), October 2005 (attending coastal ecology workshop in Germany), January 2006 (Conservation Management System and monitoring planning training in UK), March 2006 (RSPB organised project funding training in Wales), September 2006 (attending coastal ecology workshop in Germany), October 2006 (monitoring planning training at Brighton University). Silvia will continue working as conservation planning specialist at State Nature Conservation Centre in Matsalu National Park and is a committee member of the Estonian Society for Semi-Natural Communities.

**Marko Volker** is an education specialist at Silma Nature Reserve. He was involved in the project on field-based research in Estonia as an ornithologist and also took part in the two workshops in Estonia. In October 2006 he undertook an environmental education study tour to UK. He currently works for the State Nature Conservation Centre and starting on a new project concerned with the 'Agreement on the Conservation of African-Eurasian Migratory Waterbirds'.

**Hannela Lillepruun**, a student at Tallinn University, took part in field-based training in Estonia in July-August 2005 for her undergraduate dissertation on coastal wetlands monitoring in Estonia (supervised by Elle Puurmann). As part of the Darwin training, she also took part in coastal ecology conference in Poland in June 2006. She is continuing study on coastal ecology in Tallinn University with plans to develop a career in the environmental field.

**Maureen Berg**, the Darwin supported research and technical assistant based at University of Brighton, participated and initiated experimental fieldwork and monitoring in Estonia. Her research results will be the basis for her PhD thesis and associated scientific papers. She also attended and presented study outcomes at several conferences and workshops: the first Darwin Workshop in Estonia (April 2005); the Annual British Ecological Society Meeting (September, 2005); Coastal Ecology workshops (October 2005 & September 2006) and the second Darwin Workshop in Estonia (February 2007). Maureen plans to pursue a career in research on applied ecology and conservation.

## 6. Project Outputs

In nearly all cases, the project achieved, and in some, exceeded the expected outputs: it met its targets for training postgraduates and delivering long-term training for the Estonian Darwin Fellow; two workshops were organised and achieved the target numbers of participants; UK project staff spent the expected time in the host country; a website was established and maintained; a GIS database and species reference collection were substantially enhanced; good press and publicity was achieved in the host country; and dissemination networks were enhanced in Estonia and extended into the Baltic States (Appendix II).

The project achieved additional outputs for a number of its components. It established two additional monitoring stations in Estonia (output code 22), resulting in a total of 8 stations across four sites compared to the targeted six at three. This was in part due to the good value for money achieved in the purchasing of equipment. This led to one extra monitoring plan being produced (code 9) for the additional Darwin site. In addition, the monitoring plans proved so successful that a further plan was produced for an abandoned wetland of conservation interest at Hullo Bay, Vormsi, where restoration management is imminently planned. The Estonian State Nature Conservation Centre is also drafting an analogous monitoring plan for a grassland of botanical value at Diby on Vormsi island, showing that the plan concept and format is being more widely adopted. Additional training of undergraduates was achieved (code 4a) as good in-country networks and Earthwatch publicity attracted students to participate in the summer field courses in Estonia. One Darwin trainee (Maureen Berg) plan to produce a PhD thesis arising from her scientific and technical support for this project. This extra output is due for delivery in December 2007 (code 1a), at no additional expense to the Darwin Initiative. Project dissemination was extended via participation at twice as many conferences (code 14b) as originally anticipated (8 compared to 4) largely as a result of an efficiently managed travel budget. Finally, the project team used and disseminated a greater diversity of training materials (code 7), including species identification sheets for scientists and practitioners; these were also modified for use by school children.

The project team were receptive and responsive to interest and feedback from stakeholders during the project. This indicated during the final year that a management manual (originally planned under code 10) was not a priority as management plans already existed for important wetlands. Instead, stakeholders suggested that case study monitoring plans would be of more use as examples of good practice. Therefore, five of these were produced and disseminated as part of the project (an increase on the three originally planned). Furthermore, discussions with the local community at the Vormsi island Darwin workshop in February 2007 demonstrated that

educational material for school children was highly desirable, so some resources were re-directed to producing and disseminating identification packs based upon knowledge of coastal ecosystem indicators derived from the project (examples of the identification sheets are in Appendix VII). Thus, the planned outputs under code 10 were only partly achieved but were compensated for with enhanced and additional formal documents produced to assist identification, recording and monitoring of coastal wetlands. The target number of papers submitted to peer reviewed journals (code 11a) was also only partly achieved by the end of the project, with three submissions compared to the anticipated number of five. However, two papers were accepted and published with another one requiring revision and two more are in preparation for submission during 2007. Furthermore, it is expected that at least another two papers will be prepared in 2008 from the research that the Darwin project has initiated.

Project outputs have been disseminated via its web site, using the stakeholder email network, during workshops, and with meetings in person as necessary (e.g. landowners). The target audience is primarily represented within the monitoring network established, including Estonian scientists, policy-makers and practitioners, as well as stakeholders from other Baltic countries. The web site and network will be managed by the Estonian State Nature Conservation Centre after the project with reputable, interested organisations (e.g. the local NGO, Läänerannik) also having access to the list of stakeholders. Relevant outputs (e.g. scientific papers) and information (e.g. monitoring data) will be disseminated via the web site and email, while new stakeholders will be able to join by expressing an interest to the State Nature Conservation Centre.

## 7. Project Expenditure

Table 2: Grant expenditure including agreed budget changes.

| Item | Budget | Total expenditure | Variation in expenditure | variance as a % of budget |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## 8. Project Operation and Partnerships

At the beginning of the project, the main local partners were the local NGO, Läänerannik, an environmental organisation aiming to develop sustainable management of the Estonian west coast, and the Silma Nature Reserve and Matsalu National Park authorities (who had drafted the Estonian Biodiversity Strategy). During the course of the project the last two were integrated into the Estonian State Nature Conservation Centre; thus whilst the name of these local partners changed, their role as partners did not. Other partners involved in the project through specialist support, advice and activities were the University of Tartu, Tallinn University, the University of Life Sciences at Tartu, the Estonian Semi-natural Communities Conservation Association, the Estonian Fund for Nature, and Estonian BirdLife. All local partners continue to be active in the field of biodiversity conservation and will maintain and enhance the network of stakeholders initiated and developed by the Darwin project.

The main partners were involved in designing the project and most of the questions targeted were identified in cooperation with main partners and relevant specialist groups before and during the project. Feedback to plans and implementation was also achieved through the project network and at workshops. Due to the ongoing and iterative nature of consultation, it was rarely necessary to modify plans significantly following local consultation. However, local feedback did recommend the production of further monitoring plans and educational material for schools in preference to an original objective to produce a management guide at the end of the project.

Throughout, plans, progress and information was shared with coastal monitoring projects conducted by Estonian universities, the Ministry of Environment (responsible for the Estonian biodiversity planning), and West Estonian local authorities that contribute to national monitoring schemes. This included several site visits to the Darwin project monitoring stations by representatives of these stakeholders. Cooperation with the Baltic Environmental Forum (BEF) also emerged from the evaluation of the first Darwin annual report review. This led to project team members Chris Joyce and Silvia Lotman attending a BEF workshop on Natura 2000 reporting in Lithuania and project outputs were communicated to the Estonian Ministry of Environment to feed into new EU monitoring protocols.

International partners were involved in the project though the two Darwin workshops and also international conferences and workshops where project team members attended and gave presentations. The full list of international contacts is given in Appendix VI of the report. The main international partners provided academic support and information exchange particularly the Coastal Ecology Group at the Universities of Hamburg and Groningen who were working on similar ecosystems. The Project was also supported by nine teams (three each year) of Earthwatch Institute 'Corporate Fellows' or 'Volunteers'. This support totalled 51 people in the field for about twelve days each. Many of these came from three businesses (HSBC, BAT and Diageo) associated with Earthwatch who send selected staff on Earthwatch projects through corporate social responsibility 'employee engagement' programmes. Others were either 'Teacher Fellows' supported by Earthwatch Institute facilitated grants or paying 'volunteers'. Fifteen countries were represented by these Earthwatch Institute teams.

Local partners intend to continue working together to deliver agri-environment and nature conservation management and monitoring for wetland biodiversity after the Darwin project. The integration, in 2006, of separate nature reserve authorities into a national state conservation body with regional sections should further promote continued collaboration and sharing of good practice. In addition, cooperation should be further enhanced as many of the individuals who participated in the Darwin project are now working for the new State authority and/or remain active in voluntary conservation organisations.

## 9. Monitoring and Evaluation, Lesson learning

The project logical framework (Appendix V) provided the primary tool for monitoring and evaluation. Frequent and regular contact between Estonian and UK partners was critical to ensuring that the project log frame was adhered to; this was achieved through email communication, field visits and regular review/strategic meetings in Estonia or the UK. For example, an initial project review took place in the field in August 2004 with progress meetings each summer thereafter involving all of the project partners. In November 2006, all project partners met for a seminar in Brighton to review progress and plan the exit strategy. Annual written reviews of progress took place each year as part of the Darwin reporting process (half-year and year reports), including the current final report at the project conclusion. Evaluation by the Estonian partners took place with UK partners frequently, via email, by face to face meetings between partners at least three times a year (during Earthwatch field teams and Darwin training courses), and formally by workshops, review meetings, and Darwin annual reports.

The project achieved the progress indicators shown in the log frame: all research and monitoring data were shared amongst Estonian stakeholders after each field season; monitoring guidelines have been adopted within management planning at the study sites; wetland monitoring information and data are available on the project website; the two Darwin workshops attracted over 30 active Estonian participants (including representatives from all organisations undertaking monitoring); educational and capacity-building material was disseminated to stakeholders; and management has been restored to all coastal wetland study areas comprising approximately 430ha. The quantity and quality of monitoring data collected provided a useful baseline measure of project progress. Evaluation of these data indicated that the plant and bird database exceeded targets with, for example, 144 vegetation quadrats established compared with the original aim of 96 quadrats. Unfortunately, the target to achieve continuous hydrological data logging was hampered by cattle damage to equipment, despite the fencing, and insurmountable technical problems.

Milestones in the project design and implementation also serve as key points for monitoring and evaluation. These included the two workshops that disseminated information and facilitated review and evaluation; the first was used to evaluate project aims and objectives whilst the second reviewed monitoring data, plans and other outputs. The successful establishment of the project website and eight field monitoring stations were also milestones, while the monitoring plans were widely circulated to stakeholders in several draft forms for evaluation and review.

There were three main challenges to progress during the project: (1) the updating and editing of the project web page did not run smoothly in the beginning of the project due to unanticipated technical and access issues. The problems were overcome after the first Darwin annual report. However, difficulties with the web-pages emerged again in the final stage of project when the site was removed from the Vormsi island community host to the State Nature Conservation Centre server. This move was important to ensure the availability of the information on the site, but IT problems with moving the site are still being discussed with the local partners with a view to a long-term solution. In addition, the project web site was originally planned to include a Discussion/Comments forum inviting feedback, but due to a spate of Internet spamming in Estonia (some politically initiated from Russia) the forum was taken down and feedback from workshops and field-work was given by email instead. (2) The installation and maintenance of monitoring equipment (especially data loggers) in the field was far more difficult than anticipated due to severe weather conditions, software problems, cattle damage,

and some vandalism. This delayed data collection during the project and resulted in interrupted data collection. Some of the problems were overcome by re-installing and recalibrating equipment following advice from the manufacturers. However, the loggers will remain in the field as planned and will continue to collect data beyond the end of the project. (3) Attempts to engage some coastal wetland resource stakeholders proved difficult despite persistent attempts during the project. In particular, some landowners and farmers were reluctant to give time to the project while absentee, overseas landlords represented a significant obstacle. The project team regularly evaluated the success of its outreach into relevant communities in meetings and workshops and consistently found that the project achieved a high profile within the scientific and conservation sectors but did not penetrate as far as required into the farming or landowner communities. Attempts at overcoming this issue were made by inviting land managers to workshops and inviting them to visit the monitoring sites but, unless they already had an interest in nature conservation, uptake was very weak. It was concluded that a range of innovative inducements, or persistent one-to-one efforts to reach key individuals, may be more effective. However, this proved beyond the resources and time frame of this project, especially as many absentee landowners live abroad (e.g. in Sweden and Germany).

External evaluation of the project involved the Darwin annual report reviews and the annual review of the Earthwatch 'volunteer' component of the project. For the latter, all volunteers were invited to feedback during and after their experience of the project using a standard Earthwatch protocol. Volunteer assessment was consistently positive and highlighted that, in many cases, the experience had stimulated their appreciation of the environment, of the need for its sustainable management and the part they could play in this in future through their place of work and/or local community. Three additional assessment visits by Earthwatch staff were an additional part of the evaluation procedure as they gave feedback during and after their visits to the project team.

A key lesson drawn from the experience of this project is the need to nourish the project partnership. Thus, project design, implementation and management should be in collaboration where possible, such that partners have a strong sense of shared ownership. This should include partners and individuals feeling responsible enough to be able to show initiative when required and to maintain lines of communication, including especially when challenges arise. Projects require built in flexibility and partnerships should be prepared to adapt to delays and difficulties, as well as responding to new opportunities. It is also important to demonstrate progress in the host country and here local representatives (e.g. Darwin fellows) are important as the recognisable face and contact point for communities.

**10. Actions taken in response to annual report reviews**

The two Darwin annual report reviews were both very positive; actions were taken in response to all issues raised. The first year's review was immediately circulated to all partners by email and subsequently discussed in project review meetings in Estonia in July and August 2005. As recommended, contact was made with the Baltic Environmental Forum (BEF), which led to successful and ongoing cooperation. Initial meetings were followed by an invitation by the BEF to participate in a seminar to establish grassland monitoring protocol for the Baltic States. Project team members Joyce and Lotman were able to disseminate information on monitoring wet grasslands from the Darwin project. Also, as proposed in the review, the opportunity presented by the efficient use of travel funds was taken and an additional Estonian team member was invited to the UK for personal capacity building. Thus, Marko Valker spent approximately seven days in Southern England reviewing good practice for promoting wetlands (eg at English Nature managed National Nature Reserves) as educational, amenity and monitoring resources. Also following the review, the project web site was improved by uploading more information and eliminating non-functional links.

The review of the second year annual report did not raise any issues that required action but the report was also circulated amongst partners by email and discussed at a review meeting in July 2006.

## 11. Darwin Identity

The project was promoted as a Darwin project in Earthwatch public lectures and publications, including the Earthwatch website and annual review 2006, as well as all project specific publications and the project's website, which linked to the Darwin Initiative web pages. Scientific publications acknowledge Darwin Initiative funding and will continue to do so as papers are produced. All educational materials produced during the project feature the Darwin logo (see Appendix VII for an example) as does the project web site. The Darwin Initiative logo is also prominently displayed on interpretation signs at each of the permanent monitoring stations in Estonia. The two project workshops were branded as Darwin Initiative meetings with the logo displayed on slides and paperwork. The Darwin Initiative was promoted as a supporter of the project in all outreach to the Baltic wetlands stakeholder network, including emails and workshop displays, as well as to the wetlands and biodiversity scientific community at national and international conferences. Darwin Initiative support was acknowledged in all press releases and articles, one radio interview, and one feature in the Life-Nature film. The title Darwin Fellow was given to and used by the full-time Estonian project team-member Silvia Lotman. The aims and activities of the Darwin Initiative were introduced during the two Estonian workshops.

Although the Darwin Initiative project benefited from the Earthwatch funding model and the two projects were synergistic, in Estonia and amongst the Baltic network the Darwin project was recognised as having a distinct identity. This was because the project team focussed publicity and outreach for Darwin to promote the biodiversity and monitoring elements of the larger wetland programme.

## 11. Leverage

The Earthwatch Institute provided £55,269 through their 'volunteers' in the field. Dr Chris Joyce was awarded two grants, facilitated by the Earthwatch Institute, to support the Estonian field work. These were £6000 from AVIVA to purchase monitoring equipment to improve the range of the data output from the Darwin monitoring stations and £5000 from the Vodafone Foundation to purchase communications equipment to enhance health and safety in the field and mammal monitoring. Additional funds were supplied by the University of Brighton to support research activities during the project. This was comprised of approximately £5000 from the School of the Environment for post-graduate student support, £2750 from the Geography Division Research Development Fund for analysis of bird monitoring data collected in Estonia, and £600 from the Biology Division (via the EU Socrates programme) to support undergraduate monitoring of small mammals in Estonia.

*Future funds to develop the work in Estonia have been under consideration between the project partners and formed an item in the exit strategy meeting between all partners as well as a focus for discussion during the second workshop. One step for strengthening the capacity of partners was to send Darwin Fellow Silvia Lotman to European Union structural funds training organised by RSPB Wales in March 2006. The training gave a good knowledge of the European Union funding opportunities to Estonian partners, and was subsequently disseminated to the project team.* In addition, *Roger Mitchell* (Earthwatch Institute) *also attended the* European Funding for Nature Conservation Workshop (organised by Nature International, Eurosite and Natural England) in Warsaw in April 2007.

## 13. Sustainability and Legacy

The project had a clear vision of its exit strategy to ensure its legacy from the outset; this was reinforced during a meeting of all partners in Brighton in November 2006. The exit strategy has two mutually supportive elements; the enhanced capacity within Estonian partners to continue effective monitoring and Earthwatch volunteer input to provide long-term field support.

The project has delivered sufficient facilities and stakeholder network support, complemented by monitoring and management data, to the Estonian partners for monitoring of priority wetlands in west Estonia to be continued efficiently. Project partners will be able to develop existing, and produce new, management and monitoring plans. Additionally, they will be able to use information gained during the project to support educational and publicity materials (e.g. leaflets, maps, guides) and raising awareness for visitors longer-term. Indeed, one of the main partners, Läänerannik, use and disseminate Darwin-supported information in their continuing efforts to develop sustainable management of west Estonian coastal resources while the other main partner, the State Nature Conservation Centre, will take a leading role in maintaining monitoring stations and the Darwin project web site, aided by the number of its employees who received training from the Darwin project. The State Nature Conservation Centre is also extending the use of monitoring plans to non-Darwin sites (e.g. Diby on Vormsi island) and into revised management plans, demonstrating the successful acceptance of the concept. Research on biodiversity indicators, disseminated via the project web site, reports, and in scientific publications, will enable organisations working in wetlands to prioritise and focus their monitoring efforts. The project legacy would be improved if those difficult-to-engage sectors of the wetland community could be reached more effectively, particularly the absentee landowners. Also, project outputs were not embedded into Estonian environmental policies as readily as had been anticipated. Unfortunately this was constrained by the slow pace of policy reform, complicated by accession to the European Union and subsequent internal reorganisations of the statutory sector. Nevertheless, agri-environment policy developments are ongoing and the State Nature Conservation Centre is well placed to incorporate Darwin project outputs into revised land management and compensation schemes.

Earthwatch's unique model of volunteer engagement has proven to be a sustainable means of supporting long-term monitoring programmes. Thus, following development and establishment of methods and practice during the Darwin project, monitoring will be sustained through the use of Earthwatch volunteers in partnership with Estonian stakeholders. Training of Estonian team-members during this project has provided a nucleus of stakeholders capable of becoming Earthwatch project leaders in future years.

One consequence of workshop discussions and Estonian training and capacity-building is the emergence of a potential network of Baltic state partners working towards an application for funding (e.g. from the European Union). Discussions of mutual interests and potential themes are ongoing and possible donors are under consideration. Project partners maintain regular contact via email and field visits (via Earthwatch funds) and are seeking to develop new project ideas to continue biodiversity monitoring support for the Estonian national system. Project partners and other organisations have expressed interest in extending the monitoring protocol and testing it in new environments, including enthusiasm from the international, environmental NGOs, Earthwatch Institute, Eurosite, Natura International, to participate in building wetland monitoring in the Ukraine with host country partners the Black Sea Biosphere Reserve and the Institute of Ecology of the Carpathians.

## 14. Value for money

The project represents excellent value for money. Support from Darwin leveraged additional funding from Earthwatch volunteers and corporate fellows who contributed to their participation on the field project in west Estonia. The Earthwatch model also enhanced the project legacy to add further value as volunteer field teams to implement wetland monitoring are to continue (e.g. three teams of 18 volunteers in summer 2007). The project achieved value for money as the £177,765 requested from the Darwin Initiative unlocked a further £219,670 in cash or in kind from individuals, Earthwatch, Diageo Foundation, HSBC Holdings plc, Vodafone, AVIVA, EU Socrates and the University of Brighton. Furthermore, the project made use of existing equipment and facilities generated by Earthwatch expeditions or owned by the University of Brighton or Estonian partners where possible, including communications equipment, computers, tools, field guides, and stationery.

Wherever possible, the project was resourced by procurement in Estonia, not only to achieve good value for money but also to benefit local communities. For example, as much field and

office equipment and services as possible were sourced from environmentally-responsible suppliers in west Estonia. Capital items over £1,000 were subject to a competitive quotation process, and items over £10,000 to competitive tender. The project also optimised resource use by utilising electronic information dissemination and communication whenever possible.

## 15. Appendix I: Project Contribution to Articles under the Convention on Biological Diversity (CBD)

| Project Contribution to Articles under the Convention on Biological Diversity | | |
|---|---|---|
| **Article No./Title** | **Project %** | **Article Description** |
| **5. Cooperation** | 5 | Cooperating for the conservation and sustainable use of biological diversity. |
| **6. General Measures for Conservation & Sustainable Use** | 5 | Develop national strategies that integrate conservation and sustainable use. |
| **7. Identification and Monitoring** | 20 | Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data. |
| **8. (j) In-situ Conservation** | 5 | Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources. |
| **9. Ex-situ Conservation** | 0 | Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources. |
| **10. Sustainable Use of Components of Biological Diversity** | 10 | Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector. |
| **11. Incentive Measures** | 0 | Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity. |
| **12. Research and Training** | 20 | Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations). |
| **13. Public Education and Awareness** | 5 | Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in |

| | | |
|---|---|---|
| | | developing awareness programmes. |
| **14. Impact Assessment and Minimizing Adverse Impacts** | 10 | Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage. |
| **15. Access to Genetic Resources** | 0 | Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits. |
| **16. Access to and Transfer of Technology** | 0 | Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies. |
| **17. Exchange of Information** | 10 | Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge. |
| **18. Technical and scientific cooperation** | 5 | International technical and scientific cooperation in the field of conservation and sustainable use of biological diversity. |
| **19. Bio-safety Protocol** | 0 | Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research. |
| **22. Relationship with other international conventions** | 5 | |
| **Total %** | **100%** | |

## 16. Appendix II Outputs

| Code | Total to date | Detail |
|---|---|---|
| **Training Outputs** | | |
| 1a | Number of people to submit PhD thesis | 1 (Maureen Berg) |
| 4a | Number of undergraduate students receiving training | 8 (Hannela Lillepruun, Catheline Tamm, Diana Tamm, Amy Wheeler, Louis Hadjioannou, Raymond Ward, Laure Vogel, Elo Raspel) |
| 4b | Number of training weeks provided to undergraduate students | 25 |
| 4c | Number of postgraduate students receiving training | 6 (Maureen Berg, Pirje Pappel, James Phillips, Kaili Kattai, Marge Laane, Triinu Tõrv) |
| 4d | Number of training weeks for postgraduate students | 60 |
| 5 | Number of people receiving other forms of **long-term** (>1yr) training not leading to formal qualification( i.e not categories 1-4 above) | 1 (Silvia Lotman) |
| 6a | Number of people receiving other forms of **short-term** education/training (i.e not categories 1-5 above) | 35 (Estonian and Baltic stakeholders attending workshops and demonstrations) |
| 6b | Number of training weeks not leading to formal qualification | 1 week = 2 workshops of 3 days each |
| 7 | Number of types of training materials produced for use by host country | 4 (field guides, monitoring plans, website and educational material for school children) |
| **Research Outputs** | | |
| 8 | Number of weeks spent by UK project staff on project work in host country | 68 |
| 9 | Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country | 5 (monitoring plans) |
| 10 | Number of formal documents produced to assist work related to species identification, classification and recording. | 3 (species identification guides for school children) |
| 11a | Number of papers published or accepted for publication in peer reviewed journals | 2 (with 3 more in preparation) |
| 12a | Number of computer-based databases established (containing species/generic information) and handed over to host country | 1 (website with integrated database as focal point for wetland monitoring) |
| 12b | Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country | 1 (integrated GIS database) |
| 13b | Number of species reference collections enhanced and handed over to host country | 1 (botanical herbarium) |

| | | |
|---|---|---|
| **Dissemination Outputs** | | |
| 14a | Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work | 2 (workshops organised) |
| 14b | Number of conferences/seminars/ workshops **attended** at which findings from Darwin project work will be presented/ disseminated. | 10 (in Estonia, UK, Lithuania, Germany, USA, Malta and Australia) |
| 15a | Number of national press releases or publicity articles in host country(s) | 3 (2 press releases + 1 published interview with Roger Mitchell) |
| 15b | Number of local press releases or publicity articles in host country(s) | 2 (1 local article + 1 presentation to locals) |
| 15c | Number of national press releases or publicity articles in UK | Press release by Earthwatch (May 2004)<br>Article in Earthwatch annual report (2005) |
| 15d | Number of local press releases or publicity articles in UK | 1 article in University of Brighton magazine (Channel) |
| 17a | Number of dissemination networks established | 1 (dissemination network of Baltic stakeholders established) |
| 17b | Number of dissemination networks enhanced or extended | 1 (dissemination network of Estonian stakeholders enhanced) |
| 18a | Number of national TV programmes/features in host country | 1 (feature in EU Life-Nature film about local semi-natural communities in Estonian and English) |
| 18c | Number of local TV programme/features in host country | 1 (as above; this received local dissemination as a DVD) |
| 19a | Number of national radio interviews/features in host country | 1 interview for radio environmental news |
| **Physical Outputs** | | |
| 20 | Estimated value (£s) of physical assets handed over to host country(s) | £36 000 (monitoring equipment and infrastructure, reference material, office equipment and hardware) |
| 22 | Number of permanent field plots established | 8 (integrated permanent wetland monitoring stations, including 144 permanent vegetation plots and hydrological recording equipment) |
| 23 | Value of additional resources raised for project | £58,619 in cash and £161,051 in kind.<br>(Earthwatch: £15,551 kind;<br>Earthwatch vols: £29,769 cash, £25,500 kind;<br>University Brighton: £8,550 cash, £103,000nkind;<br>Estonian partners: £17,000 in kind;<br>Corporate (AVIVA, Vodafone, HSBC, Diageo): £20,300 in cash) |

## 17. Appendix III: Publications

Mark (*) all publications and other material that you have included with this report (attached as separate pdf)

| **Type *** (e.g. journals, manual, CDs) | **Detail** (title, author, year) | **Publishers** (name, city) | **Available from** (e.g. contact address, website) | **Cost £** |
|---|---|---|---|---|
| Article | Joyce, C.B. and Burnside, N.G. (2004) Baltic coastal wetlands: back from the brink? National Wetlands Newsletter, 26, 11-15 | Environmental Law Institute, Washington DC, USA | http://vormsi.lk.ee/darwin/index.php?lang=english&teema=researchers&ala=articles | None |
| Article* | Burnside, N.G., Joyce, C.B., Puurmann, E. and Scott, D.M. (2007) Use of vegetation classification and plant indicators to asses grazing abandonment in Estonian costal wetlands. Journal of Vegetation Science, 18, 645-654 | IAVS, Opulus Press, Uppsala | | None |

## 18. Appendix IV: Darwin Contacts

| | |
|---|---|
| **Project Title** | *Establishing biodiversity monitoring networks to inform Estonian coastal wetland management* |
| **Ref. No.** | *162/13/013* |
| **UK Leader Details** | **Earthwatch Institute (Europe)** |
| Name | Dr Roger Mitchell |
| Role within Darwin Project | Darwin Project Leader |
| Address | Earthwatch Institute (Europe), 267 Banbury Road, Oxford OX2 7HT, UK |
| Phone | |
| Fax | |
| Email | |
| **Other UK Contact** | |
| Name | Dr Chris Joyce |
| Role within Darwin Project | Scientific project leader |
| Address | School of the Environment, University of Brighton, Cockcroft Building, Lewes Road, Brighton. BN2 4GJ. UK |
| Phone | |
| Fax | |
| Email | |
| | |
| **Partner 1** | |
| Name | Meelis Mägi |
| Organisation | NGO Läänerannik |
| Role within Darwin Project | Head of NGO Läänerannik – logistics |
| Address | Vormsi, Hullo; Lääne County, Estonia |
| Fax | |
| Email | |
| **Partner 2** | |
| Name | Elle Puurmann |
| Organisation | State Nature Conservation Centre |
| Role within Darwin Project | Environmental specialist |
| Address | Vormsi, Rumpo; Lääne County, Estonia |
| Fax | |
| Email | |

**Appendix V: Report of progress and achievements against Logical Framework**

| ***Project summary*** | ***Measurable Indicators*** | ***Progress and Achievements*** | ***Actions required/planned for next period*** |
|---|---|---|---|
| **Goal*:*** To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve<br>• The conservation of biological diversity,<br>• The sustainable use of its components, and<br>• The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources | | | |
| ***Purpose*** (insert original project purpose statement)<br><br>A network of people and sites for coastal wetland monitoring established to inform Estonian (and Baltic) management plans and environmental policies<br>Key ecosystem indicators identified for effective monitoring and comparing change in managed and neglected coastal wetlands<br>Coastal wetlands conserved through sustainable use and informed management | (insert original purpose level indicators)<br><br>Research findings and monitoring data shared amongst Estonian (WEABR) stakeholders<br>Monitoring guidelines adopted in WEABR management plans<br>Wetland monitoring database and information on key indicator species incorporated into website<br>Attendance of Estonian stakeholders at workshops<br>Management manual disseminated to extended network (Baltic stakeholders)<br>Enhanced management on WEABR coastal wetlands | (report impacts and achievements resulting from the project against purpose indicators – if any)<br><br>*All data disseminated to WEABR stakeholders*<br>*Indicator species information and monitoring data on web site*<br>*Five monitoring plans produced and disseminated to Baltic stakeholders*<br>*Restoration/conservation management implemented at all study sites*<br>*35 stakeholders attended workshops*<br>*Peer-reviewed paper on ecosystem indicators published* | (report any lessons learned resulting from the project)<br><br>*Some stakeholders difficult to reach, particularly absentee landlords.*<br>*Monitoring more resource-intensive and problematic than anticipated, e.g. technical difficulties, damage by cattle.* |
| ***Outputs*** | | | |

| (insert original outputs – one per line) | (insert original output level indicators) | (report completed activities and outcomes that contribute toward outputs and indicators) | (report any lessons learned resulting from the project) |
|---|---|---|---|
| People network and monitoring sites established and integrated for sustained monitoring programme | Monitoring equipment in place at 3 reserves; 3 monitoring plans produced<br>Stakeholders contacted by email<br>Vegetation data collated from 96+ quadrats annually<br>Bird and small mammal species and activity recorded annually | *Equipment installed and maintained at 4 reserves; 5 monitoring plans produced*<br>*Stakeholders contacted by email/meetings*<br>*Vegetation data collated from 144 quadrats*<br>*Bird species and small mammal activity surveyed and data collated annually* | *Monitoring stations are robust but can be damaged and temperamental; they need to be checked, repaired and calibrated regularly*<br>*Some stakeholders difficult to engage* |
| Effective practice for coastal wetland monitoring (including key biodiversity indicators) disseminated | Management manual produced<br>2 annual and 1 final report<br>Website launched in year 1<br>2 workshops held | *Background research on wetland monitoring/management completed*<br>*Website maintained*<br>*Reports completed*<br>*2 workshops held* | *Web site is resource-intensive to maintain*<br>*Management manual considered unnecessary by stakeholder network, who preferred practical monitoring examples* |
| Biodiversity indicators for coastal wetland ecosystems identified | Scientific quality of output evaluated by peer-review of submitted papers | *1 paper (plants) published*<br>*1 paper (mammals) needs reviewing*<br>*2 papers (birds) in preparation* | |

## Appendix VI: Project contacts workbook

**Network contacts – international contacts during organised Darwin workshops and presentations in international conferences**

| name | organisation | position | town/country |
|---|---|---|---|
| Ainars Aunins | Latvian Fund for Nature | Project coordinator | Riga/Latvia |
| Alma de Groot | University of Groningen | Community and conservation ecologist | Haren/The Netherlands |
| Daina Indriksone | Baltic Environmental Forum, Latvia | Project manager | Riga/Latvia |
| Dalyte Matuleviciute | Institute of Botany, Lithuania | Scientific worker | Vilnius/Lithuania |
| Ester Chang | University of Groningen | Community and conservation ecologist | Hamburg/Germany |
| Gesine Engels | University of Hamburg | Community and conservation ecologist | Hamburg/Germany |
| Gronewold Britta | Nationalparkhaus Hiddensee | Scientist | Vitte/Germany |
| Heemann Sonja | University of Hamburg | Community and conservation ecologist | Hamburg/Germany |
| Hellwig Ullrich | Institute fur angewandte Umwelt-biologi und monitoring | Scientist | Wremen/Germany |
| Iiro Ikonen | Southwest Finland Regional Environment Centre | project coordinator | Turku/Finland |
| Inga Sostakiene | Baltic Environmental Forum, Lithuania | Project assistant | Vilnius/Lithuania |
| Jan Bakker | University of Groningen | Community and conservation ecologist | Haren/The Netherlands |
| Jan Barkowski | Institute of chemistry and biology of the marine environment | scientist | Oldenburg/Germany |
| Jensen Kai | University of Hamburg | Community and conservation ecologist | Hamburg/Germany |
| Joenje Wouter | University of Groningen | Community and conservation ecologist | Haren/The Netherlands |
| Jolanta Stankeviciute | Institute of Botany, Lithuania | Doctor | Vilnius/Lithuania |
| Liene Salmina | Latvian Fund for Nature | Habitat expert, Project manager | Riga/Latvia |
| Ludewig Kristin | University of Hamburg | Community and conservation ecologist | Hamburg/Germany |
| Mahlmann Claudia | University of Hamburg | Community and conservation ecologist | Hamburg/Germany |
| Mark Bertness | University of Groningen | Community and conservation ecologist | Haren/The Netherlands |
| Martins Grikis | Latvian Environment, Geology and | Ecologist | Riga/Latvia |

| name | organisation | position | town/country |
|---|---|---|---|
| | Meteorology Agency | | |
| Metzing Detlev | Institut fur Biologie und Umweltwissenschaften | Scientist | Oldenburg/Germany |
| Mora Aronsson | Swedish Species Information Centre | Coordinator | Uppsala/Sweden |
| Morkevenas Zymantas | Baltic Environmental Forum, Lithuania | Co-ordinator in Lithuania | Vilnius/Lithuania |
| Nicole Feige | University of Oldenburg | scientist | Oldenburg/Germany |
| Petra Daniels | University of Groningen | Community and conservation ecologist | Haren/ The Netherlands |
| Piec Daniel | Natura International | Project manager | Poland/UK |
| Piernik Agnieska | Institute of Ecology and Environment Protection | Scientist | Torun/Poland |
| Sandra Burmeier | University of Hamburg | Community and conservation ecologist | Hamburg/Germany |
| Scheepens Niek | University of Groningen | Community and conservation ecologist | Haren/The Netherlands |
| Schrader Stefan | University of Oldenburg | Scientist | Oldenburg/Germany |
| Seppo Ekelund | University of Gotland | ornithologist | Öland/Sweden |
| Shoenberg Wiebke | University of Hamburg | Community and conservation ecologist | Hamburg/Germany |
| Sieberling Stefan | Klinik und Poliklinik fur Kinder und Jugendmedizin | Scientist | Greifswald/Germany |
| Solvita Rusina | Faculty of Geography and Earth Sciences, University of Latvia | Scientist | Riga/Latvia |
| Stahl Julia | University of Oldenburg | Scientist | Oldenburg/Germany |
| Stock Martin | National Park Schleswig-Holstein | Scientist | Toenning/Germany |
| Suchrow Sigrid | University of Hamburg | Community and conservation ecologist | Hamburg/Germany |
| Tomas Tukaciauskas | Lithuanian Fund for Nature | Nature specialist | Vilnius/Lithuania |
| Valda Baronina | Latvian Environment Agency | Database manager | Riga/Latvia |
| Valerijus Rasomavicius | Institute of Botany, Lithuania | Head of laboratory | Vilnius/Lithuania |
| Van der Graaf Sandra | University of Groningen | Community and conservation ecologist | Haren/The Netherlands |
| Van Duin Willem | University of Groningen | Community and conservation ecologist | Haren/The Netherlands |
| Van Wesenbeck Bregje | University of Groningen | Community and conservation ecologist | Haren/The Netherlands |
| Wanner Antonia | University of Hamburg | Community and conservation ecologist | Hamburg/Germany |

| name | organisation | position | town/country |
|---|---|---|---|
| Veen Ciska | University of Groningen | Community and conservation ecologist | Haren/The Netherlands |
| Veeneklaas Roos | University of Groningen | Community and conservation ecologist | Haren/The Netherlands |
| Yzaak de Vries | University of Groningen | Community and conservation ecologist | Haren/The Netherlands |
| Glenn R Guntenspergen | US Geological Survey | Senior Landscape Ecologist | Madison, USA |

In addition to the contacts in the table above, 51 Earthwatch Institute 'Volunteers' comprising nine teams, worked on the project over the three years (see Section 8). These represented the following 15 countries: Mexico, Bermuda, USA, UK, Turkey, India, France, The Netherlands, Malaysia, China, Canada, Malta, Indonesia, Jamaica and Japan.

## Appendix VII: Examples of project outputs

See six jpgs attached.

## Appendix VIII: Monitoring plan for Rumpo

# Monitoring plan **(by Silvia Lotman, January 2007)**

# *Rumpo peninsula*

**Fact sheet:**

| | | Area |
|---|---|---|
| **Site** | **Rumpo, Vormsi Island** (58ţ57'442" N; 23ţ17'240"E) | **79ha** |
| **Owner** | 80% state owned; 20% privately owned | |
| **Key Habitats (Habitats Directive codes)** | *Nordic alvar and precambrian calcareous flatrocks (6280)*<br>*Boreal Baltic coastal meadows (1630)*<br>*Fennoscandian lowland species-rich dry to mesic grasslands (6270)* | |
| **Protection & projects** | Vormsi Landscape reserve as part of State Nature Reserve Centre<br>Väinameri project (2000-2003)<br>Earthwatch project (since 2002)<br>Life Nature project (2003-2006)<br>Darwin Initiative project (2004-2007) | |

**Management history:** Before 2000 the site was largely abandoned and re-introduction of cattle was carried out by Väinameri project. In 2006 the grazing of Rumpo peninsula was done by sheep, cattle and horses in different parts of the peninsula.

**Threats/ problems:**
Overgrowth by junipers and reed.

**Management aims:**
To keep the mosaic of junipers and open grassland.

**Management objectives:**
To continue management by diverse grazing.

**Monitoring history:**
Monitoring of Rumpo coastal grassland has been since 1999 an objective to state monitoring, carried out by Elle Roosaluste; monitoring reports are available on http://eelis.ic.envir.ee.

**Monitoring aims:** To monitor the state of grassland as habitat and the state of protected species.

**Monitoring techniques used in Earthwatch project**

*Plant surveys done since 2002*

1 Factor: Plant community composition.
2 Attribute: Abundance of indicator species in relation to management practices (abandonment and reinstating management) and environmental variables (e.g. water level, soil moisture, conductivity, pH).
3 General background: Monitoring started in 2003 during the Earthwatch project.
4 Methodology

a) Equipment: 1 x 1 m flexi-quadrat; metal detector; pen and standard recording form (see annex 1).

b) Location of sample collection: Fixed quadrats are marked on Rumpo grassland.
c) Fixed point markers: Each quadrat is marked by 1 metal pole in soil, which are found with the metal detector. The quadrats are fenced to avoid disturbance by large mammals (cows, wild boar, etc). Marker maintenance is carried out at the same time as data collection.
d) Sampling technique: All sampling should be done in groups at least with two persons at the same time, species and other data are recorded to standard recording form and names of recorders are noted.
e) Unit of measurement: Percentage cover for bare ground, litter, and plant species, height in cm, and count of number of flowering plants.
f) Sample type/specification: Dataset consists of recordings of all plant species, number of flowering plants, bare ground, moss and litter cover estimates.
g) Sampling period: June-August.
h) Frequency of sampling during sampling period: 2 sets of data are collected.
i) No. of samples collected during sampling period: Only 1 set of data is collected.
j) Repeat interval: Annual.
k) Special considerations: Note that fences need checking and maintenance.

5 Data management
a) Identification of data format: Data are recorded on the field sheets (annex 1) and then entered to an excel spreadsheet.
b) Location of data: All data are shared between the School of the Environment, University of Brighton, UK, and the State Nature Conservation Centre, Estonia, including the excel spreadsheets and GIS.
c) Data security: Copies of data are stored by two parties (see 5b).
d) Analytical technique: Comparisons of mean values.

6. Reporting/circulation of reports: Each annual report of Earthwatch project incorporates results for the field season and comparisons with previous years. Reports are circulated to all participants of field work and on the Darwin project web site (www.vormsi.ee/darwin/). The reports and monitoring plans will be disseminated to any interested organisation.

7. Risk assessment: Cattle will normally be on site during the sampling period – no particular risks are associated with cattle. Electric fences may be present on site.

*Bird surveys done since 2002*

1 Factor: Bird communities and populations.
2 Attribute: Abundance of birds including indicator species in relation to management.
3 General background: monitoring with this method started in 2003 during the Earthwatch project.
4 Methodology
a) Equipment: GPS, compass, binoculars, recording form (annex 2), pen.
b) Location of sample collection: Transects running from forest edge to shore are marked on map (see Annex 4).
c) Fixed point markers: No other fixed markers than GPS points are used.
d) Sampling technique: All sampling should be done in groups of at least three persons, species of birds are recorded to standard recording form and names of recorders are noted. Recorders begin every transect by marking bearing, GPS point and start time of transect. All transects should be done between 6 am and 11 am. One of recorders has to be measuring (e.g. pacing) the distance from transect start while other recorders seek for birds in 100 m radius. Distance to bird, angle, species, number of birds, time and activity are marked.
e) Unit of measurement: number of birds.
f) Sample type/specification: Dataset consists of recordings of all species and their locations in sampling area.
g) Sampling period: June-August.
h) Frequency of sampling during sampling period: Only 1 set of data is collected.
i) No. of samples collected during sampling period: At least 1 set of data is collected.

j) Repeat interval: Annual.
k) Special considerations: The group of recorders has to divide tasks before beginning the transect. At least one of the recorders has to be skilled in bird identification.

5. Data management
a) Identification of data format: Data are recorded on the field sheets (annex 2) and then entered to an excel spreadsheet.
b) Location of data: All data are shared between the School of the Environment, University of Brighton, UK, and the State Nature Conservation Centre, Estonia, including the excel spreadsheets and GIS.
c) Data security: Copies of data are stored by two parties (see 5b).
d) Analytical technique: comparisons of mean values.

6. Reporting/circulation of reports: Each annual report of Earthwatch project incorporates results for the field season and comparisons with previous years. Reports are circulated to all participants of field work and on the Darwin project web site (www.vormsi.ee/darwin/). The reports and monitoring plans will be disseminated to any interested organisation.

7. Risk assessment: Cattle will normally be on site during the sampling period – no particular risks are associated with cattle. Deep water (>50cm) may be present locally on site – wear rubber boots and/or avoid deep water.

*Hydrological and soil monitoring done since 2005*

1 Factor: Hydrological and soil parameters.
2 Attribute: Abiotic conditions on wetland/grassland.
3 General background: Monitoring with this method started in 2004 (water levels) and 2005 (other parameters) during the Earthwatch and Darwin projects.
4 Methodology
a) Equipment: soil parameters are recorded by DOT data logger (see details: http://www.stevenswater.com/catalog/stevensProduct.aspx?SKU=%2793273%27), water levels are recorded by Valeport Model 740 (see details: http://www.valeport.co.uk/tides.htm#model740). Portable computer with TideLog software.
b) Location of sample collection: Two each of data loggers are situated on Hosby grasslands inside of fences for marking plant monitoring quadrats.
c) Fixed point markers: The data loggers are fixed and do not need additional marking.
d) Sampling technique: All sampling is done automatically by data loggers. Data are downloaded from loggers as needed.
e) Unit of measurement: Water level (cm), pH (mv), temperature ($^0$C), conductivity (ms), soil moisture (%).
f) Sample type/specification: Dataset consists of recordings of water level, pH, temperature, soil moisture and conductivity (salinity).
g) Sampling period: All year.
h) Frequency of sampling during sampling period: Every 60 min.
i) No. of samples collected during sampling period: See above.
j) Repeat interval: Annual (Continuous).
k)Special considerations: Batteries of data loggers last a maximum of three years. After extreme weather conditions it is good to re-calibrate loggers. Manuals of data logger maintenance should be at hand for recorders.

5. Data management
a) Identification of data format: Data are downloaded via TideLog software to computer and can be converted to Excel.
b) Location of data: Data are shared between the School of the Environment, University of Brighton, UK and the State Nature Conservation Centre, Estonia.
c) Data security: Copies of data are shared by two parties (see 5b).
d) Analytical technique: Excel graphs.

6. Reporting/circulation of reports: Each annual report of Earthwatch project incorporates results and comparisons with previous years. Reports are circulated to all participants of field work and on the Darwin project web site (www.vormsi.ee/darwin/). The reports and monitoring plans will be disseminated to any interested organisation.

7. Risk assessment: Cattle will normally be on site during the sampling period – the maintenance of equipment should ensure that cattle do not damage the data loggers. Information signs should be erected for people not aware of monitoring in the area.

**Annex 1 Vegetation recording form**

**Annex 2 Bird recording form**

**Annex 3 Indicator species lists**

**Annex 4 Map of study area and monitoring locations**

**Annex 5 Archive maps of management**