

**DARWIN INITIATIVE FOR THE SURVIVAL  
OF SPECIES**

***Lobarion* lichens as indicators of primeval forests  
in Carpathians**

**(Project 162/6/111)**

**FINAL REPORT**

Prepared by  
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December 2002

Report to DETR

## DARWIN INITIATIVE

### FINAL REPORT

#### 1. Basic Project Details

Project Title

*Lobarion* Lichens as Indicators of Primeval Forests in Eastern Carpathians (Ukraine)

Contractor

Royal Botanic Garden Edinburgh

Host country collaborating institute(s)

M.G. Kholodny Institute of Botany of the National Academy of Sciences of Ukraine,  
2 Tereshchenkivska str.2, 252601 Kiev-MSP-1, Ukraine

Grant Round: 5

Grant Value: £99,450

#### 2. Project Expenditure

- Total grant expenditure: £90187.11
- Breakdown of expenditure (using expenditure categories in the original application form)

Explain any variations in expenditure +/- 10%

All expenditure has been close to the sums envisaged in the original application, with one major exception. This is the allocation of £8000 for the printing of the anticipated 'Monograph'. For explanations see below under Sections 5 and 10, and Appendix 3.

### 3. Project Background/Rationale

Why was the project needed? Please explain the project development process.

At the time the project proposal was made, several needs were identified:

- a) to enhance the lichenological expertise within the Ukraine
- b) to enhance links between Ukrainian lichenologists and those in Western Europe, as well as with those in other Eastern European countries
- c) to discover if the East Carpathian Mts still held important 'old forest' lichen communities, especially the *Lobarion*; most existing lichen information derived from the 1920–30s, although recent publications described apparently relict stands of ancient forest

**and** presuming *Lobarion* lichens are still present in the East Carpathian Mts:

- d) to improve knowledge on the European distribution of many 'old forest lichens', many of which have 'Red List' status in many countries; the East Carpathian Mts are importantly placed geographically in this respect.
- e) to use the *Lobarion* lichens as indicators of ecological continuity
- f) to highlight, especially within the Ukraine, the importance of 'old forest' lichens in biodiversity and conservation assessments, and the particular management requirements of these organisms with regard to site protection and management.

The project 'evolved' during a visit by Dr Kondratyuk to RBGE to work with Dr Coppins on the taxonomy of lichenicolous fungi. During his stay, Dr Kondratyuk was impressed with the work being carried out by British lichenologists on the lichens of ancient woodlands, and of how the use of lichens as 'indicators of ecological continuity' was being given high priority in site assessments by the British governmental and non-governmental conservation organizations. As the Eastern Carpathian Mts are home to the easternmost extension of natural fagaceous forest in Europe, it was apparent to both of us that there was a need to improve the lichenological knowledge of this region. Such information as existed was sketchy and mainly came from the 1920-30s, prior to the extensive forest exploitation and the peak in levels of industrial emissions during Soviet times. Were any 'old forest indicator lichens' left?

If relevant, what objectives have not been achieved, or only partially achieved, and why?

Although all objectives as specified in the original application have been achieved, an important failing has been the lack of dissemination of the full results in the form of the anticipated 'Monograph'. See below under Sections 5, 10 and Appendix 3.

**5. Project Outputs (see the attached list of project outputs which we would like you to use in compiling this section of the report)**

What output targets, if any, were specified for the project? (Please refer to the project schedule agreed with the Department where relevant.)

Have these been achieved?

Specified output targets relating to Output Refs 6A/B, 8, 11A/B and 22 were achieved

If relevant, what outputs were not achieved, or only partially achieved, and why?

Output Ref. 9 ['Manuscript of monograph on *Lobarion* lichens as indicators of primeval forests in Eastern Carpathians published'] was only partially achieved. For explanations, see below under Section 10 and Appendix 3. Much of the draft text for the monograph is supplied on CD.

Were any additional outputs achieved?

Additional outputs were achieved for Output Refs 13A/B, 14A, 14C, 14D, 15A, 15B, 18A, 19A, 20 and 23. These are summarized below, but see Appendix 1 for details.

- the collection and deposition in the Herbarium at Kiev of 4800 specimens, representing 270 species
- the highly successful Darwin International Workshop at Kostrino in 1998
- contributions to an additional eight conferences within Ukraine
- contributions to four international conferences outwith Ukraine
- numerous articles in the national and local press in Ukraine, plus one TV and two radio features within Ukraine
- physical assets supplied to the host country, including two computers, two microscopes and various literature and software
- attraction of contributions from other sponsors, totalling just over £10,000.

If output targets were not specified, please state the outputs achieved by the project. As far as possible, we would like you to work through the list of outputs attached to this paper and to report on those which are relevant to your project.

See Appendix 1.

by members of the UK team into Ukraine. Fortunately this problem was later resolved, and a problem-free means of 'electronic' transfer was established.

## 7. Project Impact

To what extent has the project assisted the host country to meet its obligations under the Biodiversity Convention, or to what extent is it likely to do so in the future? Please take account of the following in preparing this section of the report:

The way in which research findings have been **used** to address biodiversity objectives. What actions have been taken, or are expected to be taken, as a result of the project? How will these contribute towards the conservation of biodiversity in the host country concerned?

I am not cognizant of the obligations to which the Ukrainian government has signed up to with regard to the Biodiversity Convention. However, the results from the project have led to, or assisted in, the following:-

- a) an increase in the knowledge of the lichen biodiversity of Ukraine, with 80 species being added to the known Ukrainian biota, and many more additional regional records.
- b) an increase in the knowledge of the distribution and threat status of 'old forest' lichens within Ukraine, thus facilitating the production of a 'Red List' of Ukrainian lichens [being prepared by Dr Kondratyuk].
- c) an enabling of the use of 'old forest indicator' lichens within Ukraine to identify woodland areas of 'ecological continuity' and of high biodiversity and conservation status.
- d) enlargement of the former Regional Landscape Park Stuzhtzia into the newly established Uzhansky National Nature Park, which forms the Ukrainian part of the 'Eastern Carpathian' Trilateral Biosphere Reserve.

The extent to which training provision has improved the capacity of the host country to conserve biodiversity in the future, and the extent to which the training has addressed real skill needs. Information should be provided on what **each** student/trainee is now doing (or what they expect to be doing in the longer term), and the extent to which their skills are being used in a positive way to promote biodiversity conservation in the host country.

## 8. Sustainability

Did the host country institute(s) contribute resources to this project (these may have been provided in-kind, for example staff, materials etc)?

With regard to the International Workshop at Kostrino in 1998, a total of £1155 was contributed by the M.G. Kholodny Institute of Botany, the National Academy of Sciences of Ukraine, the Dept. of Nature Protection of Zakarpatska oblasna and the Uzhgorod division of Lviv Railway. For a breakdown see Output 23 in Appendix 1.

Some other small financial contributions may have been made at other times, but these would have been dealt with by Dr Kondratyuk and are not known to me.

Contributions in-kind were certainly made by the Stuzhytzia Regional Landscape Park authorities and by the local Forestry authorities, mainly with regard to the use of staff as guides and as trainees, and of vehicles, over and above what was paid for.

If so, what is the monetary value of the resources committed to the project by the host country institute(s)?

I have no idea – such matters were dealt with by Dr Kondratyuk.

To what extent was Darwin funding a catalyst for attracting resources (including in-kind contributions) from other sources? Please provide details on the other sources from which resources were secured for this project.

With regard to the International Workshop at Kostrino in 1998, a grant of £9046 was awarded by European Commission Directorate General XII. This was to fund the travel and subsistence of invited speakers, and other participants from former 'Eastern Block' countries.

What is the monetary value of resources generated for the project from other sources (please provide an estimate for each funding source)?

Not known to me.

To what extent is work begun by the project likely to be continued in the future (if this is relevant - some projects may come to a natural end at completion)? This is more likely to be relevant for research-based projects.

Continuation for this project should take the form of monitoring of the permanent plots established, and of widening the search area for relict ancient woodland. At present I am pessimistic about this. Problems in the future mainly concern future funding for lichenology in Ukraine. Funding from within Ukraine is likely to be minimal, at least for the foreseeable future. International funding opportunities are certainly available for 'new' projects, but my main concern is the seemingly lack of such opportunities for 'continuation' work (e.g. the further monitoring of the plots set

e) strengthening of collaborative links and interchange of information between Ukrainian lichenologists and forest ecologists and those of neighbouring countries, especially Slovakia and Poland.

What were the main problems/difficulties encountered by the project?

Minor problems and irritations are mentioned above under Section 6. The most important problems concern the 'writing-up' phase of the project and the publication of the anticipated 'Monograph'. The main reasons for this can be summarized thus:

- a) lack of allocated (applied for) funding (especially salary) available during 'writing-up' phase to senior Ukrainian collaborator; see comments under the following question.
- b) insufficient prior allocation of time available to UK Project Leader
- c) over-ambitious expectations regarding content of 'Monograph' by senior Ukrainian collaborator

See also Appendix 3.

What are the key lessons to be drawn from the experience of this project? Please try to provide as much information on this point as you can so that others can learn from the experiences of your project.

During the 'writing-up' phase of the Project, I now realise that more funds and time should have been allocated for myself to visit Ukraine (and/or for my senior collaborator in Ukraine to visit UK), and for the senior collaborator to receive a salary from the project for an additional year (cf. DTZ Pieda Consulting Rec. 34, para. 2). The so far unresolved difficulties experienced were not fully taken to account when the Project was conceived in 1996.

Does the experience of this project imply a need to review arrangements for developing and managing projects funded as part of this Initiative?

## 11. Project Contacts

To assist future evaluation work, please provide contact details (name, current address, tel/fax number, e-mail address), for the following:

UK project leader (and other key UK staff involved in the project)

Dr Brian J. Coppins, Royal Botanic Garden Edinburgh, 20A Inverleith Row,  
Edinburgh, EH3 5LR.

addresses can be obtained from (or checked by) Dr Kondratyuk; none of them speak English.

Mr Vasyl O. Kopach, Director of the Stuzhytzia Regional Landscape Park,  
Shevchenko Street 54, Velyky Berezny, 295050 Zakarpatska oblast.. Tel./Fax:

Mr Ivan P. Negri, Head of the Department of Ecological Security of Zakarpatska  
oblast Administration, Uzhgorod.

Mrs Ganna Yu. Genyuta, Head of Novostuzhytzia Forestry, Zhornova

**PLEASE REMEMBER TO ATTACH COPIES OF ALL DOCUMENTATION  
PRODUCED BY THE PROJECT IE. REPORTS, PAPERS,  
MANUALS GUIDES, CONFERENCE/WORKSHOP PROCEEDINGS  
TRAINING MATERIALS ETC**

Ref: 9120/FORMS/9120-FRS



- 9 Data gathered on the site and individual tree recording forms was entered into a database in Paradox 4. Subsequently this information was transferred to Microsoft Access as five separate databases. This data is held at the Kholodny Insitute in Kiev.
- 11A
- ✓ Kondratyuk, S.Y., COPPINS, B.J., Zelenko, S.D., Khodosovtsev, A.Y., Coppins, A.M. & Wolseley, P.A. (1998). *Lobarion* lichens as indicators of primeval forests in the Ukrainian part of the International Biosphere Reserve "Eastern Carpathians": distribution, ecology, long-term monitoring and recommendations for conservation. *Roczniki Bieszczadzkie* 1997 (6): 65–87.
  - ✓ Kondratyuk, S.Y. & Coppins, B.J. (1999). Lichens of the Ukrainian part of the international biosphere reserve "Eastern Carpathians": history of the study and problems of their protection. *Roczniki Bieszczadzkie* 1998 (7): 111–119.
  - ✓ Kondratyuk, S.Y. & Coppins, B.J. (1999). Active protection of the endangered *Lobaria pulmonaria* in the Ukrainian part of the International Biosphere reserve "Eastern Carpathians". *Roczniki Bieszczadzkie* 1998 (7): 349–358.
  - Kondratyuk, S.Y. (1999). Darwin International Workshop "*Lobarion* Lichens as Indicators of the Primeval Forests of the Eastern Carpathians". *Roczniki Bieszczadzkie* 1998 (7): 413–416.
  - ✓ Virchenko, V.M. (1999). Bryophytes of the *Lobarion* communities in the regional landscape park "Stuzhytsa" (the Ukrainian Carpathians). *Roczniki Bieszczadzkie* 1998 (7): 359–364.
  - ✓ Virchenko, V.M. (1999). Bryophytes of the *Lobarion* communities in the RLP 'Stuzhytzia' (Ukraine). *Meylania* 16: 21.
- 11B
- Kondratyuk, S.Y. & Coppins, B.J (eds) (1998). *Lobarion lichens as indicators of primeval Forests of the Eastern Carpathians (Darwin International Workshop)*. Kiev: Phytosociocentre. 192 pp.
  - X Kondratyuk, S.Y., COPPINS, B.J., Zelenko, S.D., Khodosovtsev, A.Y., Coppins, A.M. & Wolseley, P.A. (1998). *Lobarion* lichens as indicators of primeval forests in the Ukrainian part of the proposed trilateral reserve 'Eastern Carpathians'. In Coppins, B. J. & Kondratyuk, S. Y. *Op. cit.*: 64–79.
  - X Coppins, B.J., Kondratyuk, S.Y., Khodosovtsev, A.Y., Zelenko, S.D., Coppins, A.M., Wolseley, P.A. & Virchenko, V.M. (1998). Diversity of lichens and bryophytes in regional landscape park 'Stuzhytzia' (Ukrainian part of the International Biosphere Reserve 'Eastern Carpathians'). In Coppins, B. J. & Kondratyuk, S. Y. (1998). *Op. cit.*: 139–161.
  - Kondratyuk, S.Y., Khodosovtsev, A.Y., & Zelenko, S.D. (1988). *The second checklist of lichen-forming, lichenicolous and allied fungi of Ukraine*. Kiev: Phytosociocentre. 180 pp.
  - Kondratyuk, S. & Coppins, B.J. (1999). Conservation of the *Lobarion* lichens in the Ukrainian part of the trilateral biosphere reserve 'Eastern Carpathians'.

14D

1997

One; with oral presentation:–

‘Natural ecosystems of Eastern Carpathians International Biosphere Reserve and their conservation, Ustryki Dolne, Poland, 4–5 December 1997; attended by S. Kondratyuk.

1998

One; with oral presentation:–

Bieszczady National Park, Poland, 24–30 October 1998; attended by S. Kondratyuk.

1999

‘Lichen Conservation Biology’, Birmensdorf, Switzerland, 30 August to 2 September 1999; attended by A. Kondratyuk, L. Popova & V. Virchenko.

Oral presentation: ‘Conservation of the *Lobarion* lichens in the Ukrainian part of the trilateral biosphere reserve ‘Eastern Carpathians’’, by S.

Kondratyuk & B. Coppins. Posters: ‘Epiphytic bryophytes of the *Lobarion* communities of the RLP ‘Stuzhytzia’ (the Ukrainian Carpathians), by V.

Virchenko; ‘Red Data Book lichens in the National Nature Park ‘Synevyr’ (the Ukrainian Carpathians), by L. Popova; ‘Active conservation of *Lobaria*

*pulmonaria* in Ukrainian Carpathians’, by S. Kondratyuk & B. Coppins.

2000

One; with oral presentation:–

NATO Advanced Research Workshop, ‘Lichen Monitoring’, Orierton Field Centre, Pembroke, Wales, 16–22 August 2000; attended by A.M. Coppins, B.J. Coppins, A.Y. Khodosovtsev, S. Kondratyuk and P.A. Wolseley. Oral presentation: ‘*Lobarion* lichens of the ancient forests of Eastern Carpathians (Uzhansky National Nature Park, Ukraine)’.

15A

1997

Seven publicity articles in national press in Ukraine: –

*Zeleny svit* [= ‘Green World’] (Kiev); newspaper.

‘Forestry & Hunting’ (Kiev); magazine.

‘Tourism Green and Rural’ (Kiev); magazine.

*Ridna pyroda* [= ‘Home Nature’] (Kiev); magazine.

*Svit* [= ‘The World’] (Kiev), newspaper on scientific life

‘Tourism, Natural History’, Ukrainian newspaper for teachers.

*Vytoky*, Ukrainian newspaper for teachers

1998

Six publicity articles in national press in Ukraine: –

*Svitlo* [= ‘The Light’] (Kiev); magazine. [1998, No. 3(9): 69-70]

‘Plant Talk’ (Kiev); magazine. [1999, No.16: 8]

‘Ukrainian Botanist’ (Kiev); magazine. [1998, No. 5]

*Ridna pyroda* [= ‘Home Nature’] (Kiev); magazine. [1998, No. 27: 602-605]

*Svit* [= ‘The World’] (Kiev), newspaper on scientific life [1998, No. 33]

- 22 Permanent plots for long-term monitoring were established at 12 sites within the overall study area.
- 23 Contributions from other sponsors (all concerning the Darwin International Workshop at Kostrino in 1998):
- |   |       |
|---|-------|
| European Commission Directorate General XII       | £9046 |
| M.G. Kholodny Institute of Botany                 | £469  |
| National Academy of Sciences of Ukraine           | £312  |
| Dept. of Nature Protection of Zakarpatska oblasna | £218  |
| Uzhgorod division of Lviv Railway                 | £156  |

## Appendix 2

The following is taken from the draft text of the 'Monograph', prepared by Dr Kondratyuk. Figures, Tables and Appendices highlighted are not included here.

### V. MATERIALS AND METHODS

#### The study area

The initial study area for the Darwin Initiative project was the Stuzhytzia Regional Landscape Park (now the Uzhansky National Nature Park), being part of the recently established Eastern Carpathians Trilateral Biosphere Reserve. From available information on the extant 'virgin' forests in Ukraine, this area seemed to be the most likely to retain a high concentration of *Lobarion* lichens. During the course of the Project, the study area was expanded to include sites to the south-east in the Lyuta River basin, and one site in the Crimea.

#### Identification and selection of sites

The initial selection of sites for survey within the Uzhansky NNP was based on forest cover and history, regional topography and available information, there being no previous data on the precise locations for *Lobarion* lichens in the area. Forestry archives provided useful data on the distribution of old growth forests which were a primary target for survey (Fig. V.1). As information became available additional sites were surveyed outside NNP in Lyutya river basin. In order to make a comparison with more southern communities a plot was established on Boyko Mountain in the Crimea (Table V.1). Forestry areas visited in the Ukrainian Eastern Carpathians included Novostuzhytsia, Zhornava, Stavne, Kostryno, Volosyanka, Chornoholovka, Bystrynske, and Lyuta forestries and Velyky Berezny collective farm forestry.

Fig. V.1. Survey routes taken in Uzhansky National Nature Park to locate *Lobarion* lichens during Darwin expeditions.

Fig. V.2\*. [Photo] The project team (year of field work in parentheses, 1997 with Sandy)

Fig. V.3\*. [Photo] The project team (near Cheremkha Mt 1998)

Fig. V.4\*. [Photo] The participants of the Darwin workshop (Kostryno, 1999)

#### Expeditions

Ten expeditions (Darwin Expeditions, DE1–10) were undertaken between June 1997 and October 1999 (Table V.1).

During the expeditions a number of different methods were used to locate areas, establish data sets, to set up long term monitoring, as well as to provide information on conservation of the *Lobarion* community and its habitat. These included:

1. Exploratory surveys to locate sites supporting *Lobarion* and the *Lobarion* alliance.

Zhyduvsky Stream	3	3,4,5,10	3,4,5,10	5,8	10	4
Parashynsky Stream	3	3,4,5,10	3,4,5,10	5	10	3
Nimetzky Stream	1	2,3,4,5,7,10	2,4,5,7,10	5,7	10	4,6,8

Data on the total number of the sites visited and trees tagged and described are summarized in the Table V. 3.

Table V. 3

Total number of the sites visited and trees tagged and described during Darwin Expeditions

Number of Darwin Expeditions	Numbers of sites (see Table V.1 as well)	Numbers of trees tagged and described (see Table V.1 as well)
Uzhansky N.N.P.		
DE1	9701-9736	
DE2	9737-9758	2001-2018, 2020-2051, 974011-974012, 97411, 97442, 97461, 97511, 20311-20314
DE3	9790-97107	2052-2133, 72077, 82077, 72082, 82082
DE4	9822-9840	2134-2170, 21561
DE5	9851-9869, 9872-9875	2201-2250
DE6	9876-9885, 9887-9889, 9893-9896, 9899-98111	2401-2421, 98931-98933, 9810223, 981091-981093, 98944-98946, 9810611, 981104-981109, 9811110-9811114, 98991, 9810011-9810013, 9810791, 981073-981075, 981077-9810711
DE7	98112-1-98120	2252-2258, 2288-2293, 2330-2350, 23501, 22591-22592
DE8	9922, 9929-9930	
DE10	9975-9979, 9981-9983	2701-2709, 2726-2734, 99781-99782, 99811
Lyuta River basin		
DE4	9841-9847, 9849-9850	2171-2198, 2200, 98411-98416, 22001-22002
DE5	9870, 9871	
DE6	9886-9886A, 9890-9892, 9897-9898	2422-2427, 2428-2432, 2438-2462, 989726-989727
DE7	98112	2301-2329, 2463-2471
DE8	9923-9928	
DE10	9980	2710-2725
Boyko Mt.		
DE9	9936	2351-2356, 99363

### Site description

The location and characteristics of each site were entered on to a standard form (**Appendix 1 (=V.1)**). On some expeditions a GPS was used to establish location and altitude but in dense woodland readings were not obtained, and approximate grid references for the area were later obtained from U.S. Army military maps of the region in the Natural History Museum, London (Poland 1:100,000, sheet V-17, Turka, first edition AMS 1, 1944). An altimeter was used to establish altitude at all upland sites.

tagging of different trees, the following exchanges of numbers were used. A tree with '02082'-tag number was felt in 1997 and tag mentioned (02082) was mounted by foresters on neighbouring tree, which was without *Lobaria thalli* (but with *Nephroma parile*) at that time. Branches of phorophyte felt (tagged in 1997 as 02082) were found with *Lobaria pulmonaria* during next field season in May 1998. So, in 1998 several of *Lobaria pulmonaria* thalli from former 02082 tree (in data basis as 70282 phorophyte) as transplants were mounted on new tree with the same tag number. For last phorophyte a '82082'-tag number is used during data processing. In contrast to this situation 'Z02085' number is used for branch of the phorophyte with native *Lobaria pulmonaria* and tag number 02085 in Zhyduvsky Stream plot, which was felt in 1997, and tag mentioned was loosen. *Lobaria pulmonaria* transplants were mounted on another branches of the same tree in 1998. Later these branches were tagged with number 02142.

**Table V.5**

Distribution of *Lobarion* phorophytes tagged and untagged on the territory of Uzhansky N.N.P. and its vicinity

Locality	Number of trees tagged (untagged)								
	DE2	DE3	DE4	DE5	DE6	DE7	DE9	DE10	Total
Uzhansky N.N.P.	49 (12)	84 (4)	22 (2)	39 (1)	46 (42)	27 (1)		18 (10)	329 (66)
Lyuta river basin			31 (9)		63 (2)	11		16	121 (11)
Boyko Mt							6 (1)		6 (1)

To move to results:

Distribution of *Lobarion* phorophytes tagged and untagged on the territory of Uzhansky N.N.P. and its vicinity

Phorophytes species	Uzhansky N.N.P.		Lyutya River basin		Boyko Mt	Total
	Lowland	Upland	Lowland	Upland		
<i>Fagus sylvatica</i>	52(4)	85(13)	4	12(2)		153(19)
<i>Acer pseudoplatanus</i>	90	55	52	4		201
<i>Acer platanoides</i>	14	22	45			81
<i>Fraxinus excelsior</i>	4	1	10		2	17
<i>Carpinus betulus</i>	35		1		5	41
<i>Ulmus scabra</i>	3	1	1			5
<i>Alnus incana</i>	6					6
<i>Acer campestre</i>	2					2
TOTAL	210	177	113	18	7	524

( ) in brackets – a number of descriptions of untagged trees.

[May be better to include table V.6 in chapter v-vii.]

Lyuta-Mashyn		3		2							
Lyuta-Lyuta		3									
Chornoholovka		7									
Bystryzia		4									
Lyuta River basin											
Upland		18									
Rakhivska Yama		11									
Volovetz		7									
Boyko Mt		4			1			2			

### Mapping and re-location of phorophytes

Mapping of the positions of *Lobarion* trees within a site was an essential procedure for establishing long term monitoring of *Lobarion* communities, but was often undertaken at a later stage than the initial survey and tagging. At a site in Stuzhytzia where trees had been illegally felled following tagging it proved difficult to locate original positions of trees. Unfortunately, incidences of such felling of tagged *Lobarion* trees was recorded during all three years of our investigations in lowland areas at Stuzhytzia, Zhornava and Kostrino villages. Site maps of a scale of c. 1:10,000 for each long-term monitoring plot with *Lobarion* lichens were prepared to allow location and monitoring of *Lobarion* trees during this project and for future studies (Kondratyuk 1999; Kondratyuk & Coppins 1999).

### Description of phorophytes

Phorophyte species and location within the site were recorded onto an individual tree form (**Appendix 3 [V.2]**) and where possible plotted on a site map. Tree health, girth (at breast height) and inclination were recorded together with shade conditions on a 3-point scale. Vitality of the phorophytes was estimated according to the scale used by Gauslaa (1995-Lich). It was the following: 1, 'healthy' - with no wounds; 2, 'slightly damaged' - healthy, but with a dead top or one or more big and dead branches, or wounds on the trunk; 3, 'very damaged' - not healthy, more than 50% of the canopy is dead; 4, 'stump' or dead tree. As Kuusinen (1996) mentioned the correlation between trunk girth and tree age is rather weak. The age of the oldest trunks in the stands studied may be up to 200 year, whereas all the trunks in some of the managed stands may be less than 100 years old.

Because of lack of time or very bad weather, a few trees do not have full descriptions, and have been excluded from some analyses, where relevant.

Bark samples were taken from some trees to establish the pH of bark in exposed and sheltered areas and variation with tree species. Small bark samples >1 cm<sup>2</sup> were collected from areas close to the *Lobaria* thalli and air dried for later laboratory analysis. The pH was measured on samples moistened with 10% KCl using a Jencons flat tip electrode (Wolseley & James 1990).

Photographs of the tree were taken in suitable conditions, as were photographs of the *Lobarion* community or individual thalli.

### Lichen cover and *Lobarion* thalli

Number and area of all thalli and their position on the tree were recorded onto an individual tree form (**Appendix 3 [V.2]**) for all *Lobaria* spp. and for other species of the *Lobarion* such as: *Nephroma parile*, *N. resupinatum*, *Normandina pulchella*, *Parmeliella*

**Figs. V.5-7** Photos of the quadrats in Nimetzky Stream plot, Zhyduvsky Stream plot, Ertashi stream and in Cheremkha Mt plot.

All species occurring in the quadrat and on the tree were noted. Tree species, aspect, height above ground of quadrat were recorded.

Photographs of the location and the quadrat were taken using an Olympus OM-2 with a 50 mm macro lens.

Permanent quadrats were established in the following sites: Nimetzky and Zhyduvsky, Kamyanysty, Ertashi Streams, and Cheremkha Mt, Yasynny ridge plots.

### Relevés

Relevés were made of well-developed *Lobarion* communities. Location, tree species, aspect, height above ground and position on the tree were noted. Species lists were made of all lichens and bryophytes found in the area occupied by the *Lobarion* community, and visual estimates made of percentage cover of each species within that area. Species with a cover of  $\leq 5$  were marked as present. Total number of the *Lobarion* community descriptions carried out in Uzhansky N.N.P. and its vicinity is shown in Table V.7.

**Table V.7**

#### A number of the *Lobarion* community descriptions carried out during Darwin expeditions

Localities	Darwin expeditions			Total
	DE2	DE9	DE10	
Uzhansky N.N.P.				
Nimetzky Stream	2		13	15
Old Kostrino Forestry			10	10
Kamyanysty Stream			5	5
Zhyduvsky Stream	4		16	20
Parashynsky Stream	2		10	12
Ertashi Stream	2			2
Cheremkha Mt	6		20	26
Yasynny ridge	2		14	16
Unnamed ridge	7		21	28
Holanya ridge	1			1
Lyuta River basin			20	20
Boyko Mt		1		1
Total	26	1	109	156

Almost all the relevés were recorded in deciduous forests of *Fagus sylvatica* L., *Fraxinus excelsior* L., *Acer pseudoplatanus*, and *A. platanoides*. The relevés were recorded between 25-250 cm above ground on the trunks. The relevés have been arranged according to the Braun Blanquet's scale, transformed as a 0-9 ordinal scale (Van der Maarel 1979). A Minimum Variance Clustering of this transformed table was carried out with the package MULVA IV (Wildi & Orloci 1988). The resemblance function was chord distance as



*sylvatica*, *Carpinus betulus*, 380–395 and 400–420 m alt; transplants made on 23 trees on 4 August 1998.

**Semeniv Stream, Novostuzhytzia forestry.** *Source material:* from a very damaged tree at Semeniv Stream, 560 m, collected on 7 August 1998, and from the Mt Cheremkha, 'Bahno', beech forest, 1060–1080 m alt., collected from a fallen *Fagus* on 6 August 1998. *Receiver trees:* *Acer pseudoplatanus*, *Fagus sylvatica*, *Carpinus betulus*, 560 m alt; transplants made on 4 trees on 7 August 1998.

Some specimens of *Lobaria pulmonaria* were taken from a very damaged *Fagus* 98414, Rakhivska Yama, Volosyanka forestry, a. 900 m alt., collected 4 June 1998. However all these specimens were not used for transplantation experiments.

### Data processing

Data gathered on the site and individual tree forms (Appendix 1[=V.1] & 2[=V.2]) was entered into a database in Paradox 4, but was later transferred to Access. Five separate databases, namely 'UKLOBDIM', 'UKLOBSP', 'UKRLOB', 'UKRSIT', 'UKTREE' were created. ~~Addenda XX~~ provides exemplars of each database.

A lichen community analysis was performed using Two-Way Indicator Species Analysis (TWINSPAN) (Hill 1979). For individual samples and vegetation groups, commonly used diversity indices, namely species richness (number of species) and Simpson and Shannon diversity (Magurran 1988) and Ellenberg indicator values (Ellenberg 1974) were calculated.

### Numerical analysis

'Inclusion measure' method was used for comparative floristical analysis. This method is the most effective tool for comparison of floras which are rather different as in species diversity as in territories. It is accepted in the former Soviet floristics. It was for the first time proposed for comparison of the species diversity of plant communities (Sedelnikov 1982??). Later this method was applied in lichenology (Kondratyuk 1995 etc.).

Inter-correlations between lichen floras according to principal family spectra were performed by Kendall rank correlation (Sokal & Rohlf 1981; Shmidt 1980, 1984). Graphs of the 'maximal correlation way' was built using Vykhandu method (Vykhandu 1962). The last one (Vykhandu method) is well applied in Russian botanical literature and little known in Western literature.

### Monitoring of the *Lobarion* lichens within period studied

Forest in our plots visited in 1999 looked too differently of it was 1997-1998. There are many broken trees, new stumps after wind fall in 1998-1999 years. So there are many fallen trees and freshly formed high stumps in the following facilities from observation 1999 in unnamed ridge and Cheremkha Mt especially.

Cheremkha Mt plot and unnamed ridge plot were classified as areas with phase of aging beech and beech-sycamore forests in 1997 and 1998 field seasons. Unfortunately after winter 1998/1999 and strong winds during summer 1999 year these plots became much closer to the phase of disintegration, as far there are much bigger number of 'windows' or light places in the canopy owing to fallen down trees.

### **Appendix 3. Memo to RBGE Finance Officer concerning the ‘Monograph’**

Darwin-Ukraine project, 017

The money in 017 is £8000 for the publication of the Monograph giving the full scientific results of the project. The remainder is earmarked for payment to Pat Wolseley for finalizing the statistical presentations in the Monograph.

My senior Ukrainian collaborator, Dr Kondratyuk, prepared an initial manuscript nearly 2 years ago. However, this was far too ambitious in terms of scope and length. It contained far too much background information on the Carpathians, forest processes, etc., and most of the text for the background was cut and past, verbatim from other publications. This was most unsatisfactory, and could lead to copyright problems if published in this form!

From the original MS, I re-wrote 3 of the chapters (taking about a month full-time) and asked Dr Kondratyuk to attempt the same for the other chapters, leaving me mainly to straighten out the English. Unfortunately, nothing has transpired, and over a year has passed. I have sent reminders to Dr Kondratyuk, who is very keen to proceed but has been diverted by other work and responsibilities – mainly to make ends meet financially. Salaries [when they eventually appear] for Ukrainian scientists scarcely amount to a living wage.

It would be a great pity if the full results of what was otherwise a very successful project do not see the light of day in a published form. I am still hopeful that the Monograph can be rescued. However, if no significant progress is made by the end of this year (2002), I will have to concede to reality and request the balance of 017 be returned to the Darwin Initiative.

Dr Brian J. Coppins  
16 January 2002