

Evaluation of Estonian Research

- Ecology -

Report to the Estonian Science Fund Council

by

Prof Mats Sonesson
and
Prof Germund Tyler

August 1992

The authors of this report were appointed for the purpose of this evaluation
by the Swedish Natural Science Research Council.

Foreword

Several Swedish organizations have been asked to take part in a general evaluation of all research performed at academic institutions in Estonia. NFR has agreed to organize the evaluation of Estonian research within the field of natural science. This report has been prepared according to an agreement between the Estonian Science Fund Council and the Swedish Natural Science Research Council (NFR).

During the spring of 1991 Estonian scientists completed reports on their research which were sent to NFR. These reports have subsequently been distributed among 14 Swedish evaluation groups. In total about 40 Swedish scientists are engaged in the evaluations. The groups are making site visits to the Estonian laboratories and institutes during 1991/92 to discuss the research performed, the plans for future activities and to get information about the working conditions, experimental facilities, financial resources etc. Each group has been instructed to produce a report assessing its particular research area.

This report concerns the sub-field of Ecology and will eventually be a part of an extensive report covering all Estonian research in natural science.

The organization of the site visits is done in close cooperation with the Estonian Science Fund Council. Although difficult times prevail in Estonia the site visits performed so far have been successful. The NFR is grateful to the Estonian Science Fund Council for its efforts to handle all practical matters in connection with these visits.

The NFR is also grateful to the Swedish scientists who with enthusiasm and great skill have taken part in the demanding evaluation work.

Finally, the Council wishes to express its sincere hope that this evaluation report will contribute to a further positive development and strengthening of Estonian science.

Carl Nordling
Secretary General

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GENERAL COMMENTS ON ECOLOGY

The evaluation of the Estonian ecological research was carried out by Prof Mats Sonesson and Prof Germund Tyler. The ornithological projects were jointly evaluated by Sonesson, Tyler and the ornithological expert Dr Thomas Alerstam.

Estonian ecology varies in quality, ranging from poor-fair to very good-excellent. This does not apply to any entire department but separates individuals/groups of the departments/institutions. It is in other words quite a similar situation to that probably found in most other countries, for instance in Sweden.

The publishing policy of most Estonian ecologists still tends to be to place papers in national series, before 1990 mainly in the Estonian and/or the Russian languages, although recently often in English. We understand that much of this has been due to the former political situation. We also know that some research based on maps and chemical data reflecting environmental pollution, dealt with "classified data" and the results could not be published. This certainly explains some of the poor publishing found in some groups. However, we also met a few researchers who for several years have had good publishing records in international media. During the site visits a few researchers also showed some papers published between 1986 and 1991 not listed in their report (besides a few recent publications from 1992). This was confusing to us and might be due to inconsistent instructions.

It is essential to publish the original results in international refereed journals. This improves the communication with the international scientific community and is normally an efficient test of the quality and originality of the results. Indeed this process has started in some departments and with some researchers but it should be more generally adopted.

Access to literature seems to be a serious problems in many cases. The delivery of some international journals to the university libraries has ceased after 1990 or 1991 because of the financial situation. Photocopies of existing series are too expensive for the individual researchers. We suggest that immediate measures shall be taken to guarantee the continuity of subscription for all basic international journals for the university libraries of Tallinn and Tartu. Data bases of for exemple "Current Contents + Abstracts", "Chemical Abstracts", PC's and fax machines should also be made available to the separate institutions to allow contacts with the Swedish university libraries that should forward requests for offprints and photocopies free of charge. The practical arrangements of such a system, the consequences for the libraries involved, etc, should be investigated with high priority. Available computer power is apparently also insufficient particularly for those involved in modelling work and statistical calculations of large data sets.

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EVALUATION OF RESEARCH GROUPS

Prof T Frey, Station of Ecology, Tartu University, Tartu - Project leader

Scientific staff

Publications (1986-)

	First author				Co-author				Total
	R	E	i _a	i _b	R	E	i _a	i _b	
*Jane Frey	.	1	.	1	2	2	.	2	8
*T. Frey Professor (Head)	2	6	.	4	1	.	.	.	13
*Priit Kask	.	1	.	.	.	1	.	.	2
*Krista Lõhmus, Dr	1	.	1	2	1	1	1	1	8
Tõnu Oja	3	1	.	2	1	.	1	1	9
*Jaak Palumets	2	1	.	3	.	.	.	.	6
*Arne Sellin	6	.	2	.	.	1	.	.	9

Air pollution impact on coniferous forests in Estonia

Principal activities

The objectives are studies of environmental conditions affecting productivity and ecophysiology of spruce. Influence of air pollutants on forest decline: Effects on photosynthesis and carbon balance, longevity of needles, etc. Monitoring of canopy damages (crown thinning) and root damages on conifer stands.

Evaluation

The general quality of the research presented at the site visit seems ~~good to very good~~. The publication list which has a considerable length includes several titles in scientific journals mostly in Russian, though a few titles also in western international journals. Two contributions to Plant and Soil on root morphological methods can be emphasized. The character of the future activity of the group is not easy to judge since no plans were presented to us. It seems reasonable that Estonia, with a large share of land area covered by coniferous forests, must retain and develop the scientific capacity in monitoring forest decline, including the development of methods suitable for the purpose and for explaining the causal relationships. It also seems reasonable that this group should have a high responsibility in this development.

Recommendations

The objectives of future research should be clarified, the means necessary to fulfill these objectives carefully considered and an elaborate long-term research and monitoring programme developed. On these premises, continued support of the group is strongly recommended.

R: Papers in Russian

E: Papers in Estonian (incl. Finnish)

i_a: International journals with a referee system, in English/German

i_b: National journals, proceedings, etc, in English/German

(N.R., all tables are based on submitted reports/offprints. Possible inconsistencies may be inherent in the tables due to incomplete submitted materials, see Preface.)

*: Met during site visit, 4-8 May, 1992

Prof U Haldna, Institute of Chemistry, Estonian Academy of Sciences, Tallinn -
Project leader

Scientific staff

	Publications (1986-)							
	First author				Co-author			
	R	E	i _a	i _b	R	E	i _a	i _b
*U. Haldna, Professor	1	.	1	1	2	.	1	2
I. Jakovleva	.	.	.	.	1	.	.	.
D. Jegorov, Cand Sci	1	.	.	.	.	.	.	.
*P. Luiga, Cand Sci	.	.	.	.	4	.	.	.
J. Pentshuk, Dr	2	.	1	2	.	.	1	.
K. Rajur	.	.	.	.	1	.	.	1
*M. Trapido, Cand Sci	.	.	.	2	1	.	.	.
*A. Lemmik	4	.	.	.	.	.	.	.
								8
								1
								1
								4
								6
								2
								3
								4

Development and modification of the ion chromatographic technique for evaluating environmental pollution

Principal activities

The studies comprise development of IC technique, including ion-exchange resins. This is apparently a main research group for this purpose in the former USSR. Two models of IC instruments have been designed and are produced commercially, as well as several resins, by a separate company without any financial feed-back system to the development work at the department. Application methods have been developed for the analysis of, for instance, rainwater, drinking water and other natural waters.

Evaluation

The project deals partly with pure technical development and is in this respect outside the scope of our evaluation, although the instrument has an obvious interest to biological sciences. This is also true for the methods developed for different applications of the IC. The publication list includes a few papers in international journals but the total number of publications is rather small.

Recommendation

From an ecological point of view it is important to have access to ion-chromatographs of high/sufficient precision. Although the Estonian instruments obviously satisfy even great demands in this respect Dr Halda himself was fairly pessimistic about their future possibility to compete with those of the western market. However, support of the group is recommended, to retain and develop national competence in this field.

Prof Uuve Kirso, Institute of Chemistry, Estonian Academy of Sciences, Tallinn
- Project leader

Scientific staff	Publications (1986-)								Total
	First author				Co-author				
	R	E	i _a	i _b	R	E	i _a	i _b	
*Aarne Bogdanov	0
*Natalya Irha, Cand Sci	.	.	.	4	.	.	2	3	9
*Uuve Kirso, Professor (head)	.	.	1	8	.	.	3	7	19
Raissa Krasnoschekova, Cand Sci	.	.	3	1	.	.	.	.	4
Helvi Uibopuu, Cand Sci	.	.	1	.	.	.	.	1	2

Fundamentals of environmental chemistry and methods for evaluating environmental pollution

Principal activities

The studies comprise environmental chemistry; organic chemistry with ecological applications on environmental pollution, in particular the analysis of PAH (polycyclic aromatic hydrocarbons) emitted mainly from oil-shale production. Media studied are, e.g., sea-water and boundary layers in marine environment. PAH in sea-water, algae and sediment - water interfaces, photooxidation of PAH are monitored. Analytical methods for PAH have been developed and application studies on penetration rates in organisms have been performed. Several subprogrammes involve cooperation with scientists in several countries particularly in France.

Evaluation

The list of publication includes many contributions in international journals, textbooks and conference proceedings and in large Russian journals. The research of the PAH programme is of very high international standard. This applies particularly to the photooxidation research. Professor Kirso has clearly demonstrated a very high scientific competence in this field of research.

Recommendation

Continued support is most strongly recommended.

Dr Kalevi Kull, Department of Botany and Mycology, Institute of Zoology and Botany, Estonian Academy of Sciences, Tartu - Project leader

Scientific staff	Publications (1986-)							
	First author				Co-author			
	R	E	i _a	i _b	R	E	i _a	i _b
Tiina Elvisto, Dr	.	.	.	.	.	.	.	.
Indrek Kalamees, Dipl. biol.	.	1	.	.	.	.	.	.
*Andres Koppel, Dr (Director)	1	.	2	.	.	1	1	.
*Kalevi Kull, Dr (Proj leader)	6	8	1	2	2	.	.	1
*Jaanus Paal, Dr (Head)	10	2	.	1	.	.	.	.
*Ulve Pihlik, Dr	3	.	.	4	.	1	.	.
*Juhani Püttsepp, Dipl. biol	4	.	.	.	1	.	.	.
Haide-Ene Rebassoo, Dr. Sci.	1	2	.	1	.	1	.	.
Ülle Reier, Dipl. biol.	.	2	.	1	.	1	.	.
Thea Sõelsepp, Dipl biol.	.	.	.	1	.	.	.	.
*Peeter Veromann, Dipl. biol.	1	1	.	3	.	.	.	.
								Total

COENOLOGY, ECOPHYSIOLOGY AND POPULATION ECOLOGY OF PLANTS IN COMMUNITIES UNDER ECOLOGICAL MANAGEMENT

During the site visit we were informed that I. Kalamees' project on energy contents of biomass had been finished. Different projects were discerned and were evaluated separately.

A. Studies in plant ecophysiology and mechanisms of population dynamics

(1). Mechanisms of community dynamics in species-rich meadow (K. Kull)

Principal activities

The principle aims are the study of ecological mechanisms in maintaining of a high species diversity in some wooded meadows in Estonia. History of management, nutrition of plants, plant competition, plant-environment interactions, etc., are investigated in different sub-projects. A population ecology and mathematical modelling approach of research is emphasized. One of the subprojects, *The structure of monospecific stands of grasses*, conducted by one of Dr Kull's post graduate students, P. Veromann, was demonstrated during the site visit.

Evaluation

This is an extensive programme to provide empirical data for the theoretical modelling work that appears to be Dr Kull's main interest in ecology. Much of the empirical research is obviously based on modern ecological theories, e.g. those of Grime, Tilman and May, and carried out by Diplomand and PhD students supervised by Kull. The group has access to PCs and we were told that this also applies to data bases of relevant literature. The group collaborates with ecologists abroad (e.g. at Umeå University). The publication rate is high but the majority of the papers are published in Estonian or Russian (although in the latter case some papers are probably published in journals with a referee

system). Some papers have appeared in English in local periodicals or monographs. Only a few papers are published in international journals with a referee system.

Dr Kull is a very competent scientist conducting a ~~good to very good~~ ecological programme with great potential for future contributions to the international scientific community provided the present publishing policy is changed. Although the group already has good international contacts and collaborations it showed a strong interest in developing these further, particularly in the theoretical field of ecology.

Recommendations

Continued support is most strongly recommended.

(2). *Ecophysiology of carbon and water economy in conifers* (A. Koppel)

Principal activities

The main objectives are studies of carbon and water balance in trees, particularly in *Picea abies*, applying an ecophysiological approach. A model showing the ontogenetic growth based on ecophysiological relationships will be developed.

Evaluation

Dr Koppel has heavy administrative commitments at present (director of the institute) which obviously prevent him from completing the planned ontogenetic model. Still he has 5 publications, two of which have appeared in international journals and are of a very good scientific quality. Dr Koppel is conducting a ~~good project~~ and the investigated parameters are important e.g. for the study of effects of air pollutants. We were informed about a planned re-organisation of the biology departments in Tartu to strengthen the collaboration between the university institutions and those of the Estonian Academy.

Recommendations

Continued support is most strongly recommended.

B. *Vegetation studies*

Principal activities

Two subproject were recognized: (a). *Contemporary dynamics of plant cover of Baltic Sea islands* (H.-E. Rebasoo), including a comprehensive phytosociological description and classification and long-term monitoring of vegetation dynamics in selected areas and (b). *Syntaxonomical continuum of vegetation* (J. Paal), using computer technique (ordination programs, etc) to recognize patterns, continuities and discontinuities in the plant cover.

Evaluation

Only subproject (b) was presented orally. The objectives of both subprojects are essentially similar, though methods of data analysis and treatment differ. Subproject (a) uses mainly classical methods of vegetation studies and has produced a large quantity of descriptive information during the years. It is mainly of national importance and results are often published in forms less available to the international public. The long-term monitoring of vegetation dynamics seems particularly valuable to the national MAB/Global Change Program.

Subproject (b) applies numerical methods of plant sociology and has produced a number of publications, mainly in Russian journals. The quality of the work ~~is good to very good~~ and the researchers involved seem to follow the international development in this field of science. The project has a potential for further development along these lines.

Recommendations

Future research within subproject (a) should concentrate on the long-term dynamics rather than on increasing the amount of sociological descriptions. The development of subproject (b) is quite satisfactory. For both subprojects publishing in international periodicals should be emphasized. Continued support of both subprojects is strongly recommended.

C. Productivity and coenopopulation studies of economically important plants.

Principal activities

In the two first subprojects (J. Paal, U. Pihlik) the distribution and general biology of four species in Estonia with medical interest are described. The studies have a purely applied background and the approach may be described as a traditional production ecology approach, although applying some more recent methods of population ecology.

In the third subproject (J. Püttsepp) the ecology of weeds and their possible effects on crop vegetation (rye) are studied.

Evaluation

The first subproject (papers in English) shows indeed some results of general interest with regard to the biology and distribution of these plants. The papers provide ~~fair to good~~ descriptions of some demographic parameters of some species of obviously great applied interest in Estonia (and in e.g. the CIS countries). Attempts at considering any new theoretical-empirical sides of the biology of these plants are lacking, however. The extensive international literature on theories of population ecology during the past 10 years (recently also on clonal plants) seems unknown. The second and third subprojects are described too briefly and with no publications in an international language to be possible to evaluate.

Recommendations

We understand that several wild plants have a substantial commercial interest in Estonia. We also consider Dr Pihlik a good scientist with a strong interest in applied ecology. However, to promote the scientific development in this field, we recommend a more functional-experimental approach, e.g. by applying ecophysiological methods, and by taking new theories in plant population ecology into account when planning the projects. Under these premises continued support is strongly recommended.

General recommendations for the Institute of Zoology and Botany

The planned re-organisation of the Academy and University seems highly motivated both scientifically and logistically, particularly if this brings the progressive scientists together and optimizes the available and planned resources. What would be essential are instruments and other equipment to allow experiments both in the field and under laboratory conditions. From the report it is apparent that there are already plans to form different scientific groups to cover research that will span very widely from theoretical ecology to purely agricultural (e.g., cultivating medical plants) and forestry (e.g. testing *Salix* and *Alnus* clones for maximum productivity) research. We assume that the scientific emphasis will still be placed on fundamental problems, for which further support is most strongly recommended, and that the purely applied issues will mainly be the responsibility of the agricultural and forestry departments.

Drs Raivo Mänd and Jüri Keskpaik, Department of Zoology, Institute of Zoology and Botany, Estonian Academy of Sciences, Tartu - Project leaders

Scientific staff	Publications (1986-)								
	First author				Co-author				Total
	R	E	i _a	i _b	R	E	i _a	i _b	
P. Hõrak, Postgraduate	1	3	1	1	.	.	.	1	7
*Jüri Keskpaik, Dr. Proj.1.	9	1	1	3	5	1	1	1	22
Andres Kuresoo, Jun. Res. Ass.	4	2	3	2	1	.	2	1	15
Vilju Lilleleht, Dr	.	.	.	.	1	.	4	2	7
*Raivo Mänd ,Dr. Proj lead	5	8	1	5	8	.	1	.	27
Kalev Rattiste, Jun. Res. Ass.	1	.	2	2	1	.	2	.	8
Olav Renno, Dr	2	7	1	2	1	1	1	1	16
Heinrich Veromann, Dr	5	9	2	3	.	1	.	.	20

Biology of birds of Estonia

Principal activities

There are ~~three main components~~ of this project, viz. investigations of (1) the population ecology of birds, (2) the bird migration, and (3) the mapping and monitoring of the Estonian bird fauna.

Evaluation

The long-term investigations of the population ecology of the colonially breeding Common Gull, *Larus canus*, are of international importance. Very interesting results have been published and it is important that this study of a relatively long-lived species will continue for several years ahead. The scientific potential for a high-standard long-term study like the present one is very high.

The comparative study of the population ecology of the Great Tit, *Parus major*, in rural and urban areas, respectively, is also very interesting. Similar studies on tits have been and are still carried out in other countries, like England, the Netherlands and Sweden, and it is important that the further development of research on tits in Estonia is based on close contacts between researchers in Estonia and other countries.

The ecological analysis of the factors affecting the avian egg is an important integral part of the studies mentioned earlier. The new analysis method introduced into oomorphology has been published in a highly recommendable way in the ornithological journal *The Auk*.

Estonia offers excellent natural conditions for stimulating and successful investigations of bird migration. There is also a strong research tradition in this field. The present report shows that this important research tradition is still upheld, involving, for instance, analysis of the spectacular migration of the crane and of phenological patterns in bird migration. Much of Estonian research in this field is traditional and it is recommended that international exchange contacts are established with relevant universitybased projects as well as with bird observatories with advanced programmes. The mapping and monitoring of the Estonian bird fauna are also important. It is preferable

that running monitoring programmes be financed by funds for applied environmental research rather than by funds primarily intended for pure ecological research.

The publication rate of the group (8 people) is impressive with more than 100 published papers since 1986. Most have appeared in the Russian and Estonian languages which usually means that they are almost unavailable to the international scientific community. Many are also in English although in national series, proceedings, etc. More than ten papers, however, are in international journals with a referee system.

Conclusions and recommendations

The investigations in population ecology are very good and continued support to develop this branch and to safe-guard the continuation of the long-term studies on the Common Gull is most strongly recommended.

The bird migration research is good to very good, and continued support, not least to establish international research exchange contacts and collaboration projects, is also strongly recommended.

It is important that the faunistical studies and initiated schemes for monitoring the Estonian bird populations continue and expand.

The research leaders and staff in all subprojects are good to very good.

The publishing in international journals should be emphasized.

Prof Jaan-Mati Punning, Institute of Ecology and Marine Research, Estonian Academy of Sciences, Tallinn - Project leader

Scientific staff	Publications (1986-)							
	First author				Co-author			
	R	E	i _a	i _b	R	E	i _a	i _b
*Mati Ilomets, Cand Geol Sci	.	1	.	2	.	.	.	2
*Malle Mandre, Cand Biol Sci	.	5	1	1	.	.	.	.
*J-M. Punning, Prof (head)	.	.	9	16	.	.	3	.
								28

Structural and functional organization and anthropogenic dynamics of terrestrial ecosystems

1. Effects of anthropogenic factors on the function and structure of plant species and the use of biochemical and physiological methods in the indication of the state of plants (M. Mandre).

Principal activities

The group studies effects of human activity, including environmental pollution by alkaline dust, on the physiology and biochemistry of plants. Early diagnosis of pollution injuries (e.g. changes in N and S metabolism, carbohydrates and respiratory substances) is also included in the project, as well as evaluation of the importance of pathogenic behaviour to observed biological changes in the environment.

Evaluation

The work comprises several aspects of industrial pollution, including immission estimation of a number of elements and compounds and their possible effects on plant biochemistry. The work is quite comprehensive but has presently resulted in only few international publications. The problem of environmental alkalization is peculiar to parts of Estonia and quite locally to a few other areas, mainly in eastern Europe. It might therefore be of less international interest than the environmental acidification problem, but constitutes a possible Estonian scientific niche which might allow the recognition of new methods of international interest.

The results presented at the hearing seemed quite promising and some plant reactions found to be sensitive to alkaline pollution should be further elaborated. Some of the results presented are of a high interest and should be published in international journals. The general quality of the work and scientific competence of Dr Mandre is ~~good to very good~~.

Recommendations

Continued support is most strongly recommended. Collaboration with similar groups outside Estonia should be encouraged.

2. Evaluation of geochemical and biological criteria for the purpose to reconstruct the development pattern of environmental conditions and technogenic impact on the state of ecosystems (Kurtina kame field, NE-Estonia) (J-M. Punning, M. Ilomets)

Principal activities

The project aims at investigating the relationships between natural systems (species, communities, ecosystems) and influencing external factors, natural and man-made, on plant species and communities. In order to estimate the role of human activities on natural geoecosystems and to prognosticate their deviations, a paleoecological approach has been applied.

Evaluation

Much of the work so far is attempts at reconstructing "fossil" plant communities/mire structures and their past environments, particularly from a chemical point of view, by using macro-fossils, pollen and chemical data. Several rather advanced analytical methods have been used to elucidate chemical gradients in sediments and peat influenced by alkaline deposition. Forest history was reconstructed using palynological diagrams, ^{14}C datings etc, and was related to the current species composition and vegetation characteristics. Part of the studies seemed mainly to be of national interest but the effects of alkaline dust deposition on e.g. *Sphagnum* bogs are mainly unique to Estonia and, therefore, of a high general interest provided the results are published internationally. The approach of research is similar to that established in e.g. Sweden and Finland since long and the group has obviously good contacts with some colleagues in these countries, particularly in Finland.

Only little has been done with respect to present-day ecological conditions, showing: "...the anthropo-tolerance of the natural systems" according to the scientific programme stated by the group. In one paper (Ilomets 1988) the distribution of *Sphagnum* communities in two mires was described.

Professor Punning shows a very high publication rate, with on average 4-5 papers per year since 1986. However, most papers are irrelevant to our evaluation since they deal with earth science problems and topics related to purely aquatic environments. Punning has no doubt a very good competence as a researcher and conducts ~~good to very good projects~~.

Although Ilomet has some results on live plant communities his scientific profile is similar to that of Punning. He has a much lower publication rate, however. Ilomet has shown a ~~fair to good competence~~ in this field of research.

Recommendations

Although much work has been made on element distribution in the environment, hardly anything shows their biological effects. It would be necessary to show this to reach the aims of the project. Permanent plots and carefully designed experiments should be considered, from which quantitative data of the effects due to pollutants as well as to time can be derived. An emphasis on the effects of alkalization on important plants, plant communities and mire structures may be particularly fruitful because this type of pollutants is almost unique to Estonia.

Continued financial support is recommended/strongly recommended.

Dr Urve Ratas, Landscape laboratory, Estonian Academy of Sciences, Tallinn
Botanical Garden (TBG), Tallinn - Project leader

Scientific staff	Publications (1986-)								Total
	First author				Co-author				
	R	E	i _a	i _b	R	E	i _a	i _b	
*Leiti Kannukene	2	1	.	3	.	1	.	.	7
*E. Nilsson, Dr	.	1	.	1	2	1	.	1	6
Elle Puurman	2	1	1	.	.	.	.	1	5
*Urve Ratas, Dr (Head)	1	4	.	1	2	1	.	.	9
*Andres Tõnisson	1	2	.	.	.	.	.	.	3

The dynamics of geocomplexes under the influence of natural and anthropogenic factors on Estonian coastal districts

Landscape structure, dynamics and evolution of Estonian islands

Principal activities

This group is studying natural landscape elements and their development, to provide background information for the urban ecology research of the Botanical Garden.

Evaluation

The publication list contains mainly papers published in Russian or Estonian. Although a few papers are in English, only one international publication is included (in Soviet Soil Science), and most efforts have thus been directed towards the Estonian scientific community alone. L. Kannukene's papers describe the moss flora in various areas in Estonia and some taxonomic problems related to mosses. She plans an Estonian bryoflora and appears to have sufficient to good competence for that.

The personal meeting with Dr Ratas and her former student, Dr Toomas Kokovin, present research director of the Hõuama Biosphere Reserve, formed a good complement particularly to the papers in Russian and Estonian, because of the language barrier. They presented the results of several detailed studies of the distribution of plant groups ('small coenusia'), separate plant individuals as well as some edaphic (e.g. chemical) soil data along transects of some western Estonian islands (partly published in English by Ratas et al. 1988). All data were put on computer files and used for numerical evaluation of various correlations and successional trends. Field experiments to simulate various human effects were established. Both researchers show a good scientific competence and are conducting a good project of particular importance to the MAB programme of Estonia although with a potential for results of international interest as well.

Recommendations

Continued support is recommended/strongly recommended. However, the publishing should be aimed towards the international public. Contacts with researchers at for example the Institute of Ecology and Marine Research in Tartu (Drs Kull and Paal) and the Department of Plant Ecology in Uppsala (Prof van der Maarel and associates) may be of value for the theoretical and methodological development of the present project.

Prof Juhan Ross, Institute of Astrophysics and Atmospheric Physics, Estonian Academy of Sciences, Tartu - Project leader

Scientific staff	Publications (1986-)								Total
	First author				Co-author				
	R	E	i _a	i _b	R	E	i _a	i _b	
Andres Kuusk, Res. Assoc.	2	.	3	5	4	.	1	.	15
Alexander Marshak, Res. Assoc.	1	.	1	.	4	.	3	2	11
Tiit Nilson, Res. Assoc.	5	.	4	1	4	1	.	3	18
Urmas Peterson, Jun.Res.Assoc.	2	.	1	3	.	.	1	.	7
Jüri Reeman, Res. Assoc.	.	.	.	.	.	.	.	.	0
Juhan Ross, Professor (Head)	4	.	5	1	5	.	4	2	21
Kaarel Ross, Mathematician	2	.	1	.	3	.	.	.	6
Madis Sulev, Res. Assoc.	.	.	.	.	.	.	.	.	0

Optical monitoring of Estonian vegetation

Principal activities

The aims are:

- (a) to investigate by field measurements changes of spectral reflectance of main types of Estonian plant cover
- (b) to determine such spectral characteristics of vegetation which allow to characterize phenological development
- (c) to develop semiempirical models for determining productivity of different types of vegetation
- (d) to develop new methods of monitoring conifer forests using satellites

Evaluation

We were unable to meet this group. However, there is nothing in the material available indicating that their research is not at or close to the international scientific front. They have a comprehensive publication record with many papers in Russian journals, but also many recent contributions in western refereed journals and textbooks. This group has obviously a ~~very good to excellent scientific competence~~. Expertise in this speciality is important to any monitoring systems using remote sensing techniques, e.g. those related to agriculture, forestry and to various environmental problems. The reported large decrease in the funding of the group is therefore alarming.

Recommendations

Sufficient financial support to this group is most strongly recommended.

Dr Andres Tarand, Laboratory of the Environment, Tallinn Botanical Garden
(TBG), Tallinn - Project leader

Scientific staff	Publications (1986-)							
	First author				Co-author			
	R	E	i _a	i _b	R	E	i _a	i _b
*Agu Eensaar, Dr	1	2	.	.	2	1	.	.
Alla Kangur, Dr	.	3	.	.	1	1	.	.
*Siiri Liiv, Dr	1	1	.	.	.	1	.	.
Thea Normet, Jun res	.	1	.	.	.	4	.	.
*Heldur Sander, Jun res	2	10	.	.	.	4	.	.
*Andres Tarand, Dr (Project leader) (E. Sander, engineer)	2	4	.	1	1	2	.	.
								Total
								6
								5
								3
								5
								16
								10

Urban ecology

1. Urban climate and air pollution (bioindication determination)
2. Urban vegetation and land use and their role in the protection of the environment

Principal activities

The aims according to the presented report are:

- (a) To characterize the urban environment by various physical and chemical characters in order to improve this environment by means of town-planning
- (b) To organize measurements in fields not covered by official state programmes
- (c) To reconstruct past climatic conditions

Evaluation

The scientific aims of the group did not become quite clear to us neither from the written material provided nor from the oral presentations at the site visit. One explanation for this was given by Dr Tarand both orally and in his report: "...planning economy ...influenced the style of the main lines of studies making them more unclear or undetermined (all our activities were part of the plan and the plan had to be fulfilled in any case)".

The written report mentions six scientists (listed above). They have no publications in any international scientific journals. Most papers are in Estonian, some with short English summaries, a few in Russian and one in English in an Estonian Academy series. Several papers appear to be mainly floristic descriptions of wild and cultivated plants in Tallinn, estimates of the biomass and number of various planted trees, descriptions of damages in plants assumed to have a climatic background, etc (H. Sander, in several papers). A few papers in Russian obviously contain quantitative chemical data (Liiv et al 1988a), data on bioindicators (Liiv et al 1988b, Liiv 1989a+b)) and climatic variables (Tarand et al 1988) but whether these show results of more general scientific interest could not be deduced. The only paper wholly in English shown to us (Tarand 1988) is a popular account on the Estonian climatological-meteorologi-

cal research. The presented scientific projects and papers so far indicate a research group of ~~a poor to fair~~ scientific competence from an international point of view.

Recommendation

The scientific programme of the group should be reorganized towards more consistent lines of ecological research than at present, before continued funding can be recommended (except salaries). The present affiliation of much of the present research to the TBG appears scientifically artificial and due to historical reasons that are not relevant today. Collaboration with other groups on problems related to pollution-bioindication research should be considered, e.g. with Dr Kirso's and Dr Mandres' groups in Tallinn as well as with that of Dr M. Zobel in Tartu. The historical climate records could be considered in an ecological modelling context, for instance combined with some of Dr Ratás' vegetation data.

The cooperation with other countries concerning heavy metal deposition is of importance to European monitoring and should be continued and receive financial support.

Plant taxonomic research and possible research in landscape architecture seem naturally connected to the Botanical Garden, however. Landscape ecology is also planned in Tartu (Drs. Kull and Koppel) and an exchange of experiences and ideas between Tartu and Tallinn may therefore be beneficial. Possible approaches and models of 'landscaping' research can be found, for instance, at the Swedish Agricultural University.

Prof H Trass, Department of Botany and Ecology, Laboratory of Bioindication,
Tartu - Project leader

Scientific staff	Publications (1986-)								Total
	First author				Co-author				
	R	E	i _a	i _b	R	E	i _a	i _b	
K. Aaviksoo, Researcher	1	.	.	2	.	.	.	.	3
A. Kont, Researcher	.	.	.	1	.	.	1	.	2
R. Kristian, Undergrad stud	.	.	.	1	.	.	.	.	1
E. Kukk, Docent	.	.	.	1	.	.	.	2	3
E. Läärä, Research	.	.	.	.	.	.	1	.	1
M. Leis, Ass. Researcher	.	.	.	.	.	.	.	.	0
V. Masing, Professor emer	1	.	2	2	1	.	3	.	9
J. Oksanen, Ass. Professor	.	.	1	.	.	.	.	.	1
A. Pärn, Dir, Bot Garden	1	.	.	.	2	.	.	.	3
H. Rebane, Undergrad stud	.	.	.	.	.	.	.	1	1
R. Reintam, Professor	.	.	.	1	.	.	.	.	1
E. Roosaluste, Lecturer	.	.	.	.	.	.	.	1	1
R. Sepp, Researcher	.	.	.	.	.	.	.	1	1
M. Toom, Tech assistant	.	1	.	1	1	.	.	.	3
*H. Trass, Professor (Head)	3	.	.	6	2	.	.	.	11
K. Zobel, Researcher	.	.	3	2	3	.	1	1	10
*M. Zobel, Docent	4	.	5	2	.	.	3	1	15

Dynamics and structure of plant communities in the boreo-nemoral zone

The projects are described and evaluated jointly as follows:

Projects 1-3

1. *Sphagnum bogs - vegetation structure and succession* (V. Masing, M. Zobel, E. Roosaluuste, M. Toom, R. Kristian and K. Aaviksoo)
2. *Pattern and process in mixed hardwood forest* (K. Zobel, M. Zobel, R. Reintam, R. Sepp and H. Rebane)
3. *Succession of alvar communities in the land uplift area* (M. Zobel and A. Kont)

Principal activities

These projects deal with the characterization and classification of vegetation patterns and processes and the dynamics of plant communities in different ecosystems (mires, forests, alvar). A combination of theoretical and empirical approaches is applied.

Evaluation

Most of the work deals with the collection and processing of phytosociological data sets using various statistical-numerical methods to describe and discuss plant interactions, whereas much less work is devoted to plant-physical/chemical environment interactions. This reflects the particular interest and

competence of the researchers involved, but also the deficiency of equipment for measurements of environmental parameters. The total number of publications of the group comprises nearly 50 papers (since 1986) to which mainly M. Zobel, K. Zobel, V. Masing and H. Trass have contributed. Particularly the publication profile of M. Zobel (15 papers) is impressive. He has many papers of high scientific qualities in international journals and ~~shows a very good scientific~~ competence. However, we were told that some members of the staff now have left the department, and that teaching and administrative work was quite heavy for many of the people involved. It was therefore satisfactory to see that some of these persons nevertheless were scientifically very active and showed such a progress. We were told about the present difficulty to follow the new international literature. This is serious and the situation, if not changed, may limit the future progress of the group.

Recommendations

Continued support is most strongly recommended. The problems related to the insufficient access to international literature must be solved with very high priority (see Preface).

Projects 4-5

4. *Methodology and application of air pollution monitoring with the help of epiphytic lichens* (K. Zobel, H. Trass, A. Pärn, J. Oksanen, E. Läärä)
5. *Local lichen floras, mapping of threatened species and theoretical problems of lichen conservation* (H. Trass)

Principal activities

Project 4 involves a statistical analysis of the value and applicability of certain characteristics of epiphytic lichen communities used to indicate atmospheric pollution. Project 5 aims at:

- (a) describing the lichen flora of Estonia and some areas in Siberia
- (b) making a list of threatened lichen species in Europe
- (c) promoting mapping and conservation of such species

Evaluation

The work of project 4, particularly that contributed by K. Zobel, ~~is very good~~. The statistical methods for lichens as bioindicators are important for the environmental monitoring programme in Estonia and of international interest.

Professor Trass' lichen flora work (project 5) will certainly be of great importance to the botanical-ecological sciences in Estonia but also internationally. We were informed that a manuscript in Estonian was already completed but could not be published because of the present financial situation.

Recommendations

Support to project 4 is strongly to most strongly recommended. In project 5 the publishing of both the present versions of the lichen flora as well as of an English translation should be given a very high priority and financial support for this purpose is most strongly recommended.

Project 6

The use of algal assays and indicator species for determining the quality of water in different ecosystem (Finnish Gulf, lakes, mires) (E. Kukkk, M. Zobel, M. Toom, M. Leis, O. Niemi, T. Trei, H. Kukkk)

Principal activities

The measurements of indigenous phytoplankton and transparency are carried out using a combination of results from algal assays, to study temporal and spatial changes in nutrient status.

Evaluation

The publications of results of the project are mainly descriptions of ~~a fair~~ to good scientific standard.

Recommendations

Continued support is recommended.

APPENDIX

Background of evaluators

Mats Sonesson

Professor of plant ecology, presently at the Abisko Research Station, Royal Swedish Academy of Sciences. His research interests concern the ecology of boreal and arctic-alpine plants, particularly their population dynamics and ecophysiology.

Germund Tyler

Professor of ecology, presently at the Department of Ecology, University of Lund. His research interests concern soil-plant relationships, especially soil chemical properties controlling the distribution of plants and macrofungi. His position is sponsored by the Research Council of the National Swedish Environment Protection Agency.

Thomas Alerstam (advisor on ornithological projects)

Docent of behavioural ecology, presently at the Department of Ecology, University of Lund. His research interests concern behavioural ecology and ornithology, particularly bird migration.