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# International Tundra Experiment Update - December 1995 (No.7)

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## Chairman's column

### ITEX proliferates

As it seems, ITEX continues to move ahead stronger than ever. A milestone now within sight is the publication of the first set of results from the basic experiment, and we should do our very best to get this special issue of *Global Change Biology* off the ground as soon as possible. The extensive cross-site collaboration among researchers and projects has become a characteristic feature of our programme, and ITEX is now frequently used as a model for networks in other disciplines. Obviously, the presence of a common basic experiment supported by accessible and user friendly items such as the ITEX Manual and the video has helped in creating this picture. Our annual workshops are increasingly well-visited happenings, and the strong representation of grad students from the field parties is a rather unique feature.

During the last year ITEX has proliferated in many ways. Thanks to new long-term grants from some of the national funding bodies, integrative community-level experiments and monitoring have been initiated at some of the sites, particularly Toolik Lake (Alaska) and Latnjajaure (Sweden). A grant for a synthesis workshop (fall 1996) has recently been awarded in the US, and the flow of information and data will also be tuned up by the establishment of an ITEX home page on the World Wide Web in the near future. The collaboration with other environmental research programmes flourishes; besides of our strong connections with the International Permafrost Association and the U.S. Long-Term Ecological Research programme, ITEX is well-represented in the Global

Change Working Group of the International Arctic Science Committee (IASC), the European Mountain Biodiversity group, and in the new Arctic GCTE Working Group (see below in this issue).

Finally, on the behalf of all ITEXers, I welcome the new participant countries Austria and Japan to the show. It is my hope that the increasing complexity of the ITEX map also will be manifested at the Seventh International Workshop in Copenhagen, April 1996.

Ulf Molau, chair



## Report from the 6th ITEX work-shop, Ottawa, 7.-11. April 1995

*By Per Mølgaard, Royal Danish School of  
Pharmacy*

A high number of arctic botanists was able to attend the ITEX workshop this year held at the University of Ottawa in Ontario, Canada. Thanks to the organisers, Greg Henry and Toni Lewkowicz, the workshop was again very successful, and held in a cheerful and warm atmosphere with participants from Canada, Denmark, Finland, Norway, Russia, Sweden, Switzerland, UK and US.

As usual part of the workshop program concerned field reports from the participating countries, with recent developments in the field work. The aims are by means of identical observations and manipulations of plants, i.e. experimental warming, in the entire circumpolar Arctic, to anticipate the responses of plants to a global climatic change.

Apart from the well known sites from previous years in Arctic Canada, Lapland, and Greenland, reports from new sites established in Norway, Switzerland, and US were given, and we were informed of activities in Iceland and Japan, and even Bolivia. These latter sites contribute to the alpine activities also covered by ITEX, as shown on the updated map of ITEX sites (Fig. 1). Mainly with this extension in mind more plant species have been included in the experiments, e.g. *Silene acaulis* and *Vaccinium uliginosum*, but although this extension is most welcome, additional species will not be included in the manual. ITEX'ers working with other plant species than those already in the manual are recommended to design their own set of species specific parameters with reference to the pattern for the key ITEX species.

#### **Warming devices**

There was less focus on the warming devices than during previous workshops. This matter has been settled by now, the experimental warming of plants varies from site to site and according to the device. Enhanced temperatures are generally between 0.5 and 5°C. Giles Marion presented a paper based on results of temperature manipulations from the various sites and with different designs. This paper is prepared for publication in Arctic and Alpine Research in the near future.

#### **Voucher specimens**

As ITEX is a unique co-operation between arctic botanists and the work to a very high degree is species related, it was acknowledged that Dave Murray on behalf of the Herbarium in Fairbanks, accepted to receive voucher specimens from all sites of all species, with an obligation to refer back to experimenters the validity of their taxa. At the same time it was agreed that Dave should contribute with a paper on the taxonomy of the ITEX species to the forthcoming publication of first years results of phenological observations and temperature manipulations.

#### **Active layer monitoring**

Time has come to take ITEX to a higher level of organisation and one of the main options is to include measurements of the active layer and the retreat of permafrost during the growing season. Knowing that at some ITEX sites there is not enough time to do more elaborated measurements in permanent plots, the ITEX'ers acknowledged a set of minimum observations proposed by Jerry Brown. A protocol for these observations will be included in the next issue of the manual to be released before the 1996 ITEX workshop to be held in Copenhagen, but until then it can be obtained from the Danish Polar Center or directly from Jerry Brown on e-mail: [jerrybrown@igc.apc.org](mailto:jerrybrown@igc.apc.org)

#### **Vegetation cover data**

Like for the climate we also intend to have a detailed description of the vegetation composition from the ITEX sites. This should at least include a species list from all sites, but preferentially also information on the relative importance of the species, either with frequency or cover data. Marilyn Walker has offered to compile this presentation and will prepare a page with recommendations of what kind of field observation is needed for the publication.

#### **Data exchange**

The most important part of the ITEX co-operation is the exchange of data. In the planning of ITEX, data exchange was treated as a matter of mutual agreement: Every participant should contribute to the common data bank, and be involved in publications comprising his or her own data. Individual ITEX'ers should contribute to common publications, which could be species specific or site specific. This is still valid, however, the data may be of more general interest and may be used in different connections where the author may not be directly involved. We discussed a system where any participant could be not only acknowledged for contribution of data, but where the data set could be referred to as

such, and be included in any personal CV. A system for this data sharing will be worked out in the near future, and send via the e-mail to the ITEX mailing list. For further information contact Marilyn Walker, e-mail: marilyn.walker@colorado.edu.

### Publications

It was agreed that the first set of publications covering one, two or three years experiments should be made ready for Arctic and Alpine Research. Manuscripts should be produced species specific and cover as many of the sites as possible. Co-ordinators were appointed as outlined in previous issues of the ITEX Update. Ulf Molau and Greg Henry will edit the issue and should have the manuscripts in print and on floppy disk no later than 31. October 1995.

### Co-ordinators:

Climate: Barrie Maxwell  
 Vegetation: Marilyn Walker  
 Warming device: Giles Marion  
 Cassiope: Jill Johnstone/Christian Bay  
 Dryas: Jeff Welker/Josef Svoboda  
 Salix: Mikael Stenström/Urban Nordelhäll  
 Eriophorum: Greg Henry/Ulf Molau  
 Carex stans: Greg Henry  
 Carex bigelowii: Anna Lindskog  
 Oxyria: Greg Henry  
 Papaver: Per Molgaard/Greg Henry  
 Ranunculus: Ulf Molau  
 Sax.opp.: Mikael Stenström/Felix Gugerli  
 Polygonum: Felix Gugerli  
 Silene: Juha Alatalo  
 Vaccinium: Anne Tolvanen/Andy Parsons  
 Betula nana: Kari Laine  
 Vegetation cover data: Marilyn Walker

### Secretariat

The necessity of the secretariat was questioned. After establishing the e-mail itexlist the contact between ITEX'ers have been improved and facilitated. However, production of a printed manual is still needed, and the work done by the Danish Polar Center was highly acknowledged. Please, remind the national MAB committees that they pay

their fee for Northern Science Network, which also cover the expenses for ITEX.

### Concluding remarks

Pat Webber had the word for a closing remark and took up the questions raised by chairman Ulf Molau in his introductory talk. Are the responses realistic? Do we see any common trends? Where do we go from now? Not that he would try to answer the questions, rather would he share some of his reflections related to the questions:

It may not be that important to have realistic responses, as our manipulations after all are

- 1 Hveravellir, Iceland
- 2 Mt. Skálafell, Iceland
- 3 Zackenberg, Greenland
- 4 Disko Island, Greenland
- 5 Alexandra Fjord, Canada
- 6 Sverdrup Pass, Canada
- 7 Hot Weather Creek, Canada
- 8 Truelove Lowland, Canada
- 9 Baker Lake, Canada
- 10 Churchill, Canada
- 11 Niwot Ridge, USA
- 12 Toolik Lake, USA
- 13 Barrow, USA
- 14 Anadyr, Russia
- 15 Petropavlovsk, Russia
- 16 Lower Kolyma, Russia
- 17 Taisetsu Mts., Japan
- 18 Taimyr, Russia
- 19 Yamal, Russia
- 20 Kilpisjärvi, Finland
- 21 Abisko, Sweden
- 22 Latnjajaure, Sweden
- 23 Ny-Ålesund, Svalbard
- 24 Val Bercla, Switzerland
- 25 Furka Pass, Switzerland
- 26 Finse, Norway
- 27 Austria

artificial. Much more important is the value of the long term experiments, and the variation we see in time and space. For the future we must make sure that we have the potential for a change in leadership, and in that respect it is very promising to see the high number of young scientists at this meeting and at the ITEX SITES. We really have established 'the ring around the tundra'.

### ITEX activities, level two

From the discussions in the thematic working groups future activities will

highlight genetics, common garden experiments, herbivory and plant chemistry. Initiatives to include these fields in the ITEX manual will be taken according to the discussions, and guidelines, protocols and possibilities for common laboratory analyses for plant chemistry will be taken hand of. The establishment of an arctic plant collection in the Botanical Garden at the University of Oulu in Finland may prove very useful in this respect.

#### **Next ITEX workshop**

The next ITEX workshop will be held in Copenhagen in the last week of April 1996. At that time 'level two' investigations should be discussed closer and protocols for more elaborated experiments should be launched.



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## **Reports from ITEX SITES**

### **GREENLAND**

*By Per Mølgaard*

#### **Zackenberg**

During the latest years attempt have been made to establish Zackenberg as a permanent scientific station at 74° N in East Greenland. Vegetation analyses have been carried out in a transect from sea level to 800m altitude, and permanent plots established along this transect to be analysed with regular although infrequent intervals. In 1995 a climate station was established and a detailed monitoring programme was initiated. Monitoring areas were marked for observations of flowering plants as well as plots for monitoring of insects, birds and mammals, especially lemmings.

ITEX phenological sample plots were established for five species: *Dryas* (6 plots), *Salix arctica* (4 plots), *Cassiope* (4 plots), *Papaver* (4 plots), and *Silene acaulis* (1 plot). All plots were situated at the same altitude, distributed within the area of the climate station, and arranged so that a range of snow cover duration discriminates between them. Each plot is marked with pegs in the corners, and the size is determined according to the plant density and flowering intensity. The total number of flowers within each area was noted only one day in the middle of the season and will be determined once every year during the monitoring period. The flowering phenology of six selected plants was monitored on a weekly basis, and it is planned that the phenology should be scored at the very same dates during the following years. Monitoring of these plant plots as well as similar sites for birds, insects and mammals will be carried out during the next centuries! This is planned to be one of the basic activities at the Zackenberg station as part of ZERO (Zackenberg Ecological Research Operation).

#### **Disko**

In West Greenland the ITEX activities from previous years have been continued at the Arctic Station at Disko. ITEX corners around *Papaver* and *Salix arctica* gave less response in 1995 than in the previous years regarding morphological parameters, such as above ground biomass and number of flowers. However, plant chemistry gave some interesting results: The content of the alkaloid berberine in *Papaver radicatum* was higher in plants in corners facing West and South than in corners facing North and East corresponding to the highest temperature elevation in S- and W-facing corners. This also applied to plants from an open top chamber (hexagon) compared to control.

## ICELAND

By Inga Svala Jonsdottir,

The Icelandic ITEX-programme has had several difficulties in getting started. Finally, ten OTCs and equal number of control plots were set up in July 1995 in Thingvellir National Park (64°17'N, 21°05'W), at a maritime, subarctic moss-heath site on post-glacial lava (8000 years old). The vegetation is dominated by *Racomitrium lanuginosum* which forms an extensive moss-carpet 10 to 30 cm thick. The dominating vascular plant is *Carex bigelowii*. This site is not one of the original ITEX-sites in Iceland, but was chosen because it is easily accessed and substantial information is available on this two species system, such as population dynamics, population genetics, seed bank, moss growth, moss-sedge interactions, soil nutrient availability, atmospheric nutrient input, the pathways of atmospheric and soil nitrogen in the system and plant responses to increased nitrogen deposition. Next summer two students will be working at the site on both *Racomitrium* and *Carex*. Additional ten OTCs will hopefully be set up at a typical maritime tundra site in north-west Iceland.

## SWITZERLAND

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By Felix Gugerli

In 1995, the two Swiss ITEX sites continued their observation as in the preceding season. At Bidmer (Furkapass), Matthias Diemer and his undergraduate student from the University of Basel have finished their work so far, as the whole installation of their research station was taken down. They might continue next summer, but only on a small scale. Both *Saxifraga oppositifolia* and *Polygonum viviparum* were monitored for the second year at Val Bercla, and I plan to go on for a further summer. Luckily, I could acquire another research group from the University of Geneva: Jean-Paul Theurillat and his student Lucie Wiget from the University of Neuchatel will set up a newsite in Val d'Arpette (Valais, Southwestern Swiss Alps). This station is located at the transition zone from colonizing heaths with low shrubs to alpine screes at 2.180 - 2.290m a.s.l. Their monitoring will among others, include *Oxyria digyna*, *Silene exscapa*, *Saxifraga oppositifolia*, *Salix herbacea*, *S. helvetica*, *Bartsia alpina*, and *Rhododendron ferrugineum*. It is great to welcome another alpine site, which will also allow better comparisons to the northern locations, and I'm very much looking forward to this collaboration across the Swiss language border!

## SWEDEN

By Ulf Molau

The Latnjajaure Field Station, the base for the Swedish ITEX operation, was opened in mid May. The winter had been snow-rich and we spent some days digging the station and installations out of the snow. The spring and early summer were nice and warm, but from late June the weather went very cold, and this situation lasted throughout the summer until shut-down of the station in early September. Many events of snowfall were recorded in July and August this year, and only the early-flowering plant species managed to set seed at all.

Besides of the basic ITEX monitoring and manipulation with a number of species (*Carex bigelowii*, *Cassiope tetragona*, *Dryas octopetala*, *Polygonum viviparum*, *Ranunculus nivalis*, *Salix herbacea*, *Saxifraga oppositifolia*, *Silene acaulis*), a new 3.5 year grant from the Swedish Natural Science Research Council (NFR) enabled us to initiate experimentation at the community level. The new Community Level Interaction Programme (CLIP), with an experimental design adopted from the Long-Term Ecological Research (LTER) at Toolik Lake, Alaska, was set up with two replicate blocks in each of two communities, a nutrient-poor lichen-dwarfshrub heath and a nutrient-rich meadow. A fully factorial design is employed, the treatments being temperature, fertilization, and introduction of mountain birch. As Latnjajaure (ca. 1000 m.s.m.) is situated in a subarctic-alpine mountain area, the geographical distance to the nearest valley forested with birch is only about 4 km even though the ITEX site is located at 300 m of elevation above the present timber-line. We have a steady influx of birch seeds at Latnja, but so far establishment does not occur in unmanipulated tundra.

In order to quantify the background influx of seeds from lower altitudes, a number of seed trap stations (sets of plastic turf doormats) were implemented at 100 m altitude intervals from the timber-line at 700 m.a.s.l. to the top plateau of Mt. Latnjacorru at 1400 m.a.s.l.. In addition, high altitude seed flux stations were set out on two of the major peaks in the area, and a reference station was started in the subalpine birch forest at the Abisko Scientific Research Station. The seed traps will be harvested every spring immediately after snow-melt. Soil samples for seed bank analysis will be taken at all stations in 1996.

Another 4-year experiment, the Press And Pulse Programme (PAPP) was implemented at Latnjajaure in 1995 to test the validity of the ITEX method of temperature enhance-

ment and plant responses. In each of four replicate blocks in a rich meadow community we have one unmanipulated control, one standard ITEX Open-Top Chamber (OTC), and the Press and Pulse plots. In the Press unit, a stepwise increase in environmental perturbation is created by using an OTC ventilated at the bottom the first year (1996), putting it firmly on the ground in 1997, and covering it with a plastic lid in 1998. In the Press unit, a short environmental pulse (Closed-Top Chambers erected in mid July 1995 to be removed at the end of the 1996 summer) is created, and we then follow the recovery of the community and its species, particularly assessing the longevity of short-term responses. The entire PAPP will be terminated at the end of the 1998 season by destructive harvesting, including below-ground biomass.

Other activities at Latnjajaure in 1995 included initiation of ITEX manipulation and monitoring of *Ranunculus glacialis*, increased field work on sexual and vegetative reproduction in *Carex bigelowii*, and a study of the responses of several bryophyte species to the temperature experimentation. An additional climate station was erected on top of the most experiment-intensive ridge for summertime use. The new lab cabin from late summer 1994 was a welcome addition to the facilities, and one of the old cabins for living was completely renovated. The number of user days of the station increased from the normal ca. 450 to 688 in 1995. A team from Swedish Television visited Latnja in June, and a segment covering ITEX and the experimentation at the Swedish site was broadcasted in a magazine programme in August. As in 1994, the costs for the weather observer/field assistant and the *Carex* programme were financed by the Swedish Agency for Nature Conservation.



## Reports

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## **VI IOPB Internation Symposium**

*By Ulf Molau*

The 6th International Symposium of the International Organization of Plant Biosystematists (IOPB) was held at the University of Tromsø, Norway, 29 July - 2 August, 1995, this time entitled "Variation and Evolution in Arctic and Alpine Plants". Thanks to the IOPB steering committee and the local organizers, the symposium was a great success, attended by most of the world's leading scientists in arctic and alpine plant biology. The sessions included themes like biodiversity, reproductive strategies and demography, molecular methods in population biology, and Global Change. The level of the meeting was set already in the inspired opening address by Peter Raven. ITEX was well represented, with oral presentations by Jim McGraw and Dave Murray from the U.S., Terry Callaghan and Phil Wookey from the U.K., Volodya Razzhivin from Russia, Gaku Kudo from Japan, Inger Nordal and Arve Elvebakk from Norway, Felix Gugerli from Switzerland, and Ulf Molau from Sweden. Several other ITEX projects were presented in the excellent poster session. The ITEX video, "Arctic Tundra in a Changing Climate", was shown during the final session. This very stimulating symposium offered presentations of arctic and alpine plants and environments from all over the planet.

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## **NEWS**

### **New ITEX country**

We welcome a new member country in the ITEX family. Austria has entered the network by the research group of Prof. Dr. Georg Grabherr, Vienna. They are studying altitudinal shifts in the high alpine flora in Austria, and have recently also initiated field work in Franz Joseph's Land; the latter will be the northernmost of all ITEX sites.

### **IGBP**

*By Ulf Molau*

IGBP (International Geosphere-Biosphere Programme) has acted towards a better accommodation of arctic terrestrial ecology within GCTE (Global Change and Terrestrial Ecology) by establishing the "Arctic GCTE Working Group" comprising ten national representatives from each of ten countries: Terry Callaghan (U.K.), Torben Christensen (Denmark), Barbara Godzik (Poland), Greg Henry (Canada), Jarle Holten (Norway), Kari Laine (Finland), Ulf Molau (Sweden), Yuri Starikov (Russia), John D. Tenhunen (Germany), and Halldor Thorgeirsson (Iceland). This group continues the mission of the temporary Task Force established at the Oppdal conference in August 1993 (Callaghan - Maxwell - Molau - Oechel - Panikov). The Task Force is preparing a draft "Arctic Terrestrial Ecosystem Research Plan" to be discussed at the IASC conference in Hanover, NH, in December 1995.

### **Back in the Field**

Pat Webber, the first chairman of ITEX, returned to his professorship at Michigan State University, East Lansing, in August 1995 after serving two very successful years as Program Director for the Arctic System Science Program (ARCSS) of the National Science Foundation (NSF) and its Office of Polar Programs at Washington, D.C. Pat is now setting up an ITEX research group working in the Barrow area in northernmost Alaska. We all wish him good luck in his returning to active field research.

### **ICALPE**

*By Ulf Molau*

ICALPE, the International Centre for ALPine Environments, have initiated a European network on mountain biodiversity. A preparatory workshop, supported by the European Science Foundation (ESF), was organized at the Centro di Ecologia Alpina, Monte Bondone, Trento, Italy in September 1995, and a steering committee, chaired by Prof. Frank Klötzli (Zurich) is under formation. For more information, call the programme co-ordinator Jennifer McConnell

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(Edinburgh), fax +44-131-662-0478, e-mail JMCC@srv0.bio.ed.ac.uk.

### **INTAS-RFBR**

(International Association for the Promotion of Co-operation with Scientists from the Independent States of the former Soviet Union-Russian Foundation of Basic Research) Detailed information about the INTAS-RFBR activity is available from: INTAS: INTAS, 14a, rue du Luxembourg, B-1040, Brussels, Belgium

Fax: +32-2-5490156

E-mail: INTAS@infoboard.be

Internet WWW home pages:

<http://www.ib.be/intas>

<http://www.rfbr.ru>

<http://www.cordis.lu>



## **Conference Calender:**

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### **ICARP - the International Conference for Arctic Research Planning**

**5-9 December 1995**

Organized by IASC,

Place: Hanover, New Hampshire, USA.

Contact

Julia Lloyd Wright, ICARP Conference Coordinator,

Institute of Arctic Studies,

Dartmouth College,

6193 Murdough,

Hanover, NH 03755,

USA;

Fax: +1 603 646-1279,

E-mail: [julia.l.wright@dartmouth.edu](mailto:julia.l.wright@dartmouth.edu).

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### **Restoration Ecology and Sustainable Development,**

**27-29 March 1996.**

Organized by the Swiss Federal Institute of Technology in Zurich

Contact:

Restoration Conference Secretariate,

c/o Geobotanical Institute SFIT Zurich,

Zürichbergstrasse 38,

CH-8044 Zurich,

Switzerland,

Fax +41-1-632-1215.

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### **7th ITEX Workshop**

**26-29 April 1996**

Place: Danish School of Pharmacy

Contact:

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### **KAZBEGI '96:**

**9-16 June 1996**

Plant Life of High-mountains. The 4th International Ecological Symposium

Organized by the Institute of Botany of the Georgian Academy of Sciences with assistance of the World Wide Fund for Nature (WWF).

Place: Kazbegi High-mountain Station of the Institute of Botany in the Great Caucasus

Contact

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Institute of Botany,

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380007 Tbilisi,

Republic of Georgia,

Phone +995 (8832) 987448,

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### **Mountain Research -**

**14-18 October 1996**

Challenges and Directions for the 21st Century: A scientific conference sponsored by the American Association for the Advancement of Science (AAAS) and the International University of Kyrgyzstan, ,

Place: Bishkek, Kyrgyzstan.

Contact:

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# Announcement

## 7th ITEX Workshop 26-29 April 1996 in Copenhagen

**Organising Committee:** Per Mølgaard, Thomas B. Berg, Christian Bay

**Place:**

The workshop will be held at the Danish School of Pharmacy, Universitetsparken 2, close to the Museum of Zoology in Copenhagen.

**Travel arrangement**

Arrival:

The Copenhagen airport is situated at "Kastrup" 10 km from Copenhagen City. Airbuses to the Main Station in city leaves every 20 min from the airport (ticket fee 35 DKK one way)

Accommodation:

You will have to make your own hotel reservations

The Danish Polar Center has special hotel rates at the following hotels:

Hotel	Phone Fax	Price/night single room	Price/night double room
Bertram's Hotel Vesterbrogade 107 DK-1607 Copenhagen V	+45 3325 0405 +45 3325 0402	DKK 475	DKK 595
Park Hotel Jarmers Plads DK-1551 Copenhagen V	+45 3313 3000 +45 3314 3033	DKK 596	DKK 796

When booking please refer to the special rate for Danish Polar Center

**Registrations and Deadlines**

Registration: 1 April 1996

Abstracts: 1 April 1996

1/2 page abstracts of oral presentations and posters should be mailed to the ITEX Secretariat preferably on a 3,5" diskette (Mac, Windows or DOS), as an e-mail file or as hard copy.

**Local buses**

Copenhagen is covered by a net of bus systems. A blue bus card with 10 tickets is available for 70 DKK. One ticket covers 1 hours "free" use of buses inside the city.

**Preliminary programme,**

Thursday 25 April	17.00	Reception at the Danish Polar Center
Friday 26 April	09.00	Registration at the Danish School of Pharmacy
	10.00	Start of the 7th ITEX Workshop
Saturday 27 April		Workshop continues
Sunday 28 April		Workshop continues
	14.00	Excursion
Monday	12.00	Workshop closes

**Speakers**

Presentations must be of max 20 min. Please indicate your need for AV equipment.

**Posters**

Boards for posters covers 1x1m, please indicate how many boards you require

**Free entrance**

Your conference card will give you free entrance to the Museum of Zoology

**Payment**

The conference fee may be covered by external grants.

Meals will be charged for.

Accommodations will be on your own expenses

**For further information please contact:**

ITEX Secretariat, Danish Polar Center, Strandgade 100H DK-1401 Copenhagen K,  
Phone +45 32 88 01 18, Fax: +45 32 88 01 01, E-mail: tbb@pops.dpc.min.dk

- ♣ School of Pharmacy &  
Museum of Zoology
- ♣ Danish Polar Center
- ① Botanical Garden
- ▲ Main Station
- Bertram's Hotel
- ★ Park Hotel

## Registration Form

PLEASE USE CAPITAL LETTERS ONLY

Last name		First name
Address		
Phone	Fax	E-mail

I will present a speech with the following title:
I will present a poster with the following title:

## U.S.A.

By M. Jones and M. Walker with assistance of other ITEX investigators

USTEX, the US component of ITEX, is now in full operation, with six independent projects operating, five in the Alaskan arctic and one in the Colorado alpine. Three projects incorporate the basic ITEX temperature manipulation, and two of these add increased snowpack to shorten the growing season. One study involves early snow removal plus additional energy inputs to tundra, and a fifth uses existing long-term temperature and nutrient manipulations. The sixth project is a controlled environment study of plant evolutionary responses to climate change. A National Science Foundation proposal is currently under review for USTEX science coordination.

### Toolik Lake, Alaska

1 The summer of 1995 was the first full field season for a collaborative project at Toolik Lake in Alaska (M. Walker, J. Welker, S. Walker, T. Seastedt, principal investigators). The purpose of the project is to examine responses of key tundra plant species and ecosystem properties to experimentally-manipulated changes in summer temperature (using ITEX OTCs) and winter snowpack (using 3 x 60 m snowfences) in moist and dry tundra.

In 1994, snowfences were erected and OTCs were placed within and outside the snowpack area, and community composition was quantified using standard ITEX point-frame methods. This season, phenological and growth measurements were recorded for several ITEX species, including *Dryas octopetala*, *Salix pulchra*, *Eriophorum vaginatum*, *Vaccinium vitis-idaea*, and *Betula nana* from mid-May through mid-August.

Several environmental properties were sampled, including snowdepth, temperature, active layer, soil moisture, soil nutrient solutions, and NDVI. Ecosystem diurnal CO<sub>2</sub> and methane fluxes were recorded in zones of deep and shallow snow, and in and out of OTCs. Preliminary results include an apparent effect of increased snowpack on phenology in dry tundra, but not in the moist. An additional standard ITEX site was established to include *Cassiope tetragona* and *Salix reticulata*.

Other investigators include A. Parsons and M. Jones.

2 This summer was also the first field season for a project to examine effects of increased season length on plant phenology, community composition, productivity, and ecosystem carbon fluxes at Toolik Lake (S. Oberbauer, investigator). This study involves early removal of snow cover, subsequent daily energy addition to the tundra using electric heat strips, and extending the growing season by covering plots with polythene tents.

Phenological monitoring of 8 study species (*Eriophorum vaginatum*, *Carex bigelowii*, *Salix pulchra*, *Betula nana*, *Ledum palustre*, *Vaccinium vitis-idaea*, *Cassiope tetragona*, *Polygonum bistorta*) were conducted from 3 May through 30 August. Carbon dioxide and methane fluxes were measured on the control and treatment plots throughout the season. Plant canopy development, temperature, active layer, and soil moisture were measured, and foliar nutrient and soil solution samples were taken. Community composition of all plots were measured following ITEX point-frame procedures. Preliminary results show that two species showed accelerated senescence on the early season

treatment plots, *Betula nana* and *Polygonum bistorta*. Net carbon dioxide fluxes were negative by the last two sampling dates although some positive fluxes were apparent during the day as late as 26 August.

Other participants on this work include G. Starr and E. Pop (graduate students), and C. Calandriello (undergraduate REU).

- 3 A project to examine interacting mechanisms of adjustment to climate change in primary production (G. Shaver, principal investigator) was also initiated in 1995. The purpose is to determine how individual species adjust to environmental changes in their growth rates, allocation patterns, nutrient use efficiency, and vegetative demography.

In this first season, retrospective growth analysis was conducted for *Salix planifolia*, *Betula nana*, and *Ledum palustre* in all treatments of a factorial, long-term warming and fertilization experiment that has been running for 6 years at Toolik Lake. Warming and fertilization has caused a major shift in community composition toward dominance by *Betula nana*. Preliminary results from the retrospective analysis indicate that this shift in dominance results principally from a major shift in its growth habit, from producing mainly short shoots to producing many more long shoots, and from conversion of existing short shoots to long shoots, although cambial and length growth also contribute. In contrast, *Salix planifolia* also responds to warming and fertilization with greatly increased cambial and length growth, but suffers extensive shoot mortality not found in *Betula*; *S. planifolia* also does not have the large supply of meristems (in the form of short shoots) available to take advantage of

good conditions that are found in *Betula*. *Ledum palustre* also responds to fertilization and warming with greater growth and greater mortality. It seems to flower less, but branches more, and suffers from herbivory in the fertilized plots.

Other investigators on this project include D. Bret-Harte and J. Laundre.

### **Barrow, Alaska**

The 1995 field season was the second year for collaborative ITEX research at Barrow, Alaska (P. Webber, C. Bay, F. Nelson, and J. Brown, principal investigators). The work focuses on fundamental ITEX research using OTC's and also includes monitoring an extensive array of additional species.

Two sites at Barrow, a dry beach ridge site established in 1994, and a new marsh site established this year near the raised beach ridge, were monitored for plant phenological and quantitative measurements and active layer depth over 10 weeks in 1995. A total of 27 vascular plant species are being monitored phenologically at each site. This season, detailed analyses of community composition were carried out in all ridge site plots using the standard ITEX point-frame protocol. Vertical and horizontal variation in temperature was measured in a few OTCs, and a destructive study of biomass in a few experimental plots at the ridge site was also initiated. A new ITEX site was established in August at Atquasuk, south of Barrow, where the same key species are being monitored, including *Cassiope tetragona* at a ridge site and *Carex aquatilis* ssp. *stans* and *Salix pulchra* at a marshy site.

Summer 1995 was much cooler than that of 1994. The averagetemperature at the ridge site was 5.94° C in 1994 and 3.18° C in 1995. The average OTC

temperatures were correspondingly cooler in 1995 than 1994 yet the OTCs were warmer by 1.7° C in both years the control plots. This attests to the effectiveness of the OTCs. The OTCs produced many positive responses. Late season phenophases were accelerated by as much as a week in a nine week growing season and plant stature, especially for *Carex stans* which was double that of the controls, was markedly increased in many species. Some plants, for example, *Cardamine pratensis*, only flowered in the OTCs. This year active layer response within the chambers was followed and by the end of the season the active layer was 2.4 cm deeper under the ridge chambers and 0.5 cm deeper under the marsh OTCs. The active layer measurements were very variable but these slight increases as a result warming by the chamber are considered to be real. The ITEX protocol for active layer measurements agreed to in Ottawa was followed at the Alaskan sites. Late summer thaw on the 1000 meter grids were: Barrow: 34.8 cm; Atkasook: 44.4 cm; and Toolik: 45.1 cm.

Other investigators here include L. Walker and B. Hollister (graduate students).

### **Niwot Ridge, Colorado**

This was the third field season for a collaborative project at Niwot Ridge in the Colorado alpine that is analogous and complementary to the temperature and snow manipulation study at Toolik Lake (S. Walker, T. Seastedt, M. Walker, principal investigators). Like the Toolik Lake study, the purpose of this project is to examine responses of key tundra plant species to increases in summer temperature and winter snowpack.

In 1993, open-top chambers and control plots were placed at intervals of 10, 25, 45 and 75 m within and outside of the

snowdrift area behind the snowfence, which was placed in the transition from a moist *Deschampsia* meadow to a drier *Kobresia* meadow. The phenology and growth of *Bistorta bistortoides* and *Acomastylis rossii* are followed throughout the growing season. Preliminary results indicate that the phenology of the plants has been altered by the snowfence and the OTCs. Growth of *A. rossii* is being influenced at the 25, 45 and 75 meter zones by the OTCs, while *B. bistortoides* has shown a significant response at the 25 meter distance only.

Other investigators at this site include L. Turner (graduate student), J. Welker, A. Parsons and M. Jones.

### **Synthesis Grant awarded to ITEX through new US National Center for Ecological Analysis and Synthesis**

ITEX has recently been awarded support from the National Center for Ecological Analysis and Synthesis at the University of California, Santa Barbara, to conduct an ITEX workshop to analyze and synthesize the combined, global ITEX data set. The purpose of the synthesis effort is to address the fundamental ecological problem of integrating spatial and temporal variability into a conceptual model of population and community response to increased summer temperature. Small teams of ITEX researchers and statisticians will focus on clearly-defined hypotheses that can be analyzed with the ITEX dataset. Because of the high degree of control and broad geographic scale of the ITEX data, ITEX is in a unique position to accomplish this important goal and provide a new degree of understanding not possible through a conventional review of existing studies. The success of the synthesis effort will require a strong commitment among all ITEX researchers. Details about the workshop and preparation needs will be made

available in the coming months as they develop. The April 1996 ITEX meeting will be an important preparatory step for the synthesis efforts. For information about the planned synthesis activities, contact the co-principal investigators, M. Walker (mwalker@taimyr.colorado.edu) or M. Jones (jonmi@taimyr.colorado.edu).

\* \* \*

### **Notes about the 7'th ITEX Workshop**

On page 14 the preliminary programme for the Workshop is outlined.

#### *Finances:*

There will be no conference fee. Participants will have to finance their own accom-modation. Lunches during the workshop will be served at the Royal Danish School of Pharmacy. Participants will be charged a meal ticket covering all service during the day as well as the Sunday dinner at a restaurant in town. Participants will have to finance other evening meals by their own. An ordinary dinner at a restaurant is around 150,- DKK (incl. beverage), though it is possible to eat cheaper.

Meal ticket must be paid in cash at the registration: 350,- DKK  $\approx$  60 US\$

\* \* \*

## **Preliminary Programme for the 7th ITEX Workshop Copenhagen, 26-29 April 1996**

### **Thursday 25 April**

Place : Danish Polar Center (DPC)

18.00 Informal get together, registration, drinks & snacks

### **Friday 26 April**

Place: Royal Danish School of Pharmacy (RDSP)

08.30 Registration, morning coffee. Poster mounting.

09.30 Opening of the 7th ITEX Workshop

09.40 Chairman's note

10.00 GISP - Greenland Ice Sheet Project *by Professor Claus Hammer, Niels Bohr Inst.*

10.30 Climate prognosis - Climate models *by Ass. Professor Axel Walløe, Niels Bohr Inst.*

11.00 Coffee/tea break

11.20 Presentation of the new ITEX-manual  
Progress reports from ITEX-sites - 20 min. each

13.00 Lunch break, lunch to be served at RDSP

14.00 The initiation in 1995 of Zackenberg Ecological Research Operation (ZERO) at Zackenberg, Northeast Greenland *by D. Sc. Hans Meltofte, DPC*

14.30 EDP - modelling of biological data *by Ass. Professor Søren Nors Nielsen, RDSP*

15.00 Coffee/tea break, poster session.

16.00 Progress reports from ITEX sites, continued - 20 min. each

17.30 End of session, evening in town

### **Saturday 27 April**

Place: RDSP

09.00 Species specific reports (titles and abstracts to be presented in the final programme)

10.30 Coffee/tea break, poster session

11.30 Species specific reports continued. Project co-ordination, formation of working groups.

13.00 Lunch

14.30 Working group session.

16.00 Coffee/tea break

16.30 Reports from working groups

17.30 End of session, evening in town

### **Sunday 28 April**

Place: RDSP

09.00 Plenum meeting, decision of new working groups

10.30 Coffee/tea break

11.00 Working groups session

13.00 Lunch

14.00 Excursion to Viking Ship Museum and nature reserve near Roskilde 50 km west of Copenhagen or similar exciting place

Return to Copenhagen

19.00 Dinner at a decent place

**Monday 29 April**

Place: RDSP

- 09.00 Plenum meeting  
Decisions, recommendations, ect.  
Special topics meeting  
Election of a new steering comm  
Steering committee meeting
- 12.00 Closing of 7th ITEX Workshop
- 13.00 Last lunch at RDSP

NB: The programme may be changed according to contributions.