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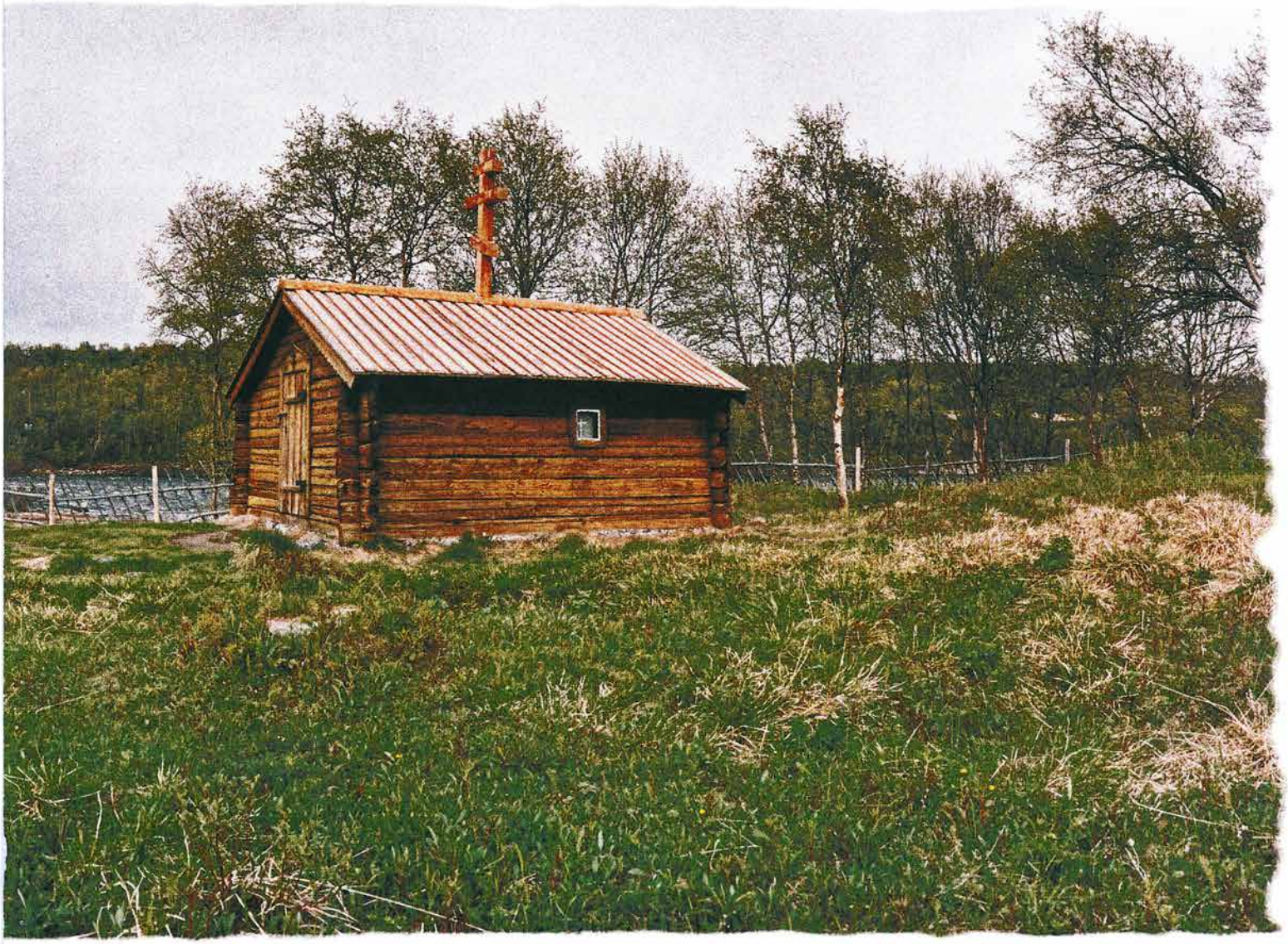
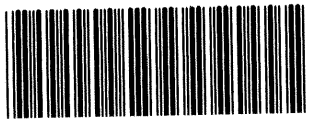
ANNUAL REPORT 1998



NINA • NIKU

Foundation for Nature Research and Cultural Heritage Research



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"From the Skolte area in Neiden, South Varanger in Finnmark county. This was formerly the site of the Skolte Lapps' summer camp. After contact with Russian munks in the 1500's this also became the Skolte Lapps' church center. In the foreground of the picture is St. George's Chapel, which contains 16 old Russian ikones. In the background one can glimpse the Skolte falls, where traditional net-fisheries for salmon occur".

Cover Photo: Arve Kjersheim, Niku

Research in a market place

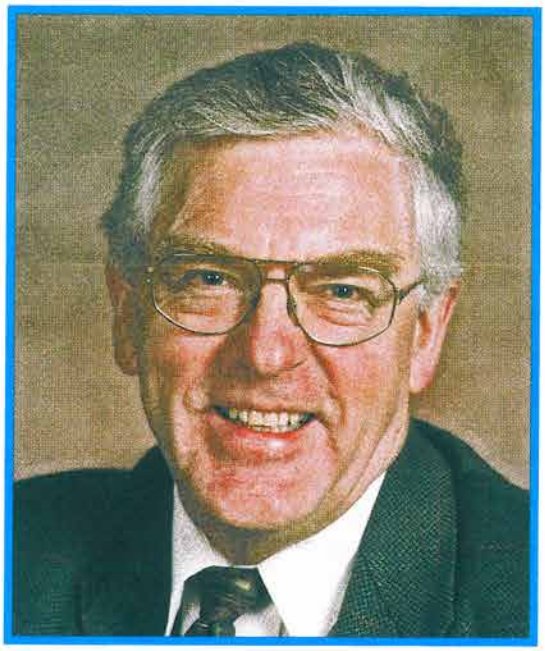


PHOTO: ANNE E. T. WINTERTHUN

With the present external constraints for contract research, we need to wage a continuous battle to maintain our basic expertise, through professional renewal and long-term strategic efforts. Short-term contracts and increasing competition characterise everyday life more and more, leaving increasingly less space for the meritable research which is the very foundation of our existence.

Research expertise within our 'core areas' must be maintained and continually developed if we are to compete successfully in the national and international arenas, also in a market for contract research which has shifting needs and demands flexibility.

Nevertheless, we must deliver research-based products to our clients, in contrast to the pure consultant firms.

At the same time, we also have to bear in mind that we need to serve a market undergoing substantial change, which also includes various sectors of society with their own responsibility for the environment. Here another kind of expertise is also needed, where perhaps the most important key word is communication. This embraces such aspects as marketing, acquisition and customer relations, not least the ability to reflect the client's perspective. Some of our employees are good at this, but as an institution we still have far to go before we can express satisfaction with our ability to be market-oriented.

The success of NINA•NIKU thus depends upon our ability to develop our research expertise further and actually apply it in a market where the environmental management authorities will continue to be key clients, but where a number of other sectors that manage natural resources and cultural heritage will become increasingly more important clients. In such a perspective, there is no indication that our knowledge will be less in demand. We will be able to meet these needs by, for example, acknowledging that we must always live on the crossroads between academic research and the market place.

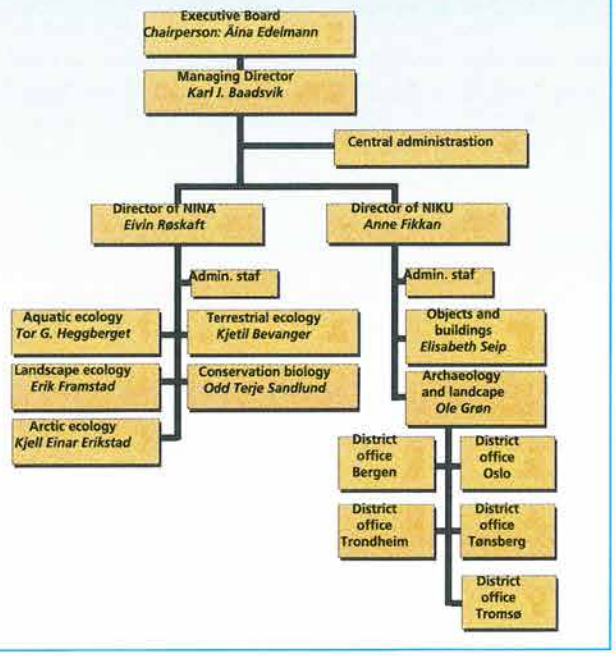
It is, however, essential that we maintain our foundations, and this is really a robust and proactive strategy. Our basic expertise is not only useful in meeting the needs today, it also represents an exceptionally important stand-by resource when new challenges appear. For instance, if we had not had our basic ecological expertise when the Chernobyl accident occurred, we would have been unable to clarify the consequences as we did.

Odd Reidarsen

Contents:

This is NINA•NIKU

NINA•NIKU organisation



The Foundation for Nature Research and Cultural Heritage Research (NINA•NIKU) consists of two institutes, the Norwegian Institute for Nature Research (NINA) and the Norwegian Institute for Cultural Heritage Research (NIKU). The Foundation was established in 1988 and has its principal administrative seat in Trondheim. NINA has personnel in Trondheim, Oslo, Tromsø and its research station for freshwater fish at Ims, near Stavanger. NIKU has staff in Oslo, Tønsberg, Bergen, Trondheim and Tromsø.

The purpose of the Foundation

The Foundation for Nature Research and Cultural Heritage Research is intended

- to be a national and international centre of expertise for applied research into ecology, the natural environment and cultural heritage
- to propose and conduct long-term, expertise-building research and development work in the principal fields of nature and cultural heritage management
- to advice and carry out assignments for nature and cultural heritage management authorities and other bodies, regarding research, other investigations, documentation and conservation
- to impart experience and research results for practical application in the fields of applied ecology and cultural heritage conservation
- to foster the scientific development of its personnel and prepare them for efforts within the Foundation and elsewhere.

The Foundation's principal fields of activity

NINA is chiefly concerned with studies of species, populations and communities attached to land, freshwater and coastal areas. These involve

- biological diversity
- sustainable harvesting of renewable game and fish stocks
- studies of threatened species and populations, including large predators
- contamination, including acid precipitation, heavy metals and radioactivity
- conservation criteria and conservation plans for areas of open countryside
- environmental impact assessments and measures concerned with various kinds of encroachment on nature
- landscape ecology and the ecological impacts of fragmentation.

NIKU's expertise embraces

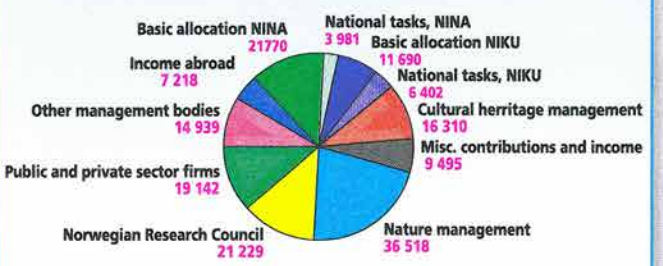
- archaeological investigations
- research on Norwegian medieval towns
- cultural landscape analysis
- historical buildings research
- conservation, restoration and photographic documentation
- scientific diciplines relating to archaeological investigations, including physical anthropology
- cultural monument registers.

Both institutes have a great deal of expertise in environmental impact assessment analysis concerning various forms of encroachment on nature. The Foundation is also active in the application and development of expertise linked to Norwegian aid to developing countries and eastern European countries.

Sources of funding

As the figure below shows, the Foundation still receives more than 95% of its funding from public-sector management bodies and firms, and the Norwegian Research Council.

Turnover in NINA•NIKU in 1998



(Figures in thousands NOK)

TOTAL OPERATING INCOME: 168 694

From the Board's Annual Report

Introduction
1998 has been a positive year for the Foundation, both scientifically and financially, and a great volume of research has been conducted. The year has been marked by new international commitments, more multidisciplinary co-operation, and a detailed evaluation of NIKU organised by the Norwegian Research Council. The 10th anniversary of NINA's establishment was celebrated in October with a seminar and social arrangement. The Norwegian Parliament, partly through its debate on White Paper no. 58 (1996-97) "Environmental policy for sustainable development", has advocated that all sectors of society must have an independent environmental responsibility and draw up their own action plans for the environment. This will carry work on the environment into a new phase where demands for knowledge will hopefully be grater and more precisely formulated. NINA•NIKU leads the way in important fields of environmental research. 1998 has therefore seen substantial resources being invested in presenting the Foundation for new potential clients.

The accounts for the year show that the cut-backs implemented in autumn 1996 spring 1997 are now having their effect. Tight financial control is still required, not least following the rise in rent costs at Tungasletta, which will have their full effect in 1999 after the premises have been rent free for 10 years.

The Board
The Board held six meetings in 1998 and dealt with 43 matters. The Ministry of the Environment appointed a new Board 1 March 1998, with the following members:

Adviser *Äina Edelmann,*
The Norwegian Farmers and Smallholders Union (chairperson)
Professor *Einar Niemi,*
University of Tromsø (Vice-Chairperson)
Manager *Øystein Dahle,*
The Norwegian Mountain Touring Association
Senior Lecturer *Gunilla Rosenqvist,*
Norwegian University of Science and Technology
Assistant County Governor *Tormod Karlstrøm,*
County Governor's Office in Hedmark
Research Ecologist *John Atle Kålås,* NINA
Technical Curator *Tone Marie Olstad,* NIKU

Personnel and organisation
A total of 208 man-years of work were executed in NINA•NIKU in 1998, against 220 in 1997. NIKU saw a reduction from 66 in 1997 to 58 in 1998, NINA registered 123 against 125 in 1997, and the central administration 27 instead of 29. As of 31Dec. 1998, the Foundation had 228 employees.

The proportion of women in NINA•NIKU at the year-end was 40.5%, a slight reduction from the previous year. The proportion of women in scientific posts in NINA remains low, but shows a slight tendency to increase, and is now 18.7%. The corresponding figure for NIKU is 53.1%. The average leave of absence through ill-health dropped from 5.5% in 1997 to 4.1% in 1998. This trend is positive and the level is satisfactory. As previously, the level is somewhat higher among women than men, on average 6.1% against 2.8%. The new organisational structure for the main administration became effective from 1 January 1998.

Strategic commitments
The NINA•NIKU Board has decided that NOK 10 million of the equity capital that has been saved will be spent on strategic commitments during 1998-2002. The areas chosen are:

- geographical information systems (GIS)
- work related with development aid
- market developments and marketing.

Applications amounting to approximately NOK 2 million were approved in 1998, mostly in the areas of GIS and development aid. The work is well under way and emphasis is being put upon good joint projects between NINA and NIKU. As regards other commitments, it should be remarked that the Board has formulated strategies for the future activities of the Foundation in the Barents Region.

NINA

In 1998, NINA had existed for 10 years. This anniversary was marked in October by a seminar entitled "Biological diversity - challenges going into the next millennium" and a dinner-dance for all employees, the Board and invited guests from political and nature management authorities, the Research Council and co-operating institutions.

The number of contracts in NINA in 1998 changed little from 1997. The total turnover rose by NOK 5 million from 1997 to 1998, chiefly due to a rise in revenue from the Norwegian Research Council and Development Aid Projects, whereas somewhat fewer contracts came from, for example, the Directorate for Nature Management.

An important scientific task that should be mentioned is that NINA, in 1998 and 1999, has been a foremost supplier of data to a publicly-appointed committee considering the status and future of wild salmon that has recently published its findings in an NOU report.

Work related with development aid is steadily increasing and a project in Botswana in co-operation with the Department of National Parks and the University of Botswana concerning game ecology, nature conservation, population dynamics and biological diversity is well under way.

A research ecologist in NINA successfully defended his Dr. scient. thesis at the Norwegian University of Science and Technology in Trondheim in 1998. This means that 32 of the scientific staff in NINA have taken doctorates in 1988-1998. More than 70% of NINA scientists now have a doctorate.

From the Board's Annual Report

NIKU

The flow of contracts was good. Two major, complicated projects that were completed deserve special mention, the conservation of the altar piece in Førde Church and the archaeological excavations associated with the erection of a building to protect the Cathedral ruins at Hamar. NIKU was also commisioned by the Ministry of Education, Research and Church Affairs, to be responsible for Norway's gift to Iceland in connection with the millennial celebrations of Iceland's conversion to Christianity. The gift is a replica of Haltdalen Stave Church, to be built in Iceland.

NIKU has undergone evaluation during 1998. A panel appointed by the Norwegian Research Council's Divisional Board for Environment and Development carried out the work. This included a thorough internal evaluation.

The question of NIKU being permitted to undertake archaeological excavations outside the medieval towns has still not been clarified, a situation that the Board views with deep concern. This lack of clarification was once more compensated for by a special grant from the Ministry of the Environment of NOK 1 million in 1998.

A doctorate programme for NIKU scientific staff began in 1998. The Board views this as being very important for building up expertise within the institute in the years ahead. One employee gained her doctorate in 1998.

Information and contact with society

Publications, conference contributions and lectures from the Foundation in 1998 amunt to 747 titles, 510 from NINA and 237 from NIKU. The Foundation's own publication series produced 189 publications, over 50% more than in 1997; 24 were Fact Sheets. The Board is very satisfied with these figures. NINA•NIKU has also figured prominently in connection with a number of established events around the country and through numerous items in the media.

Economy

The financial result for the year is satisfactory, better than budgeted for. The turnover in 1998 was NOK 168.7 million, an increase of NOK 2.3 million from 1997.

NINA's share was NOK 117 million, while NIKU answered for NOK 51.7 million. The Foundation had an operating loss of NOK 0.3 million, NOK 3.0 million less than in 1997. The strategic use of equity capital, totalling NOK 1.8 million, is an important reason for this change. The net financial income was NOK 3.7 million, and the total profit was NOK 4.2 million. The total assets of the Foundation are NOK 114.4 million, NOK 29.5 million of which are non-current assets, including long-term investments. Equity capital totalled NOK 54.0 million at the year-end. In 1998, a long-term deposit of NOK 20 million was paid to the Directorate of Public Construction and Property. Despite this investment, the liquidity is still good.

THE BOARD AND DIRECTORS OF NINA•NIKU IN 1998

SITTING FROM THE LEFT: MANAGING DIRECTOR: KARL BAADSVIK, JON ATLE KÅLÅS, ÄINA EDELMANN (CHAIRPERSON), EINAR NIEMI OG DIRECTOR ANNE FIKKAN (NIKU). BEHIND FROM THE LEFT: TORMOD W. KARLSTRØM, GUNNILA ROSENQVIST, DIRECTOR EIVIN RØSKAFT (NINA), TONE SKARSAUNE (FROM 1.JAN. 1999) AND ØYSTEIN DAHLE.

PHOTO: ANNE E. T. WINTERTHUN

From the Board's Annual Report

Future perspectives

The Board is able to record that 1998 has been a good year for the Foundation, both scientifically and financially. Both institutes have attained the specific targets that were set for the year.

NIKU has been evaluated after functioning for only four years. The report has not yet been made public. The Board hopes it will offer constructive views concerning the further development of the institute.

In financial respects, development is as budgeted, but the Foundation will be faced with substantial increases in costs from 1999 because the premises at Tungasletta have ceased to be rent free. Cost-effective operations will thus have top priority.

The status of NINA•NIKU as a co-ordinated institution was expected to mark a step forward scientifically by leading to multidisciplinary research. Several such projects have begun, but paradoxically the management authorities are not enquiring after such expertise. The Board therefore draws the conclusion that the potential for scientific co-operation has so far not been fully drawn upon. NINA•NIKU is positioning itself in the market with regard to clients outside environmental management. A prime challenge in the years to come will be to supply clients with knowledge in the spheres in which they are interested, while at the same time maintaining and extending the Foundation's basic expertise. The Board believes it has an important responsibility to help to acquire external constraints that continue to maintain free, independent research. In this context, we must keep a watchful eye on the consequences of the basic allocation having been reduced, and the situation that the institutes are becoming increasingly dependent upon short-term contracts.

Our human resources are the very fundament of the Foundation. A large measure of keen involvement and a high scientific standing characterise our work at every level. The Board will therefore conclude this Report by thanking and commending every single employee in NINA•NIKU.

NINA•NIKU's accounts for 1998

Profit and loss acc. for 1998

(NOK 1000)	1998	1997
Basic allocation (Note 1)	33460	33200
Other contributions (Note 2)	17468	19447
Revenue from projects (Note 3)	110347	111320
Other operating income	7419	2431
TOTAL OPERATING INCOME	**168694**	**166398**
Salaries and personnel costs	83203	78554
External assistance and services	28157	29089
Travel expenses	16433	16355
Equipment and expendables	18661	19035
Ordinary depreciation (Note 4)	3772	5804
Other operating exp. (Notes 3 & 6)	17934	14014
TOTAL OPERATING EXPENSES	**168160**	**162852**
OPERATING RESULT	**534**	**3546**
Financial income (Note 6)	4041	1829
Financial expenses	391	207
TOTAL FINANCIAL ITEMS	**3650**	**1622**
NET INCOME	**4184**	**5168**
Which will be appropriated as follows:		
Adjustment of supplementary capital	2920	3000
Distributable reserves	-1520	300
Allocation for research purposes	2784	1868
UTILISED NET PROFIT	**4184**	**5168**

Balance as of 31.12.1998

(NOK1000)	1998	1997
ASSETS		
Cash, bank and postal giro	65798	74246
Trade debtors (Note 5)	18923	19698
Other short-term debtors	189	170
TOTAL CURRENT ASSETS	**84910**	**94113**
Long-term investments (Note 6)	20032	
Machinery and fittings (Notes 4 & 6)	3302	3998
Buildings (Notes 4 & 6)	6174	5990
TOTAL NON-CURRENT ASSETS	**29508**	**9988**
TOTAL ASSETS	**114418**	**104101**
LIABILITIES AND EQUITY		
Trade creditors	5100	5221
Tax deducted/pensions/fees	5666	5488
Accrued holiday pay	7007	6459
Advances from customers	38733	34969
Other current liabilities	3884	2118
TOTAL LIABILITIES	**60390**	**54256**
Basic capital	30000	30000
Other restricted equity	10920	8000
Distributable funds	8456	9977
Allocation for research purposes	4652	1868
TOTAL EQUITY	**54028**	**49845**
TOTAL LIABILITIES AND EQUITY	**114418**	**104101**

Zimbabwe's rock art in jeopardy

Detail of a scene depicting costumed men dancing in trance. In the trees behind them hang weapons, hide bags and a wild boar's head. By attenuating the figures, the painter conveys the release from gravity experienced in trance.

PHOTO: TERJE NORSTED, NIKU

Zimbabwe is a rich treasury of rock paintings. They are several thousand years old, and were created by hunter-gatherers, the ancestors of the present Bushmen (the San people). The paintings are to be found in shallow caves and on the overhanging faces of cliffs and boulders. Distinguished by their narrative qualities, the motifs evidently represent a common metaphorical system based on myths and trance experiences.

Much of this art is deteriorating at an alarming rate, largely due to the impact of humans. The worst damage is to be seen in localities which have been prepared for tourism. In 1998, 60-70 percent of the paintings at the well-known Domboshawa were messed up by dark brown house paint.

Given the seriousness of the threat, the documentation of the paintings is vital. In time, the documentation material will probably be a better source of information than the originals. Having enlisted NIKU's experience, the National Museums and Monuments of Zimbabwe has given rock art documentation a high priority. Collaboration between the two institutions started in 1998, when an archaeologist from Zimbabwe participated in the recording of cave paintings in Moskenes, Nothern Norway. As a follow up, NIKU is going to hold a workshop on the photographic documentation of rock paintings in Zimbabwe.

TERJE NORSTED

Medieval floor unearthed

In 1997, NIKU's excavations in Hamar Cathedral brought to light large portions of the building's late medieval floor. The excavations were undertaken in advance of foundation work for the glass and metal shell that now protects the ruin. The extent of the remains came as a welcome surprise, since it had been expected that earlier restoration work and excavations would have left little intact.

Running along the length of the northern aisle was a floor of square ceramic tiles, and, though many were weathered to a greater or lesser degree, it was still possible to make out the original colour pattern. The floor was interrupted by a number of grave markings, together with a tomb situated between two of the pillars in the northern row. Excavation in the southern aisle revealed a floor of rectangular bricks. A relatively well-preserved section of this floor can now be viewed through a protective glass plate in the new floor. The lifts used in the erection of the protective shell over the ruin enabled archaeologists to photograph the floors from above, and these photographs will be joined together with the help of digital processing to produce a panorama.

TINA WIBERG

PHOTO: STAN REED, NIKU

DEPOSITS IN DANGER

NIKU is also involved in monitoring the Hamar Cathedral ruin and the underlying cultural deposits. The ruin itself is protected from the elements by a glass and metal shell, but there is reason to fear that the remaining deposits will gradually dry out. This will inevitably accelerate decomposition of the organic components, which not only will mean losing archaeological information, but will very likely have an adverse effect on the ruin as well.

Among other things, the monitoring programme involves the placing of instruments at selected points in and around the ruin to measure the deposits' moisture content and the rate of dehydration.

A stave church for Iceland

The people of Norway will be presenting a stave church copy to Iceland in the year 2000, as a gift to mark the thousandth anniversary of the island's conversion to Christianity. The idea was originally suggested by Norway's former Prime Minister, Jan P. Syse. The Norwegian parliament voted the necessary funds, and NIKU was contracted to oversee the construction work. The copy will be modelled on Haltdalen stave church, which forms part of Trøndelag Folkemuseum in Trondheim.

Before building commenced, NIKU carried out exhaustive historical and architectural research, and experts from the institute examined every inch of Haltdalen stave - church. This will ensure that the copy, whose completion is scheduled for July 2000, is as true to the original as possible. The new stave church is to be raised on Heimaey, one of the Vestmanna Islands and the site - according to the Landnåma chronicle - of Iceland's first church, built by the Norwegian king Olav Tryggvason. In this church the principal load-bearing elements probably were staves or posts, whose bases were anchored directly in the ground - a technique that unfortunately leaves the posts relatively vulnerable to rot. The surviving medieval stave churches, none of whose wooden members come into contact with the ground, represent an evolved version of this construction type.

OLA STORSLETTEN

Haltdalen stave church, the model for the copy to be built on Heimaey, stands in the grounds of Trøndelag Folkemuseum in Trondheim.

PHOTO: RIKSANTIKVAREN

Conservation of wood; techniques, thoughts and theory

Participants in the "Wood Workshop" try out traditional woodworking tools during their stay in Røros.

PHOTO: TONE MARIE OLSTAD

In 1998, NIKU was once again one of the institutions responsible for organising and holding the 8th International Course on Wood Conservation Technology. This is a widely acknowledged course in the technology and the conservation of the cultural heritage made from wood. The teaching staff numbered more than 20 specialists from all over the world, among them several NIKU employees.

Supported by among others UNESCO, this is an international course for the further education of professionals working with wood in the cultural heritage field. Organised jointly by NIKU, SINTEF, the Nordic World Heritage Office, the Directorate for Cultural Heritage, and NTNU, the course was held in the summer of 1998, mostly in Oslo. One of the course's main objectives is to enable participants to recognise the causes of decomposition in wood, and to choose the optimal method for conserving and restoring any particular wooden object.

Selected mainly on the basis of achieving a satisfactory geographical spread, the 19 participants were drawn from 19 different countries. 35 of the course's 39 days were spent in lectures, laboratory work, fieldwork and museum visits. Following a six-day period of fieldwork in Røros, the participants enjoyed a number of excursions, including a trip to Urnes stave church for on-the-spot evaluation of state of preservation, and a tour of Bryggen in Bergen.

TONE MARIE OLSTAD

Painted décor from the 13th century onwards

Decorative painting has a long tradition of use in sacred buildings worldwide. In Norway, we know that the painting of decorations in churches started in the High Middle Ages, with the oldest preserved example dating from the end of the 13th century, and has continued right up to the present.

Though perhaps not quite so old, the practice of decorating dwelling-houses goes back a long way in Norway. Some fragments of medieval painted decoration are to be found in museums, but the oldest known example of painted decoration still surviving in a dwelling dates from the start of the 17th century. Up until the end of the 18th century, only the well-to-do could afford this kind of decoration. Gradually, however, the number of interior painters started to increase, and before long most communities could draw on the services of one or more. The majority either learned to paint all by themselves, or were taught by a relative, and many worked for next to nothing. As a result, before the 19th century was out, interior decoration was no longer beyond the means of ordinary people, though naturally the extent and quality of the decoration varied a great deal, depending on the painter's skill and on how much the home-owner was willing to spend.

Possibly the finest combination of stencil and freehand decoration to be found in Norway: the Crown Prince's audience chamber in the Royal Palace, Oslo. The ceiling's decorative details were executed by P. C. F. Wergmann in the early 1840s. The richly moulded cornice displays a variety of stencil decorations, some of them later additions. The ceiling surface itself is painted blue-green to represent the sky, with the illusion of a cast iron trellis bordering the entire length of the cornice. Attached to this trellis is a patterned cloth that covers the ceiling's central part. Distemper and oil-based paint on plaster.

PHOTO: JON BRÆNNE
(FROM JON BRÆNNE: DEKORASJONSMALING. TEKNOLOGISK FORLAG, 1998).

While a lot of this work has undoubtedly been lost in one way or another, we should be grateful that so much has managed to survive. True, many of the remaining examples can be classified as relatively simple and rustic, but – taking into account the artists' technical skill and creativity, their feel for motifs and models, and the current state of preservation – we also find a surprising number of high-quality pieces. As one of the richest parts of our cultural heritage, it is incumbent on us to ensure its survival for posterity.

JON BRÆNNE

ILLUSIONAL AND FLORAL DÉCOR

The painting of illusional decoration became popular at a relatively early stage. Appropriate techniques enabled painters to disguise the underlying, poorer quality surfaces with painted imitations of finer materials, mostly rare kinds of wood or stone, as well as wallpaper. Illusional decoration is often found in combination with numerous varieties of freehand painting, of which the so-called "Rosepainting" represents the most familiar style. While individual or regional differences are often present, "Rosepainting" nevertheless possesses a uniquely "Norwegian" character, and has acquired a fame that extends beyond the borders of its country of origin.

Railway building threatens Siberian forest hunters

The Evenk people of Siberia are worthy of in-depth study and recording. Compared with hunter-gatherer societies in desert, polar and other marginal areas, forest-hunters represent a relatively neglected type. NIKU has carried out ethnoarcaeological fieldwork among the Evenk in 1997 and 1998, concentrating on a group of reindeer hunters inhabiting the mineral-rich Chara region deep within the taiga, Siberia's vast coniferous forest. These mineral riches are the root of the Evenk's problems. Mining necessitates the building of railways for transportation, and this disruption of the wilderness will undoubtedly cause a drastic reduction of the reindeer herds. Unless remedial action is taken soon, the consequences for the Evenk and their traditional way of life will be serious.

The Evenk use tamed reindeer for transportation. Not only to pull sleds, but for riding as well, and petroglyphs depicting reindeer and riders show that this practice goes back a long way. There is good reason to believe that the culture and behavioural patterns of forest-hunters like the Evenk are substantially different to that of hunter-gatherers in less productive habitats. This has important implications for archaeological and anthropological research, because accurate data on the lifestyles of contemporary forest-hunters will better enable us to interpret the material culture of prehistoric hunter-gatherer societies, many of which lived in forest environments. For instance, up till now it has been widely held that hunter-gatherers only returned to formerly occupied localities after relatively long intervals, principally to give the surrounding forest time to regenerate and thus restore the supply of firewood. The Evenk, however, use the same winter and summer sites for long periods, since the taiga is a virtually inexhaustible source of firewood.

So there are two sides to the present project. The first is to study and record Evenk culture in detail before it is changed or lost. The second – which will be handled mainly by NIKU's sister institute, NINA (the Norwegian Institute for Nature Research) – is to find ways to reduce the impact of mining, and thereby enable the Evenk to retain as much as possible of their present way of life. Ensuring a viable future for the Evenk – and as much as possible on their own terms – will be an exciting and demanding challenge. Especially in view of the fact that, with Russia so desperate for cash, curtailing the mining operations is not a realistic option. Which just means that we'll have to come up with some creative solutions!

OLE GRØN OG ALEG KUZNETSOV

A heavy goods train invades the otherwise virgin wilderness in Siberia's Chara region.

PHOTO: OLE GRØN

Two Evenk women smoking pipes at the entrance to a birch-bark tent. (Ca. 1925; from the archives of the Centre for the Preservation of Cultural Heritage, Chita)

PROBLEMS UNDER COMMUNISM

The Kremlin cared little for the Soviet Union's aboriginal peoples, especially those pursuing a way of life not geared to production. Many Evenk were coerced into working for geological expeditions surveying the area's mineral wealth; not even nursing mothers were exempt. And in keeping with the communist policy of religious repression, Evenk shamans were systematically sought out and shot. Friction intensified in the 1960s, when an attempt was made to force the Evenk into a reindeer farming collective.

Geographic Information Systems

The Directorate for Cultural Heritage has turned over responsibility for the National Monuments Record to NIKU, and this has helped to stimulate interest in expanding the institute's expertise in the application of Geographic Information Systems (GIS). The Record contains detailed information, including locational data, on all of Norway's known ancient sites and monuments, together with more general information on the country's post-medieval monuments. Conversion of the Record's data to a format suitable for GIS operation started in 1998, and NIKU will be in a commanding position when the entire body of data becomes available for the purposes of fieldwork, impact assessments and research, particularly with regard to nationwide projects.

One of the main reasons behind NIKU's drive to make the Record's data accessible for GIS-processing is the institute's involvement in the national rock art project. NIKU is under contract to the Directorate for Cultural Heritage to develop a rock art database before the end of 1999. When completed, the GIS-based system will be used primarily to record, process and organise existing and new survey data, especially in relation to conservation strategies concerning the individual rock art localities.

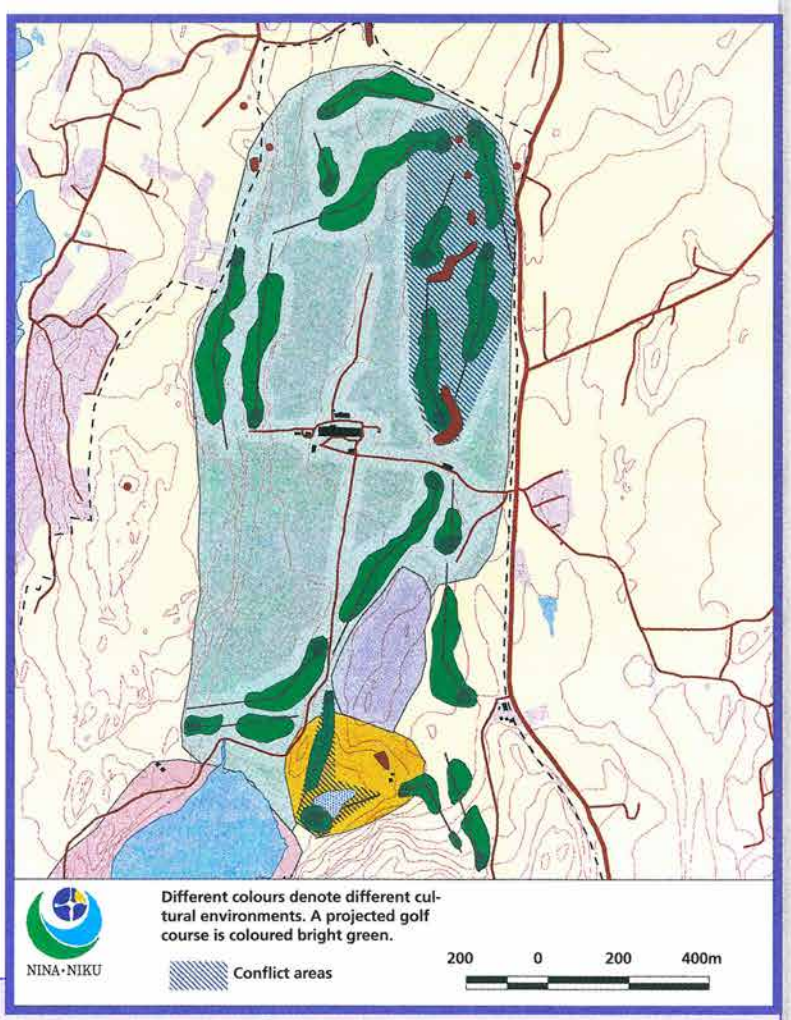
NIKU is also responsible for the cultural heritage aspect in a landscape inventory project run by NIJOS (the Norwegian Institute of Land Inventory). The project involves establishing an information system to monitor conditions and verify changes in the agricultural landscape. The system is based on the use of aerial photos for mapping land-use types and attributes, coupled with GIS for processing and analysing the data. Covering the entire country, the monitoring programme will provide an overview of processes operating in the agricultural landscape, information that is vital to the formulation of sound agricultural and environmental policies.

As a complement to the landscape inventory project, NIKU, NINA, NLH (the Agricultural University of Norway) and NIJOS have initiated a three-year research project on the structure of landscape and its significance in relation to biodiversity, cultural remains and perceptual value. The project's primary role is to facilitate utilisation of the copious data quantities collected by the monitoring programme, with a view to determining "landscape indices" – systematic relationships between land-use types, biodiversity, cultural remains and perception of landscape.

In 1997, NIKU and NINA joined forces on a research project entitled "Cultural heritage conservation and forestry planning".

Sample surveys have shown that forested areas contain a high proportion of hitherto unrecorded cultural remains – which are protected by Norway's Cultural Heritage Act. Since the requirements of modern forestry pose a considerable potential threat to these remains, the project's main objective is to find ways of reconciling the often conflicting interests of forest management and cultural heritage conservation.

WENCHE HELLIKSEN OG BIRGITTE SKAR



Impact assessment map showing potential threats to cultural remains. NIKU's investment in research and development of tools and methods for analysing survey data guarantees the institute's ability to produce high-quality evaluations on time. Cooperation between NIKU and NINA on improving in-house GIS expertise has helped elevate the two institutes to leading positions in the field of landscape analysis for the individual and joint purposes of nature and cultural heritage management.

Many of Norway's younger churches have great values

Which of Norway's churches built after 1850 should be listed? This question forms the basis of a project undertaken by NIKU on behalf of the Directorate for Cultural Heritage in connection with the formulation of new guidelines for the conservation of ecclesiastical buildings belonging to the Church of Norway.

The project is scheduled to end in the year 2000. NIKU shall evaluate every single one of the nearly 1000 churches built during the period 1850-1945, as well as a number of churches built after 1945. The half-century from 1850 to 1900 saw the most intensive wave of church building in Norway since the Early Middle Ages, and to many people these later-19th century churches symbolise the essence of a place of worship.

NIKU's evaluation includes architectural aspects the building's style and its significance in architectural history, the arrangement of the interior, and the major furnishings and fixtures. Other important factors include the church's place in the surrounding natural and cultural landscape, since new churches were very often built on or close to the site of an older church, thereby continuing a building tradition that in many cases dates from the time of Norway's Christianisation. Consideration has also been given to alterations. In addition, many of these younger churches contain furnishings or other objects of considerable age and/or great artistic worth. The sum of all these factors provides an index of the individual building's status.

Norway's cultural heritage authorities understandably take the view that, in principle, they all deserve listing, not least in recognition of the fact that each building represents a major investment and achievement by the local community. But with close on 1000 churches, this would be an impracticable proposition. NIKU's task has therefore been to provide the groundwork and criteria for the identification of those buildings most worthy of listing, either on the strength of the building's intrinsic qualities, or as a exemplar of a particular class. Now that roughly half of the relevant buildings have been examined and evaluated, it seems likely that about half of the churches built between 1850 and 1945 may be proposed for listing.

JENS CHRISTIAN ELDAL

When the new church at Hjelme in Øygarden to the north of Bergen was completed in 1971, the old church built in 1875 was still in singularly good condition and virtually unaltered. Although the individual elements are relatively simple and in no way atypical, they combine to make an interior that is particularly worthy of preservation. Take special note of the cylinder stove; many churches built before the mid-20th century were heated by stoves like this one, but sadly few now remain.

PHOTO: BIRGER LINDSTAD, NIKU, FOR THE MONOGRAPH SERIES "NORWAY'S CHURCHES"

DATABASE FOR CHURCHES

The information collated by NIKU in connection with the younger churches project will be incorporated into a computerised database. This will serve not only as the project's electronic archive, but also as an important source for research projects or future evaluations requiring information on church architecture, church art, and furnishings. NIKU's database derives from the Directorate for Cultural Heritage's original database containing basic information on all of Norway's known churches, existing or not. This has now been supplemented with entries for the inputting of more detailed information on the individual buildings, including aspects such as surroundings, interior and furnishings. For most of the country, the new record as yet contains updated information on churches built during the period 1850-1945 only, with a few more recent churches as well; for the counties of Akershus, Hedmark and Buskerud, however, the database covers all churches built after 1536.

Recent excavations in Bergen reveal late medieval structures

Originally, the quarter called Vågsbunnen formed the innermost part of Bergen's harbour, but a substantial portion had been converted to building land by the end of the Middle Ages. And in 1558 Bergen's market-place, Torget, was moved from its original location in the middle of Bryggen to a new site in Vågsbunnen, at the head of the harbour.

In connection with the current renovation of Vågsbunnen, the city council has recently begun replacing the quarter's outworn sewage and water mains system. In advance of this, NIKU carried out a test excavation in the autumn of 1998 at the junction of the two thoroughfares Vågsallmenningen and Nedre Korskirkeallmenningen. The investigation's main objectives were to check the state of preservation of the underlying cultural deposits and their contents, and to ascertain whether the area contained medieval or older deposits, which are protected under the provisions of Norway's Cultural Heritage Act.

Excavation revealed the presence of robust wooden foundations, laid down in three successive building phases. The oldest structures have been tree-ring dated to ca. 1500, and with their completion this particular area was reclaimed from the sea for good. The associated deposits yielded a wealth of small finds, mainly pottery and glass sherds, including an almost whole – but empty – earthenware money box and numerous fragments of painted window glass.

Considering its relatively small extent, the investigation has made a significant contribution to our knowledge of Bergen's late medieval and post-medieval history, particularly concerning the development of the area occupied by the town's early post-medieval market-place.

ALF TORE HOMMEDAL

On the right, the excavation area; Torget and the harbour lie to the left of the site. In the background can be seen the spire of Holy Cross Church.

PHOTO: ARKITEKTGRUPPEN CUBUS

The excavation in Bergen's Vågsbunnen-quarter in the autumn of 1998 revealed the presence of wooden foundations, laid down in three successive building phases. The first structures date from ca. 1500 and represent part of this area's earliest waterfront.

PHOTO: JANICKE ÅSTVEIT

Radio transmitters on salmon

How quickly do fish swim? Radio transmitters can answer this; they are not only attached to bears. NINA has been using aquatic telemetry since 1991, in more than 35 projects in seven countries. The transmitters can also provide information about how much energy a fish uses, the depth at which it swims, and the water temperature and salinity. This gives us new opportunities to evaluate such things as fish ladders and prescribed discharges in regulated rivers. We also acquire a better understanding of the behaviour of salmon during the spawning period, and some results can be used to compare spawning behaviour in wild and farmed salmon.

NINA uses telemetry in many areas where management authorities require more knowledge about the ecology, migration and behaviour of fish stocks. Many of these problems are taken up through international co-operation. Our most important partner is the University of Waterloo in Canada, a leader in the development of physiological telemetry and automatic systems for determining the position of fish.

In Italy, we are co-operating with COISPA to study the effect of marine reserves on a threatened marine fish. In Denmark, we are working with the Danish Institute for Fisheries Research to find out why the re-establishment of salmon in the River Gudenå is proving unsuccessful and to study northern pike and pikeperch predation on emigrating smolt. In Russia, we are co-operating with PINRO in a study of salmon immigration up the River Varzuga, which enters the White Sea, and the distribution of spawning grounds in the river. Some salmon here run upstream in autumn and remain in the river for a whole year before they spawn, while others run up in summer and spawn the same autumn, like Norwegian salmon.

EVA THORSTAD OG FINN ØKLAND

Tagging salmon with radio transmitters in the River Ingdalselva in Sør-Trøndelag.

PHOTO: FINN ØKLAND

Salmon return to the lower Orkla

Juvenile Atlantic salmon have returned to the lower stretches of the River Orkla. NINA's investigations in 1993-1997 have shown that their density has become similar to that further upstream. The lowest 21 km of the river have therefore begun producing salmon again.

The Orkla used to be one of the best salmon rivers in the country. In the last 20 years of last century, more than ten tons of salmon were normally caught there annually. But catches began declining around 1920, and the stock was in a shocking state for the next 50 years. Around 1950, practically no salmon were caught. One reason may have been seepage of acidic water containing heavy metals from mines that have now closed. Most of the seepage came from the Løkken Mine (1654-1987), the last to be worked. The water drained into a stream called Raubekken, which entered the Orkla. Water analyses made by NIVA revealed a strong increase in heavy metals downstream from this confluence. Scientists from the county environmental division studied the status of the young fish population in 1978-89 and were unable to find any juveniles downstream from Raubekken. Upstream, there was normally a good stock of juveniles.

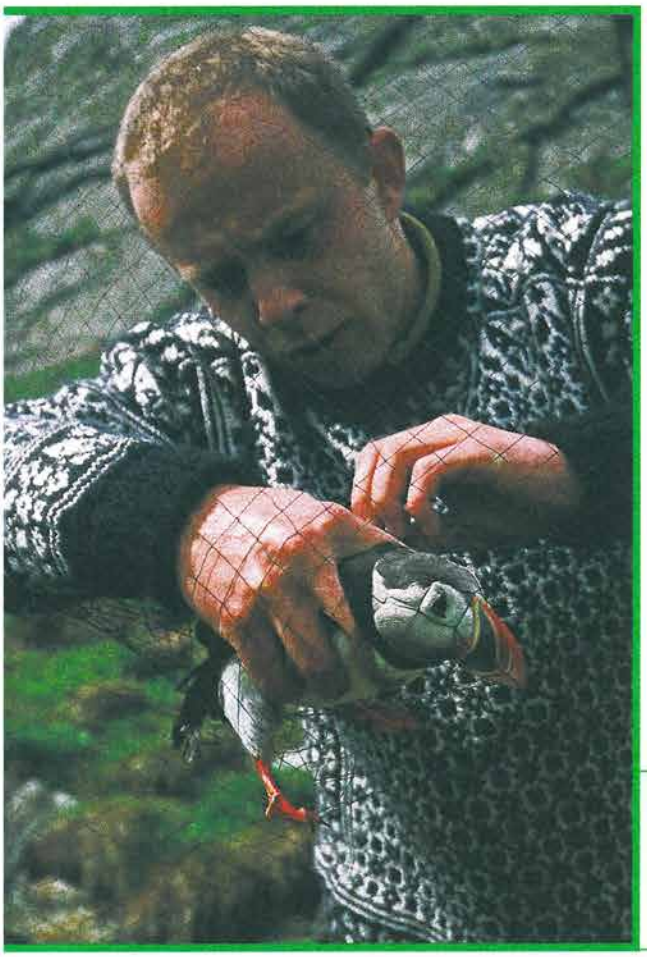
Løkken Mine made a great effort to reduce the seepage of heavy metals, and the regulation of the river through the Orkla Hydroelectric Scheme in the 1980s had a favourable effect on the heavy metal contamination. Raubekken was diverted into the Svorkmo Power Station intake tunnel, and the discharge of the Orkla was evened out. The combined effect of these changes brought the annual mean values for copper in the Orkla below Raudbekken down from approximately 70 micrograms per litre about 1980 to less than 10 micrograms per litre after 1992.

ARNE JENSEN

FRY DIE IN CONTAMINATED WATER

The youngest stages of salmon (eggs, yolk fry) are most sensitive to heavy metals. Even though adult salmon can survive and spawn in contaminated water, their fry will die. Adult salmon can recognise small concentrations of dissolved copper and zinc, and their run up a river may be disturbed if the water becomes too loaded with heavy metals.

Metadatabase on Internet



From net to net. This puffin gave NINA•NIKU valuable data for one of its many databases. The metadatabase will also spread information via Internet about what data the Foundation possesses.

PHOTO: TYCHO ANKER-NILSSEN

NINA•NIKU is developing a metadatabase, i.e. a database containing information about other databases, which in a simple manner can disseminate up-to-date information about our projects, databases, publications and the scientific expertise of employees via Internet. The metadatabase will be equipped with a number of search capabilities which will also be able to rationalise several administrative routines in the concern, for example in connection with accounting, quality assurance, preparing lists of publications, project catalogues, applications and "Who does what". At the same time, we will try to give our home pages on the net a facelift and regular update, and increase the use of the data network as a platform for information flow to suppliers of contracts, partners and the society at large.

NINA•NIKU has built up broad expertise within the spheres of biology and cultural history, and is undertaking R & D assignments for many public and private institutions. In addition to numerous publications presenting results, our activities generate a number of data sets with a user value far beyond that of solving problems in the projects responsible for obtaining the data.

The ability to link and compare results across traditional disciplinary boundaries will be essential for gaining a better understanding of the processes controlling the phenomena we are studying. Enhanced knowledge outside the Foundation regarding our expertise and data will be an important motivation factor for multidisciplinary and interdisciplinary co-operation. This is one reason why the metadatabase is being developed.

TYCHO ANKER-NILSSEN

Resource database for developing countries

NINA has developed a beta version of a generalised resource database for management and research in developing countries. The database has been demonstrated for representatives of environmental authorities in developing countries which are interested in the application being further developed for use in their management of natural resources. It was demonstrated in Tanzania, spring of 1999.

The database enables all environmental resource data to be stored, irrespective of whether they are point data (localised by geographical co-ordinates) concerning mammals, birds, plants, fish or insects, or polygonised data, for instance on national parks. Information about the locality, a register of addresses and the actual observation of the natural resource is stored in separate tables that are interlinked. It is thus easy, for example, to select information about the number, sex and age of elephants observed at a specific locality by a particular person during a certain period.The database has been developed using the Centura application tool and is fully compatible with Microsoft Access databases because the data are stored in Access format. Arc-View is used as the GIS tool linked to the database. Data can be selected in the database application with the aid of a specially developed, menu-based, search tool which enables several tables to be searched with ease simultaneously. The selections can be exported and displayed in Arc-View.

SVEIN-HÅKON LORENTSEN

NINA-visitors in Tanzania, spring 1999.
PHOTO: KJETIL BEVANGER

Reindeer winter grazing in Finnmark

THE LICHEN GRAZING NEEDS PROTECTION

Where reindeer are mostly found, lichens *(Cetraria nivalis, Cladonia mitis, C. stellaris and Stereocaulon sp.)* cover 60-90 per cent of the area occupied by plant communities that are available for winter grazing. When grazing is heavy, most lichen-covered areas are worn bare and may remain without vegetation for many years. If reindeer husbandry is to be based on natural grazing, it is vital to maintain the lichen grazing so that it will give the maximum possible, durable yield of easily digestible food.

Lichen fragments of various sizes and species being planted in permanent plots inside a fence. Bodil Wilmann is making a species list and photographing a plot.

PHOTO: GØSTA HANSSON

Reports from Finnmark (north-east Norway) tell of exhausted reindeer grazing and vegetation damage, but opinions differ widely regarding the seriousness of the situation. In summer 1998, NINA began co-operating with NORUT (University of Tromsø) on a programme to monitor the winter grazing. NORUT has mapped the grazing areas and NINA has laid out permanent plots in lichen-clad areas. In 1998, 275 plots were established in the Kautokeino and Karasjok districts. Photographic evidence and determining the lichen cover and its height are key aspects of the documentation. The work will continue in summer 1999 further east, as far as the Russian border.

When the ground is not snow covered, the reindeer graze vascular plants. The quality of this grazing is decisive for the growth and development of the reindeer. The annual regeneration of the winter grazing amounts to 10-15 per cent of the living lichen cover. If grazing is too heavy, the annual yield of the winter grazing is greatly reduced. When the density of reindeer is high, the animals initially eat the surviving lichen cover. If the grazing pressure remains high, large parts of the lichen cover will disappear, as we can see happening over wide areas of lichen grazing in Finnmark.

Perhaps the lichen grazing can be improved by planting fragments of lichen? This is how these species spread naturally. Such a project, to last three years initially, began in summer 1998 to find out whether it is a viable measure.

ELDAR GAARE AND HANS TØMMERVIK

Genetically modified soya in the shops

The genetics laboratory at NINA proved in the summer of 1998 that several food items in Norwegian shops contain genetically modified soya material, without being labeled as such.

NINA scientists are developing expertise for identifying the presence of genetically modified organisms and the potential dispersal of genetic material from these. The technique used is highly sensitive and involves amplifying specific segments of the inserted genes. Results demonstrated that ordinary plant genes could be amplified in most foodstuffs on which the analysis was performed. We were able to amplify gene sequences that are specific for material from a transgenic soya bean produced by an American company. The discovery created quite a stir in Norwegian media.

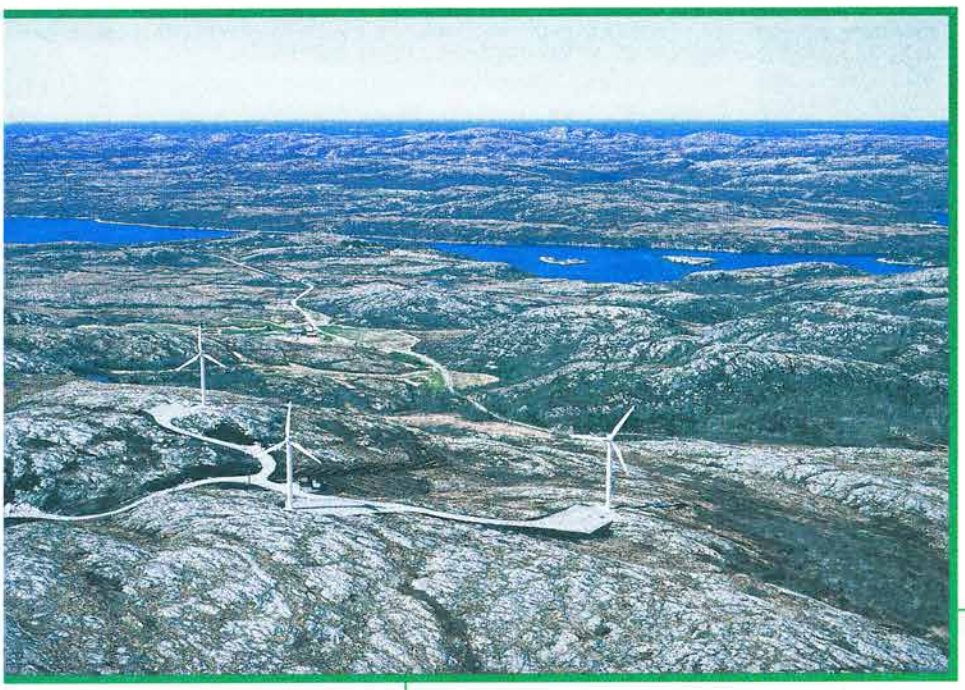
KIRSTI KVALØY

Wind power also has negative aspects

Wind power may become popular as a means of raising our future energy production in an environment-friendly way, but negative aspects also exist. During the past year, NINA has contributed to focus on the environmental effects of large windmill parks on the coast, and what can be done to reduce their impact. In 1998, Statkraft commissioned NINA to organise investigations of endangered and vulnerable birds in connection with plans for windmill parks on Stadlandet, Smøla and Hitra.

A good deal can no doubt be learnt from research and experience in other countries. Several aspects require new information through environmental impact analyses, and pilot and follow-up investigations. Collisions with windmills are now considered less of a risk than they used to be in the coastal landscape. It will be just as important to examine some other factors, including the fact that windmills seem to reduce the available area both for nesting and resting birds as they will probably shy well away from the windmills. The consequences of disturbances linked with both the windmills and associated infrastructure in the area, and the effects of reduced space and the collision risks when new power lines are built must also be assessed.

ARNE FOLLESTAD



Windmills at Vikna

PHOTO: PER JORDHØY

The northern birch woodlands

The sub-arctic birch woodlands are confined to northern parts of Scandinavia and Finland, particularly in north Norway. This ecosystem has a narrow oceanic «climatic niche». It is fragmented on the large scale by topographical and climatic conditions, and it is affected by specific disturbance factors dominated by periodical population fluctuations of small herbivores.

Norway should have a special responsibility for research and management here, but little research has taken place on this ecosystem. NINA has now started a research project consisting of two sub-projects. The first will clarify how climate and system fragmentation affect the occurrence and richness of species in a selection of indicator and key species. This is taking place along three important gradients in the birch woodland in Nordland, Troms and Finnmark. The indicator species (ground beetles, winter and automnal moths and parasites of small mammals) have been chosen to indicate the effects of fragmentation and climatic conditions. The key species (small rodents, moths, and passerine birds) have been chosen because they represent the main disturbance factors, or have other important functions in the ecosystem.

The second sub-project will look into the effects of the shift in tree species to spruce in two study areas in Nordland and Troms. The species being studied in the first sub-project will be used here for population and community-ecological studies with a strong landscape ecological emphasis. The project will last five years and began in 1997 for the second part and 1998 for the first part. Field work for the first part consists in monitoring ca. 125 plots located in five important fjord and valley districts: Skjomen, Målselv, Nordreisa, Alta, the Mathisdalen valley, and Porsanger (the Lakselvdalen valley).

NIGEL YOCCOZ

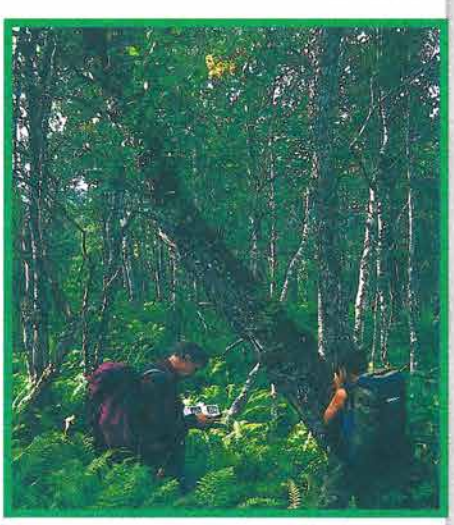


PHOTO: KARL-BIRGER STRANN

Threatened species of beetles and true bugs

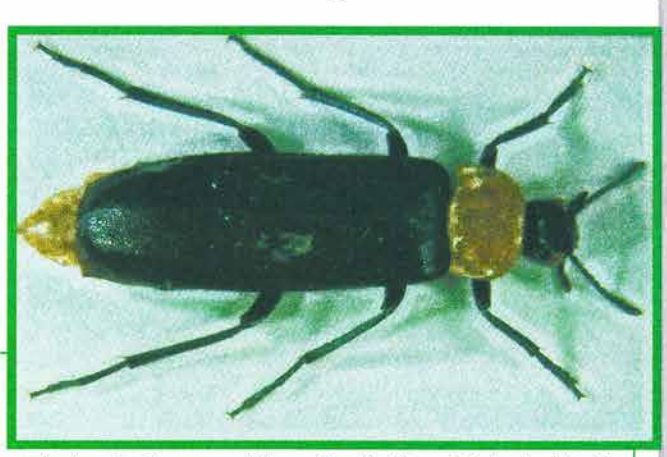
About 3450 species of beetles and 445 species of true bugs have been found in Norway. The extent to which these insect groups are threatened has now been evaluated for the first time. The suggestions for the Red List show their status, based on current knowledge of the threats to which they are exposed. The work has been done for the Directorate for Nature Management (DN) and will form the basis for the final Red List which DN draws up.

The proposed Red List for beetles contains 778 species. The Red List category Ex? (assumed extinct) numbers 45 species. Another 26 are "directly endangered" (E), 117 are "vulnerable" (V), 446 are "declining, demand care" (DC) and 44 are "indeterminate" (I). One hundred species are given the status of "insufficiently known" (K); it has not been possible to decide whether these are endangered.

The corresponding list for true bugs contains 82 species. The Red List category Ex? (assumed extinct) numbers 9 species. One species is considered to be "directly endangered" (E), 6 are "vulnerable" (V), 24 are "declining, demand care" (DC), 14 are "indeterminate" (I) and 28 are looked upon as "insufficiently known" (K).

The type of habitat they live in and the threats to which they are exposed are stated for all the species on the Red List. Nearly half the beetles and approximately 1/3 of the true bugs are attached to woodland and forest. Most of these species live in association with dead wood and are threatened by various forestry activities. These woodland species have been placed in the strictest Red List categories, and many are at risk of becoming extinct. A large proportion of the species have a pronounced southerly distribution in Norway, and the occurrence in Norway of many of them is limited to the most densely populated areas in south-east Norway. For many which live in small areas, the threat that these areas will be built on will therefore pose one of the greatest risks.

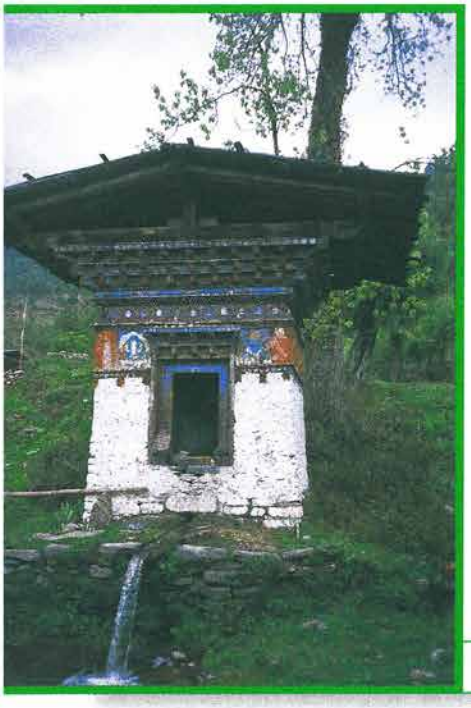
These reports are based on a comprehensive, updated assessment of the situation facing nearly 4000 of the approximately 15,000 species of insects so far recognised in Norway. This work therefore represents an important contribution towards making a justifiable management of Norwegian insects possible in line with international obligations. FRODE ØDEGAARD



The beetle Phryganophilus ruficollis *(Fam. Melandryidae) is directly threatened by extinction because the habitats which are relevant for it to live in are continually being reduced in extent. The only known occurrences of the species in Norway are in Lierne in Nord-Trøndelag.*

PHOTO: ODDVAR HANSSEN, FRODE ØDEGAARD

Waterpower development in the Himalayas



A hydroelectric scheme is being planned on the River Mangdechhu in Bhutan, and the environmental consequences are being investigated by Statkraft Engineering, NIVA and NODE (Norwegian Consortium for Development and Environment, comprising NINA, NORAGRIC and CMI). NINA is responsible for the wildlife and fish studies. The Mangdechhu has few species of fish, in contrast to the main river, the Manas/Bramaputhra, on the lowland plain of India. Only a few species can migrate up the Manas to the lowest stretches of the Mangdechhu; the stretch (ca. 13 km) where the development is planned to take place falls approximately 650 metres and has a normal water velocity of 2.5 m/s. The water was milky and cold due to melting glaciers in the mountains. We only found stationary fish during the field work. One species dominated and had a good density. It was the "snow trout" *(Schizothorax richardsonii)*, a carp that lives on algae. Newly hatched "snow trout" fry were found. One representative each of the genera catfish and smerling were also found. The catfish was mentioned as a potential source for manufacturing medicines. Fish formed an insignificant part of the diet of the local population. The "snow trout" had a potential as a food fish in the lower part of the area to be regulated. We viewed the development of the Mangdechhu as posing little controversy as regards fish. We proposed a minimum discharge for the whole of the stretch affected as one of several measures which should be implemented in the event of development.

NILS ARNE HVIDSTEN

A hydro-powered prayer wheel. PHOTO: JAN OVE GJERSHAUG

Active participation in land-use planning

In the last two years, NINA has developed a new approach to reporting environmental impact assessments by extensively employing geographical information systems (GIS). These analyses are based on the mapping of natural areas.This can be understood as a practical approach to evaluations of biotopes and ecosystems with regard to both individual species and biodiversity in general. The objective is to delimit uniform areas based on a multidisciplinary synthesis of geology, geography, vegetation and other biological fields. The use of digital land-use maps and digital elevation model (DEM) are particularly important, for delimiting different habitats and landscape elements (Figure 1).

These methods will be developed further and provide a good basis for practical land-use planning.

Mapping of natural areas forms the basis in assessing environmental values and vulnerability to planned encroachments. These assessments are also presented as digital maps. "An important contribution to improve the decision - making process in land-use planning." This is how we may characterise this method of documenting environmental properties and imparting the results in a form suitable for use by planners.

Two projects undertaken for the Public Roads Administration in the county of Buskerud have given NINA valuable experience in this type of analysis. The planning procedure included the mapping of environmental values and the vulnerability, before the specific locations of new stretches of road were decided. Various environmental considerations can thus form an underlying factor for road planning, instead of entering as a comparison of alternative layout plans that have already been drawn up.

As planners we make increasing use of GIS. NINA is in this way able to communicate its land-use oriented results directly in the form of digital maps. The scientific inputs to the planning process can thus be integrated into the planning tool at an early stage. Figure 2 shows a map of environmental values and experience has shown that the Public Roads Administration has largely taken into account the information on this map when determining the location of the road.

LARS ERIKSTAD OG ODD STABBETORP

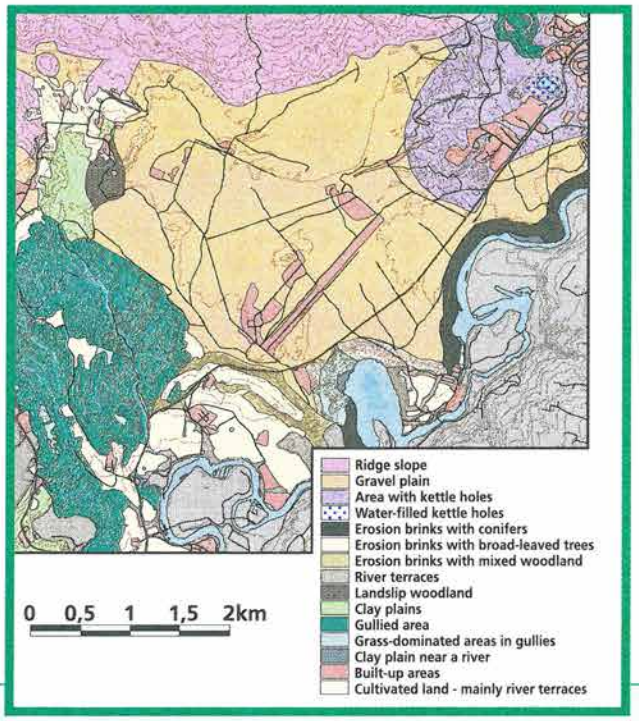


Figure 1.
Map of natural areas prepared in connection with the planning of a new stretch of main road (Rv 35) from Nymoen to the Oppland county border (Ringerike, southern Norway).

Figure 2.
Map of environmental values prepared in connection with a new stretch of highway E16 from Rørvik to Vik in Hole, southern Norway.

NINA and environmental monitoring

What is the present state of Norwegian moose populations regarding body condition and reproductivity? These and other questions are answered by the annual monitoring of seven Norwegian moose populations. PHOTO: ERLING SOLBERG

WHAT IS ENVIRONMENTAL MONITORING?

Environmental monitoring may be described as systematic and regular gathering of environmental data with the help of established methods, and the evaluation and reporting of such data to provide documentation about the state and development of the environment.

Data derived from environmental monitoring are fundamental for a nature management whose objective is to ensure sustainable management of natural resources. To assist the nature management authorities to reach such goals, environmental monitoring should also include variables that provide a basis for separating natural variations from human induced changes.

The last 20 years have provided a number of examples where Norwegian monitoring data have proved their value. E.g. related to international negotiations concerned reduction of environmental toxicant emissions, and optimal harvesting of Cervides.

The need for environmental monitoring has been strongly emphasised in connection with the «Convention on Biological Diversity» (Rio Convention), and a national «Plan for monitoring biological diversity» has been worked out and will be put into effect during the next three years. In this context, we expect that monitoring activities will increase and that most of our current monitoring will continue as part of this national plan.

In addition to the immediate benefit accuring from information derived through environmental monitoring, biological monitoring also generates long-term data sets that are very useful for studying more fundamental processes in nature. This concerns studies of both individual species (population studies), and relations between species and processes in nature (ecosystem studies). Such knowledge will also be useful when decisions are to be taken that ensure the sustainable utilisation of our common heritages, the natural ecosystems.

NINA has wide-ranging tasks associated with environmental monitoring, including:

- Population monitoring of moose, red deer and wild reindeer as part of "The National Monitoring Programme for Cervides". (Directorate for Nature Management, DN, since 1991).
- Monitoring environmental toxicants and plants and animal populations in connection with "The Monitoring Programme for Terrestrial Ecosystems". (DN, since 1990).
- Population monitoring of a number of seabird species as part of "The National Programme for Monitoring of Seabirds". (DN, since 1988).
- Monitoring of radioactive caesium in plants, wild reindeer, trout and char for as a follow-up of the "Effects of the Chernobyl Accident". (DN, since 1986).

JOHN ATLE KÅLÅS

The lynx - the Nordic minitiger

Lynx. PHOTO: PETER KIRKBY

SURROUNDED AS IT IS BY MYTHS,

the lynx attracts a great deal of attention. Many people view it as an animal that kills for pleasure, just sucking blood from its victim before hastening to the next one. It does not eat frozen meat either, so it continually has to kill new prey. The lynx produces kittens when only one year old, several litters each year, and up to 7 or 8 kittens per litter, so everyone must realise that here we are faced with a species which, in a short time, will lay the country waste if we fail to implement measures to limit the population....

The only correct statement here is that the lynx is surrounded by myths! With few exceptions, it consumes all its prey, gnaws stiffly frozen meat without any problem, most females wait until they are three years old before they have young, and only one of 72 known litters in Norway and Sweden comprised more than three kittens.

NINA has been carrying out extensive investigations on the lynx for the last five or six years. In northern districts, the work has centred around its impact on reindeer husbandry, while in the south we have been concerned with the fortunes of the fine roe deer population that has grown up over recent decades. Will roe deer hunting be a thing of the past in a few years? This is unlikely, but the lynx can obviously make considerable inroads into the population of our smallest species of game deer.

In Hedmark, we have radio-tagged and followed 40 lynx and 130 roe deer in recent years. It seems obvious that, some years, lynx are capable of taking 25-30 per cent of the roe deer east of the River Glomma. The roe deer population in this district is very small, less than one animal per km^2, but lynx are nonetheless able to find and kill roe deer just as often as those inhabiting areas with a denser roe deer population. What will happen in areas with far larger numbers of roe deer, where hunting is an important pursuit?

Few game projects now have funds to do research at many different places, enabling the effect of different environmental factors, such as varying densities of lynx and roe deer, to be studied. To make up for this, close and profitable co-operation has to be established with foreign research groups so that the results of all the investigations can be viewed as an entity. NINA has taken the consequence of this and now has valuable co-operation with relevant groups in Sweden, Poland and Switzerland. The demand for knowledge has increased, and new groups are continually appearing on the scene wanting answers to their questions. We hope to be able to supply them with information through our ongoing field investigations and extended international co-operation.

REIDAR ANDERSEN

PCB measured in blood from glaucous gulls

Glaucous gulls on Bjørnøya. PHOTO: J.O. BUSTNES

Animals in our part of the Arctic have for a long time been known to contain alarmingly high levels of certain environmental toxicants. This particularly applies to some creatures at the top of the food chain, like polar bears and glaucous gulls. In the mid-1980s, scientists became aware that many glaucous gulls were dying on Bjørnøya during the breeding season, and subsequent analyses of these birds proved high levels of chlorinated organic compounds, like PCB.

Despite these high levels, little has been known until recently about the effect of these substances on the populations. In 1997, NINA began a research project on glaucous gulls on Bjørnøya in co-operation with the Norwegian Polar Institute, the objective being to find out whether the high PCB levels are affecting the population. Studies of reproduction and adult survival aim to be able to predict the long-term effect of the contamination.

By using a relatively new technique that measures PCB in blood, we avoid having to kill the birds and can follow individuals over several years. This is more efficient in population ecological studies. The National Veterinary Institute in Oslo is doing the analyses.

In 1997, blood samples were taken from 113 gulls, double samples being taken from 25 birds. Good agreement was found between levels measured early and late in the breeding season. Hence, just one sample could be taken and it could be assumed to represent the actual toxic load in the bird. Males had higher levels than females, probably because females rid themselves of the toxicants through their eggs.

Considerable differences were found between different colonies on Bjørnøya. These could largely be related to the food selection in the colonies. Birds nesting nearest the sea eat much more fish and have low levels of PCB, whereas those nesting higher on the bird cliff and mainly eating seabird eggs have far higher levels.

Around 80 per cent of the birds ringed in 1997 were observed in 1998. Blood samples were taken from 30 of these in 1998, too, to be able to compare the toxic levels from one year to the next. The most interesting discovery to date was a negative relationship between PCB levels in 1997 and the probability of the birds returning to Bjørnøya in 1998.

JAN OVE BUSTNES

Population regulation in salmon

All natural populations have a limit to their size, chiefly determined by availability of food. Individuals which lose out in the competition for food will eventually die. This is called density-dependent mortality, since the risk of dying rises with increasing density. However, some will die even though the population density is low, far below the starvation limit. Their deaths result from what are called density-independent factors which, in the case of fish, may be high or low water temperatures and too little oxygen.

Density-dependent mortality factors regulate the size of a population because they increase in strength towards and beyond the carrying capacity of an area, whereas density-independent factors do not have such an effect, but merely reduce the number of individuals. To be able to regulate the harvesting of natural populations, we need to know how the size of the population is regulated, in order to assess whether the harvest comes instead of, or additional to, the natural mortality. To study this in natural salmon stocks, we need sets of data amassed over many years, while recruitment and environmental conditions vary.

Population regulation has been studied for salmon in the Imsa, a small river in Rogaland, where NINA has an admirable research station. The upstream and downstream migration of all the salmon, both smolt and adults, has been studied here continuously since 1975. The results have shown that the smolt stock in fresh water is regulated by density-dependent mortality factors, whereas the survival of older fish in the sea is limited by density-independent factors.

The density-independent mortality in the sea means that the more smolt that emigrate, the more salmon, on average, will return to the river as adults, and the better will be the basis for catching salmon. However, there will be annual variations in the mortality, caused by varying living conditions in the sea. This mortality may, for instance, be a result of low water temperatures, or factors that may be related to the water temperature, such as production of prey organisms, the efficiency of predators and the risk of becoming infected with parasites like sea lice.

NINA JONSSON

HIGH SMOLT PRODUCTION

Studies in the River Imsa showed that the number of emigrating smolt rose with the density of eggs spawned, up to a density of approximately 6 eggs per m^2, the smolt production then approaching 15 smolt per 100 m^2 of river bed. By international standards, this is a very high smolt production. Six eggs per 100 m^2 correspond to the quantity of roe produced by 25 female salmon weighing 2 kg. Smolt production showed little increase with higher egg densities. Excess spawn therefore die. Since it is the strongest smolt that survive, this does not mean that excess egg production is wasted. It enhances the genetic diversity and strengthens the basis for natural selection in the stock. Excess egg production is therefore desirable and perhaps essential for the long-term viability of the stock.

NINA JONSSON

NINA Research Station, Ims. PHOTO: JON BACKER

Reduced acidification raises hopes for the fish

Precipitation in Norway has become much less acid in recent years, bringing prospects for an improvement in fish stocks in acidified waters, and hence less need for liming.

In areas where local stocks have been lost, fish may become reestablished, either by natural immigration or by being released. Even though the water quality is gradually becoming satisfactory, successful immigration depends on such factors as the ability of the species to migrate, the distance to the closest remaining stock and the size of that stock, and whether physical barriers hinder immigration. So far, few instances are known of fish having naturally immigrated into limed rivers and lakes, nor can such immigration be expected in the short term. Fish are therefore being released as acidic localities are limed. For many years, limed lakes have been successfully stocked with vast numbers of brown trout.

In the last two years, NINA has released perch into three acidic lakes which formerly contained perch in the Tovdal river basin in the county of Aust-Agder. Perch are common in southernmost Norway, but almost half the stocks have been destroyed by acidification. The aim of the experiment was to see whether the water quality in the basin had improved sufficiently for perch to survive and reproduce again. A lake that was not acidified functioned as a reference locality, while a fifth lake was limed prior to the release of perch. The results showed that the water in the acidic lakes is still too acid for perch to survive. However, the perch in the limed lake did reproduce, and the reference lake also has a good stock. The most acidified waters in southernmost Norway will therefore have to be limed for many years to come if fish are to have conditions in which they can survive.

Fish stocks on the margins of acidified areas will be the first to record an improvement as acidification gradually decreases. Enhanced recruitment has already been observed in brown trout stocks in such locations, for instance at Vikedal in Ryfylke. Conditions are, nevertheless, unstable and it is too early to say whether the recruitment will remain at a relatively high level.

Many acidified rivers whose Atlantic salmon stocks have been lost or reduced have been limed in recent years, and will need liming for an indefinite period. NINA is monitoring young salmon and trout stocks in many of these rivers, and several rivers in southernmost Norway that had lost their salmon are now showing natural recruitment. Liming has still not started on many formerly good salmon rivers, and large numbers of acidic lakes whose fish stocks have been lost or damaged, have also still not been limed. The need for liming is therefore far greater than public funding is currently meeting.

TRYGVE HESTHAGEN

Gillnet fishing on Jarfjordfjellet, Sør-Varanger, north-east Norway, where fish damaged by acidification have been found. PHOTO: EGIL LUND

LESS SULPHATE IN THE PRECIPITATION

The concentration of sulphate in the precipitation in southern Norway has been halved in the last 25 years. However, owing to relatively high precipitation towards the end of the 1980s, the wet deposition of sulphate has not decreased to the same extent. Nitrogen compounds also contribute to watercourse acidification, and have not decreased in recent years. A slight improvement in the water quality has been recorded, but it is far less than should be expected from the reduction in emissions.

Good news from the Foundation

Polar Environment Centre
- a national innovation

In autumn 1998, NINA•NIKU moved to the new Polar Environment Centre in Tromsø. NINA's Department of Arctic Ecology and NIKU's personnel working on landscape and the cultural environment have thereby joined an exciting environment. This is the new meeting-place in Norway for research, environmental monitoring and advice on the northern regions, the Arctic and the Antarctic. More than 200 staff, spread over eight institutions, represent a major national investment on co-operation that is expected to give a substantial synergetic effect.

The Polar Environment Centre, with the Polaria Exhibition Centre in the foreground.
PHOTO:ARNE KARLSEN / LOKALVEIVISEREN

The River Alta 10 years on

How did the River Alta fare following its development for hydroelectric power? "Altalaksen" (The Alta Salmon) is a book reviewing the consequences for cultural life, power development and the local environment, and arose from a conference "Altaelva 10 år etter" (The River Alta 10 years on). It is edited by Tor F. Næsje, NINA.

PHOTO FROM THE BOOK TAKEN BY ROAR LUND

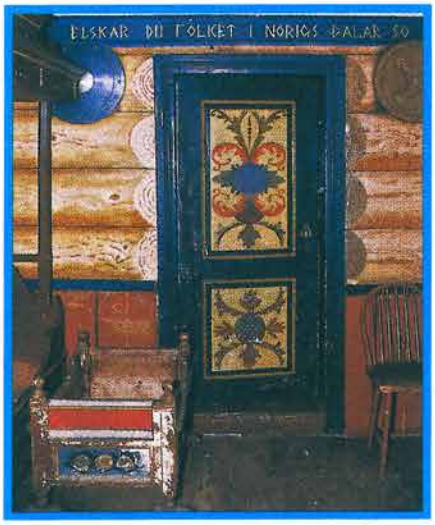


PHOTO FROM THE BOOK: JON BRÆNNE

Prize for good presentation to the public

On NINA's 10th anniversary day in October, Jon Brænne (NIKU) was presented with the Svein Myrberget Memorial Prize, the Foundation's prize for popular scientific work. Short time later he published his book "Dekorasjonsmaling" (Decorative Painting), which deals with traditional painting techniques.

Doctorates at NINA•NIKU in 1998

- Annika Haugen, NIKU, defended her doctorate on the climate in old stone walls. The title of her thesis was "Uppvarmning och bevarande av medeltida stenkyrkor" (Heating and preservation of medieval stone churches).
- Erling Solberg, NINA, defended his doctorate entitled "Variation in population dynamics and life history in a Norwegian moose *(Alces alces)* population: Consequences of harvesting in a variable environment".

Hope for the Java hawk eagle

Nils Røv and Jan Ove Gjershaug from NINA attended a workshop in 1998 on the preservation of the Java hawk eagle in Indonesia. Their results are a very important contribution to the nation's preservation plan for this endangered species. PHOTO: TORGEIR NYGÅRD

Age is no obstacle

Scientists generally love their subject and want to continue working on it even after they retire. NIKU gets good value from its "enthusiastic pensioners". Several major projects can be completed simply because researchers do not lay down their pens when they reach 67. In 1998, we have four retired researchers, the oldest being 81 years old.

Nils Røv tagging a Java hawk eagle with a radio transmitter.

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Publikasjoner og annen formidling 1998

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