Coastal region and small island papers 21

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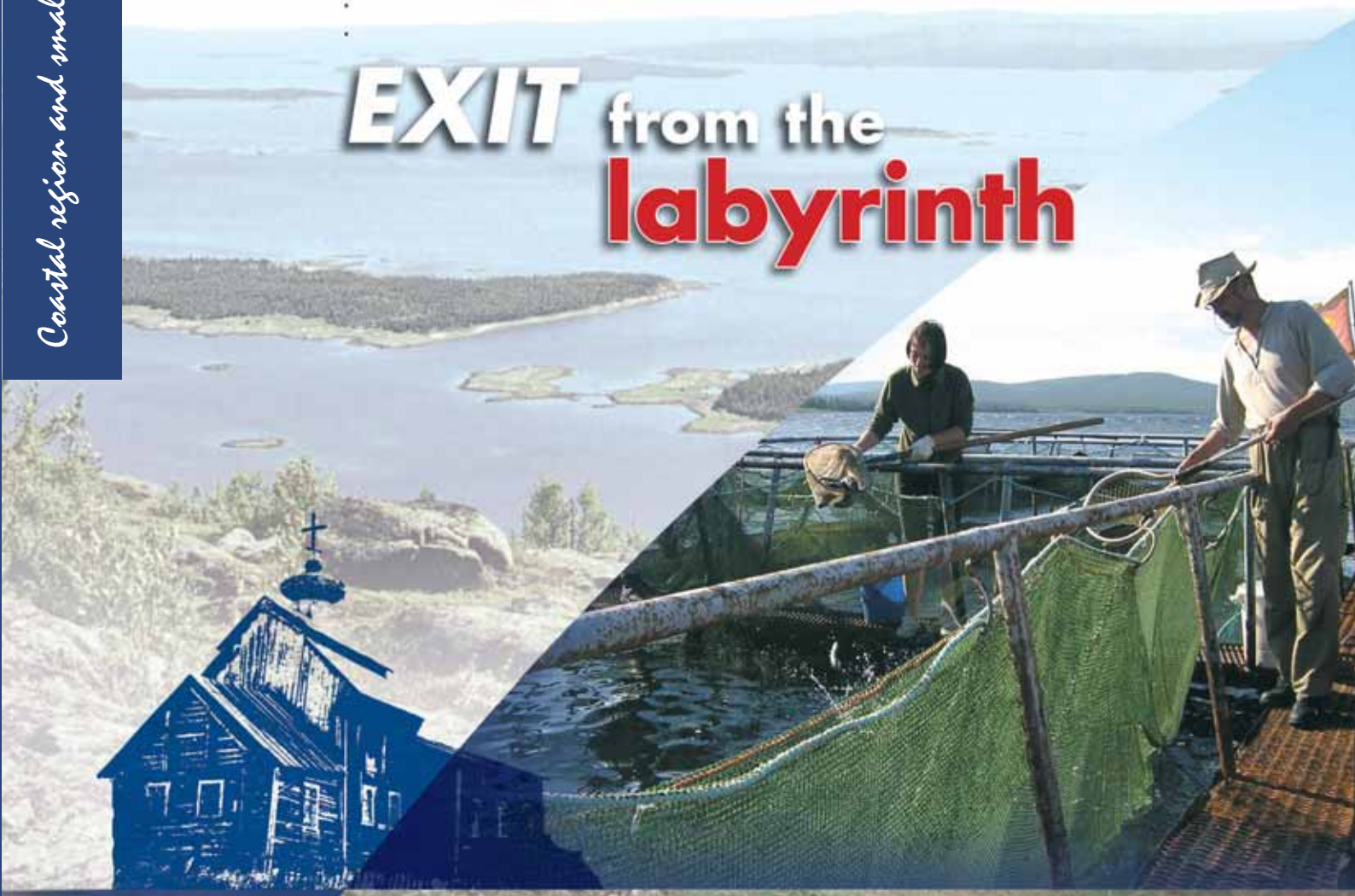
# EXIT from the labyrinth



## Integrated coastal management

### in the Kandalaksha District, Murmansk Region of the Russian Federation


Novaya Zemlya Is.
Spits Bergen Is.
BARENTS SEA
R U S S I A
NORWAY
FINLAND
Kislaya Bay
BARENTS SEA
Polarny
Murmansk
MURMANSK OBLAST
Lake Imandra
Khibiny M.
Kolskaya Nuclear Power Plant
Kandalaksha
Zelenoborsky
Zarechensk
Kovda
Kola Peninsula
Kandalaksha Gulf
Lake Kovdozero
Arctic Circle
WHITE SEA
Archangel
KARELIA
R U S S I A
N
0
200 km
Petrozavodsk
Lake Onega
Lake Kadoga
St Petersburg
Novgorod
KANDALAKSHA
R. Niva
Kandalaksha fish farm
Nivskaya power station
Kandalaksha Sea Port
R. Kanda
R. Luvenga
GULF OF KANDALAKSHA
Luvenga
Belomorskaya oil terminal 'Vitino'
Oleny Is.
R. Kolvitsa
Beloye More village
Gandvik camp
PINRO cage farm
Udarnik cage farm
KANDALAKSHA
STATE
RESERVE
Medicinal silt producing facility
Palkin Bay
Ryashkov Is.
Ryashkova Salma Strait
0
25 km

Coastal region and small island papers 21

# *EXIT* from the labyrinth

## Integrated coastal management

in the Kandalaksha District,
Murmansk Region of the Russian Federation

Ministry of Education and Science, Russian Federation
Russian State Hydrometeorological University
United Nations Educational, Scientific and Cultural Organization

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# Foreword

Over the past two decades, change has characterized the Gulf of Kandalaksha, an area of fragile ecosystems and severe weather conditions, typical of Russia's remote northern Arctic region. The economy of the Gulf has changed in response to political events: State-run industries have given way to a free-market economy and, with the end of the Soviet era, lifestyles and work practices have been transformed.

Extensive oil and gas reserves are located in the continental shelf of the Russian Arctic. The Shtokmanovskoe gas-condensate field and the Prirazlomnoe oil field were discovered in the Barents Sea in 1988 and 1989 respectively. Development of these reserves started in 1992 and full-scale production is imminent. This promise of large-scale oil and gas production and the accompanying demand for transport has had a considerable effect on the economy of the region. The Belomorskaya oil terminal and the Kandalaksha commercial seaport in the Gulf of Kandalaksha have been enlarged and modernized.

A project, undertaken by the Russian State Hydrometeorological University, and supported by the Ministry of Education and Science of the Russian Federation, and the Environment and Development in Coastal Regions and in Small Islands platform of the United Nations Educational, Scientific and Cultural Organization, started in 1990 as an academic study of the waters of the Gulf of Kandalaksha and evolved into an holistic study encompassing the ecosystem, economy and social structure of the Gulf. Within the Russian context, where there are as yet few specific laws or regulations directly relating to coastal regions, such an approach is an innovation. The project's aim is to develop an integrated coastal management system, within which all sectors of society – industry, the local administration, naturalists, native peoples, fishermen, academics, the tourist industry and the general population – can work together so that development and lifestyles are sustainable.

Against this background, it is timely to publish this report, even though the results remain preliminary, in the hope that the lessons learned can be passed to other persons living and working in northern coastal regions that face rapid development as gas and oil reserves are exploited.

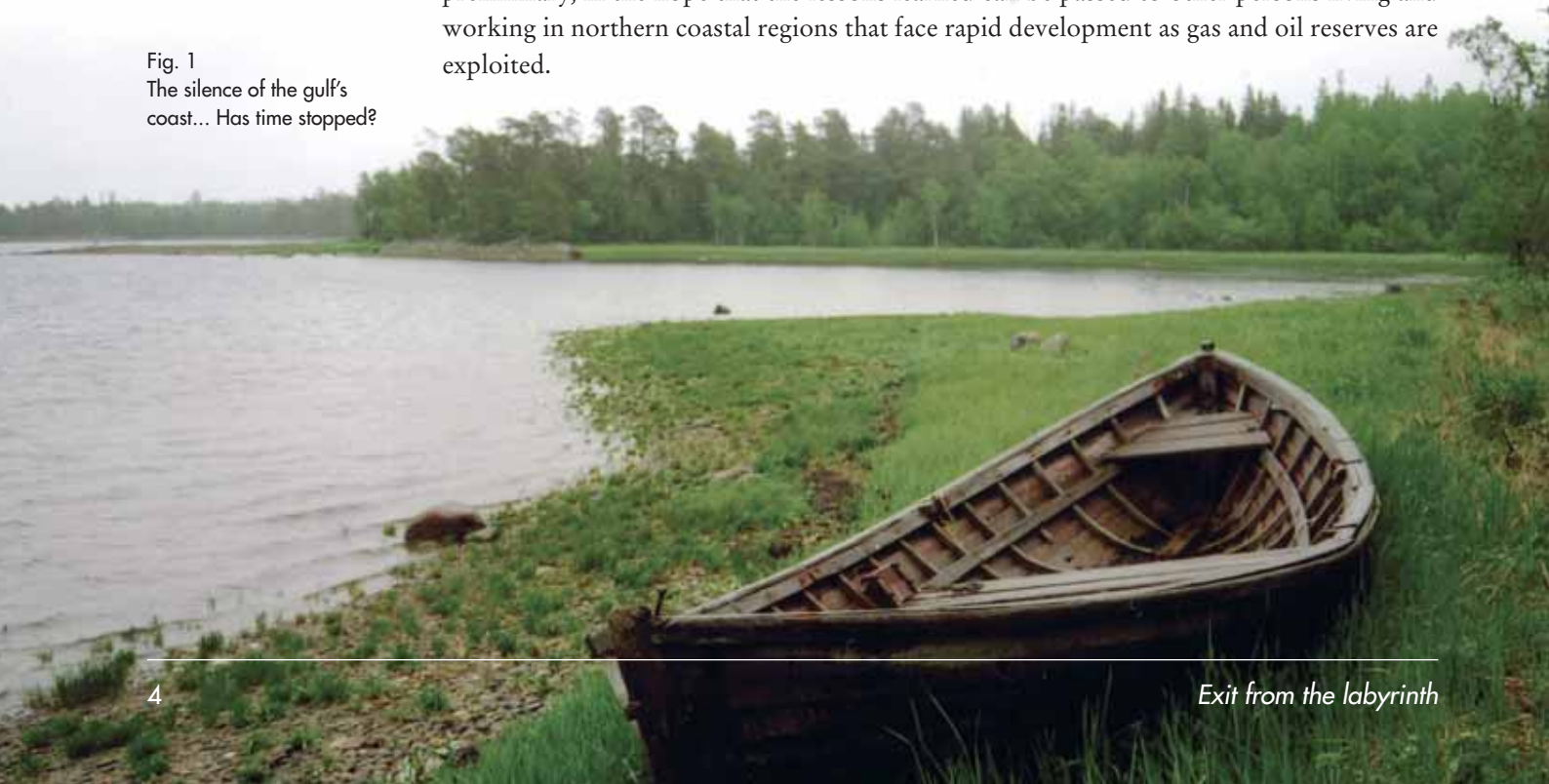


Fig. 1
The silence of the gulf's coast... Has time stopped?

# Предисловие

Прибрежная зона Кандалакшского залива, характеризующаяся особой чувствительностью («хрупкостью») экосистем и суровостью погодных условий – то есть всеми признаками Русского Севера – в последние два десятилетия охвачена изменениями. Изменения в экономике явились отражением политических событий: с окончанием Советской эры государственно регулируемая промышленность уступила место свободному рынку; изменились стиль жизни и характер труда людей.

В конце XX века выяснилось, что на шельфе Российской Арктики размещены огромные запасы нефти и газа. В 1988 г. и 1989 г. в Баренцевом море были открыты Штокмановское газоконденсатное и Приразломное нефтяное месторождения. Эксплуатация этих запасов началась в 1992 г., и надвигается их полномасштабное освоение. Начало многообещающего развития крупномасштабной нефте-газовой индустрии и сопутствующей транспортной инфраструктуры оказывает значительный эффект на всю экономику региона. Беломорский нефтеналивной терминал и Кандалакшский морской торговый порт расширены и модифицированы.

Проект, предпринятый РГГМУ при поддержке ЮНЕСКО (подотдел прибрежных зон и малых островов) и Министерства Науки и Образования Российской Федерации, стартовал в 1990 г. в виде классических академических исследований структуры вод Кандалакшского залива, и с тех пор развился в комплексное холистическое изучение экосистемы, экономики и социальной структуры прибрежной зоны залива. Учитывая контекст России, где до сегодняшнего дня законодательная база по регулированию берегопользования не развита, подобный подход является инновационным. Цель проекта – развитие системы комплексного управления прибрежной зоной, которая бы охватывала все сектора общества: промышленность, местную администрацию и органы самоуправления, экологов и натуралистов, коренных жителей, рыбаков, ученых – исследователей, туристическую индустрию и население в целом – и обеспечила бы устойчивость развития и высокий уровень жизни населения.

В соответствии со сказанным, публикация данного отчета по проекту очень своевременна. Хотя результаты проекта имеют несколько предварительный характер, приобретенный в его ходе опыт может быть передан другим берегопользователям, живущим и работающим в прибрежных северных регионах, где также ожидается быстрое развитие в связи с эксплуатацией нефтегазоносных месторождений.

# Contents

# List of figures and tables

# List of acronyms

| | |
|---|---|
| BFU | Baltic Floating University |
| CSI | Coastal Regions and Small Islands platform (UNESCO) |
| GIS | Geographic Information System |
| ICM | Integrated Coastal Management |
| IOC | Intergovernmental Oceanographic Commission |
| KG | Gulf of Kandalaksha |
| KSNR | Kandalaksha State Nature Reserve |
| PINRO | Knipovich Polar Institute of Marine Fisheries and Oceanography, City of Murmansk |
| RSHU | Russian State Hydrometeorological University, St Petersburg |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNITWIN | University twinning and networking scheme (UNESCO) |
| WiCoP | Wise coastal practices for sustainable human development |
| WSSD | World Summit on Sustainable Development, Johannesburg 2002 |

# Summary

Historically the Gulf of Kandalaksha in the White Sea supported a small population of native peoples who managed the region in a sustainable way. Commercialization of fishing and hunting from the 17th century onwards, industrialization in the 19th century and the birth of the Soviet Union in the 20th century brought change. The population increased, as did their impact on the environment, fish and mammal stocks fell, pollution increased, raw materials were used in an unsustainable fashion and the long-term outlook for the Gulf of Kandalaksha and its people, flora and fauna seemed uncertain.

Students and staff from the Russian State Hydrometeorological University (RSHU) in St Petersburg have come to the Gulf of Kandalaksha to do fieldwork every summer since 1990. Initial studies were of the hydrophysical characteristics of the Gulf; further studies focussed on identifying changes in the coastal ecosystem due to natural variability and human activity. More recently the social and economic situation of the people who live on the Gulf coast have been studied. This research became the basis for a joint RSHU - Coastal Regions and Small Islands (CSI) platform of the United Nations Educational, Scientific and Cultural Organization (UNESCO) White Sea – Barents Sea project to develop sustainable integrated coastal management in the Gulf of Kandalaksha.

Various methods and tools to help build consensus, among the population and stakeholders of the region, on how the region should develop were devised, used and refined.

The work has been assessed periodically to ensure that it remains focussed, develops, has achievable goals and expands.

Continuing education is an important aspect of integrated coastal management. To this end the RSHU and the Kandalaksha Centre ran vocational courses in 2003 and 2004 on 'Small business management in the coastal zone'. The courses were designed to help business managers understand how businesses impact on the environment and the local population.

Two further steps have helped in making integrated coastal management a reality in Kandalaksha: the creation of an integrated coastal management working group within the Administration of the Kandalaksha Municipality; and the preparation, by the working group in conjunction with the RSHU, of a Strategic Plan for the development of an integrated coastal management system in the Gulf of Kandalaksha.

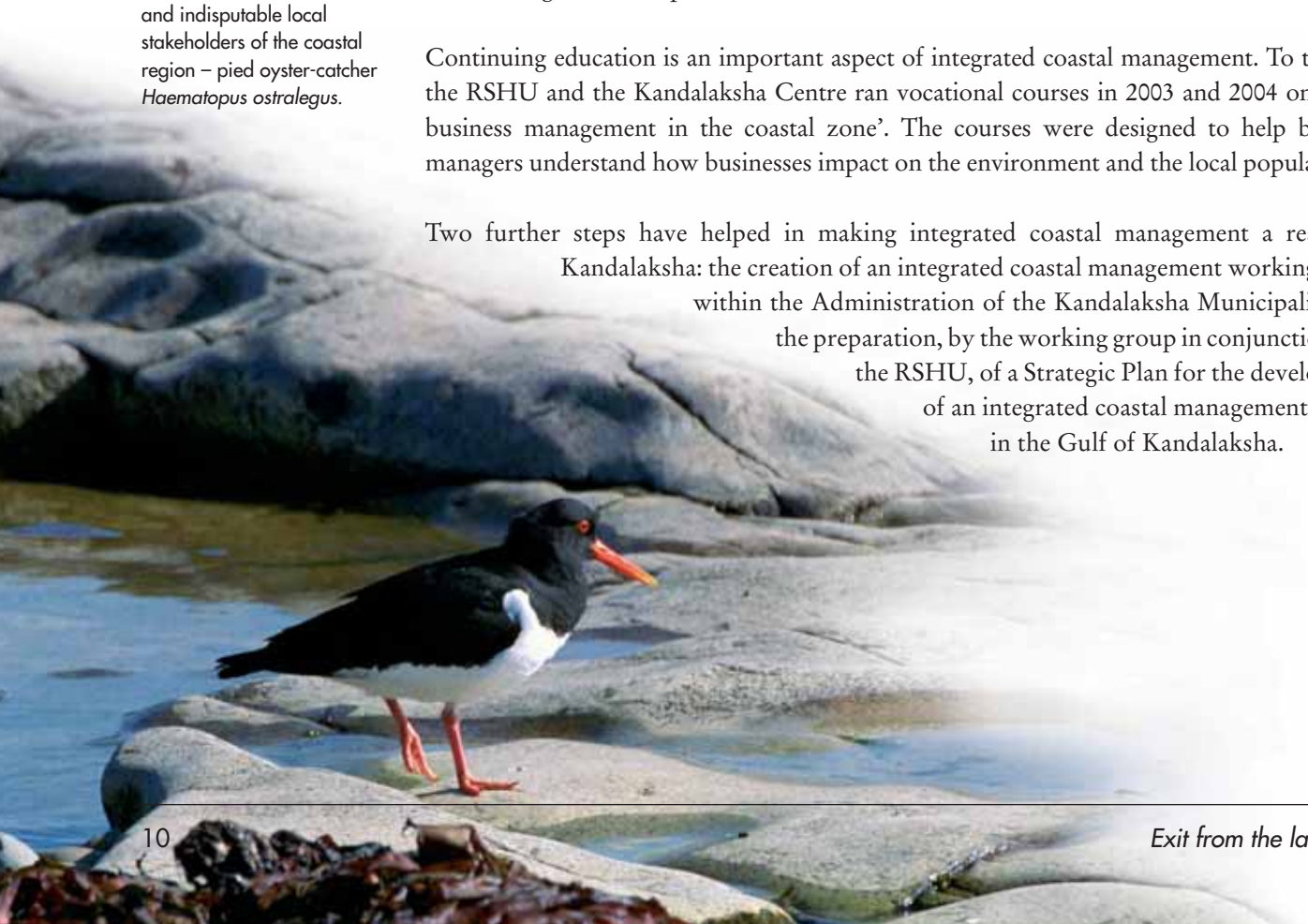


Fig. 2
One of the traditional, and indisputable local stakeholders of the coastal region – pied oyster-catcher *Haematopus ostralegus*.

# Резюме

Исторически прибрежная зона Кандалакшского залива Белого моря обеспечивала устойчивое существование малочисленного местного населения, использовавшего устойчивые формы берегопользования. Коммерциализация охоты и рыболовства, начавшаяся с 17 века, индустриализация региона в 19 веке и создание социалистической системы хозяйствования в 20 веке нарушили равновесную систему. Рост численности населения, возрастание антропогенной нагрузки на прибрежную зону, сокращение численности промысловых рыб и морских млекопитающих, увеличение загрязнения среды, расточительное экстенсивное использование природных ресурсов повысили неопределенность долговременных перспектив развития региона.

Начиная с 1990 г. преподаватели и студенты Российского государственного гидро-метеорологического университета (РГГМУ, г. Санкт-Петербург) проводят ежегодные летние полевые исследования в Кандалакшском заливе. Изначально работы были направлены на исследование гидрофизических и гидрохимических характеристик водных масс залива; в дальнейшем акцент сместился на выявление изменений в прибрежных экосистемах, вызванных природными и антропогенными факторами. Наконец, были выполнены оценки общей социальной и экономической ситуации в прибрежной зоне. Результаты исследований легли в основу совместного Баренц-Беломорского проекта РГГМУ и Подотдела прибрежных зон и малых островов ЮНЕСКО, направленного на разработку платформы комплексного управления прибрежной зоной (КУПЗ) в Кандалакшском заливе.

В ходе работ по проекту были использованы и развиты различные методы и технологии обеспечения достижения консенсуса между основными заинтересованными природопользователями исследованного региона. Периодические отчеты по проекту и результаты его мониторинговой оценки позволили обеспечить постоянную направленность на достижение изначально поставленной цели: обеспечение устойчивого развития прибрежной зоны Кандалакшского залива.

Непрерывное обучение всех участников процесса берегопользования является важнейшим компонентом КУПЗ. В целях развития данного компонента, РГГМУ и Центр занятости населения г. Кандалакша в 2003-2004 гг. организовали учебные курсы «Управление малым бизнесом в прибрежной зоне». Курсы были проведены с целью оказания методологической помощи различным берегопользователям, предпринимателям и менеджерам, в частности – для определения влияния малого бизнеса на береговую среду и местное население.

Два следующих шага способствовали превращению КУПЗ Кандалакшского залива в реальность: создание при администрации г. Кандалакша рабочей группы по развитию программы КУПЗ, и подготовка этой рабочей группой при участии РГГМУ предложений по формированию системы КУПЗ в Стратегический план развития Кандалакшского района.

# Introduction

A 4,000 year old labyrinth in the Kandalaksha skerries has become a symbol of the region. Its origins are obscure. Built originally either as a primitive trap or cage for salmon, or as a way of communicating with ancestral spirits, now its ancient stones and living grass symbolize the link between the past and the present. To those trying to develop a sustainable, integrated coastal management system the complicated relationships between various stakeholders such as local inhabitants, fishermen, industrialists and conservationists, can be labyrinthine. The path to developing a management system that satisfies them all may also at times resemble a labyrinth.

Systems analysis is the best method of analyzing the labyrinth of links and feedback loops in a complicated system. This approach reveals the dynamic nature of human society's interaction with the natural environment. (*Adapted from Morachevsky, 1994*)

A manager in search of the best administrative decisions may seem like a person wandering in the complicated labyrinth of relationships between various coastal resource-users. Integrated coastal management methods help to show the way out of this confusing labyrinth. (*Collective wisdom of the project participants, 2003*)

## 1.1 Coastal regions and their integrated management

The coastal region may be defined as the area of land subject to marine influences and the area of sea subject to land influences. It has three components: the sea, the interface between land and sea (often but not always a beach) and the land behind this interface. These sub-systems interact in many ways, physically, economically and culturally, and the boundaries between them fluctuate. The coastal region is not an isolated system. Rivers and watercourses transport sediment and pollutants from inland activities, such as forestry and agriculture, to the coast sometimes to the detriment of coastal habitats; currents carry pollution great distances, sometimes across boarders; while tourists, drawn to the coast for recreation, may place excessive demands on the local infrastructure. The high biodiversity present in coastal waters and the often high population density of coastal lands make it inevitable that economic, environmental and demographic pressures converge sharply in coastal areas.

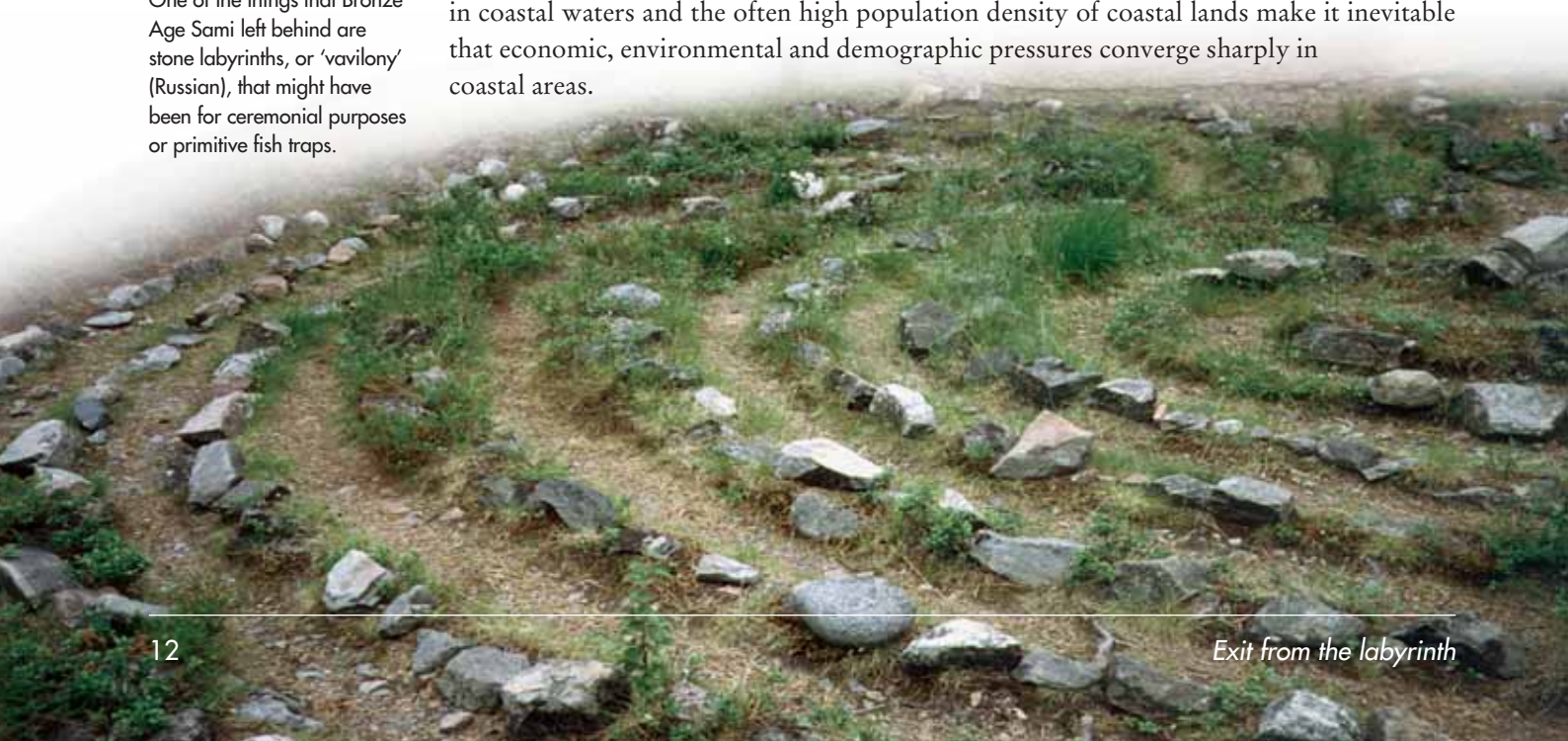


Fig. 3
One of the things that Bronze Age Sami left behind are stone labyrinths, or 'vavilony' (Russian), that might have been for ceremonial purposes or primitive fish traps.

As stresses in coastal regions intensify there is an increasing need for governmental and management systems that are capable of coping with the multi-faceted problems and issues that face these areas. The private sector (industrialists, developers and port officials), the scientific community, politicians and policy-makers, government officials, conservationists and concerned members of the public need to collaborate in developing long-term, sustainable management systems capable of reaching and maintaining a balance between resource management, ecosystem health and quality of life. This system is integrated coastal management.

### Integrated coastal management

'Integrated coastal management (ICM) can be defined as a continuous and dynamic process by which decisions are taken for the sustainable use, development and protection of coastal and marine areas and resources. ICM acknowledges the interrelationships that exist among coastal and ocean users and the environments they potentially affect, and is designed to overcome the fragmentation inherent in the sectoral management approach. ICM is multi-purpose orientated. It analyses and addresses implications of development, conflicting uses, and interrelationships between physical processes and human activities, and it promotes linkages and harmonization among sectoral coastal and ocean activities.'

*Cicin-Sain and Knecht, 1998*

While several countries (principally in Europe, the Caribbean and North America) embarked on coastal management initiatives in the 1970s and 1980s, the United Nations Conference on Environment and Development (Rio de Janeiro, 1992) marked the beginning of serious international efforts to coordinate management of marine and coastal resources. Every major international convention and agreement concerning the sea and coasts since then has mandated this approach. The World Summit on Sustainable Development (Johannesburg, 2002) strongly re-endorsed it suggesting a policy: 'to promote integrated, multidisciplinary and multisectoral coastal and ocean management at the national level and encourage and assist coastal states in developing ocean policies and mechanisms on integrated coastal management' (WSSD, 2002).

In compliance with this, integrated coastal management systems are being implemented around the world through co-management partnerships between intergovernmental organizations (including many United Nations agencies), national governments and local stakeholders. Although any management system is, in detail, specific to the needs of a given area, there are many common elements, and integrated coastal management guiding principles and tools continue to be developed.

## 1.2 Integrated coastal management in northern Russia

The Russian Federation has the longest coastline in the world: approximately 60,000 km. It also has the most extensive coastal region, which covers about one third of its territory and is home to approximately 17 million people. It has a huge variety of climatic, ecological and hydrological conditions; and its level of socio-economic development is equally varied.

The centralized political system, planned economy and absence of market mechanisms that existed in the former Soviet Union meant that, as the rest of the world developed the methodology of integrated coastal management, Russian coasts were administered differently.

Even now, Russian Federation legislation does not recognize the coastal region as an entity to be regulated as a whole. Currently the use of natural resources is governed by specialized legislation dealing with each resource individually. Control of conservation, protection, registration and use of resources lies in the hands of various government bodies. In these circumstances integrated coastal management is a challenge, but as this system is now recognized around the world as the most promising one for both conserving and developing the coastal area, it is something that Russian administrators have to confront.

**Features of northern coastlines that make their management challenging**

- Their natural resources determine future socio-economic development;
- Their relatively low biodiversity makes the ecosystem vulnerable to human intervention;
- The need to preserve the cultural heritage of their native populations;
- The availability of traditional local knowledge;
- The historical lack of interest of local populations in solving coastal problems;
- The lack of government and legislative structures to direct coastal management;
- The often conflicting interests of numerous coastal users.

The White Sea is the only sea whose entire coastline belongs to Russia. Its 12th century Pomory population were the first people in Europe to apply a sustainable approach to the development of coastal resources. The White Sea has long been of geopolitical significance to Russia and is now a centre for industrial development, transport, fishing and mariculture, tourism and recreation, waste reclamation, as well as being a naval base. These activities all have an impact on the environment and often on each other. Planned developments also pose a potential threat to the environment and the local population. All these factors directed the choice of the White Sea – Barents Sea and specifically the Gulf of Kandalaksha as the area to use as a proving ground for integrated coastal management in the Russian context.

## 1.3 Sustainable coastal development in the White Sea – Barents Sea region, northern Russia project

The objective of the White Sea – Barents Sea project is to achieve sustainable coastal development in the Kandalaksha region through the creation of an integrated coastal management system, development of a scientific basis for management decisions, and involvement of local stakeholders in the decision-making process. The project also provides background information (ecological, social and economic) to stakeholders and administrators.

Other objectives are to:

- Analyse the socio-economic and ecological parameters of the region and estimate its natural resource potential;
- Analyse the attitude of the population to economic and ecological problems;
- Raise environmental awareness and understanding of integrated coastal management in the general population, business enterprises and decision-makers;
- Assess the ecological safety of current business and leisure activities in the region;
- Develop approaches for interaction among resource users so as to reduce and resolve conflicts, and establish dialogue between scientists and holders of traditional local knowledge.

A time line of the project is included as Annex 2. It shows the gradual growth and evolution of the project away from a purely scientific investigation of the region to studies intended to give a more complete understanding of how the history, climate, ecology, economic and social conditions in and around the Gulf of Kandalaksha interrelate. Understanding their relationship is an essential part of integrated coastal management.

The White Sea – Barents Sea project benefits from investigations conducted as part of various other projects:

- The 'Wise Coastal Practices for Sustainable Coastal Development in Europe' (WiCoP-Europe) project of the Inter-Universities Network of the United Nations Educational, Scientific and Cultural Organization (UNESCO) / University twinning and networking scheme (UNITWIN);
- The 'Optimization of relations between diverse natural resource-users in the Russian Federation coastal seas and an efficiency analysis of the country's marine activities' project of the sub-programme of the 'Investigation of the nature of the World Ocean' of the Federal Target programme 'World Ocean';
- 'The White Sea' project of the 'World Ocean' Foundation of Science and Technology Target Programme;
- 'The Baltic Floating University – Northern Component' programme of UNESCO and the Intergovernmental Oceanographic Commission (IOC).

## 1.4 Documenting the process

The lessons learnt in Kandalaksha need to be understood, discussed, published and disseminated so that the wise practices developed here are available to those interested in establishing integrated coastal management in other northern coastal regions.

This publication is addressed to Kandalaksha residents, stakeholders, industrialists, developers, conservationists, and local authorities. To these people it provides a 'blue print' of how a system of integrated coastal management has grown and developed in their region and how its continued evolution might be assured. This document is also addressed to people responsible for coastal management elsewhere. Although it gives the specific example of how integrated coastal management is developing in Kandalaksha, it also describes the tools, techniques and wise practices that have been developed over more than a decade to achieve and maintain such a system. These general principles may be applicable to other northern coastal regions seeking to develop integrated coastal management.

# 2 Kandalaksha region and its stakeholders

## 2.1 Geography

Fig. 4
Kandalaksha railway station.

Project activities have been carried out at the head of the Gulf of Kandalaksha, which administratively is in the Kandalaksha District of the Murmansk Oblast or Region. The Kandalaksha District covers approximately 14,400 km² and includes the cities of Kandalaksha and Zelenoborsky and twenty three other settlements (see map inside front cover).

Kandalaksha City is the second most important city, after Murmansk, on the Kola Peninsula and is a regional centre. It is one of the oldest settlements in northern Russia, but is now a typical industrial city with a well equipped modern port, a large aluminium factory that has been in operation since 1951 and a railway station that serves as a junction connecting Murmansk, Archangel and St Petersburg. The city lies in the Niva River valley, the natural boundary between the Khibiny Mountains of the Kola Peninsula and the marshy tundra of the Karelian coast.

The Gulf of Kandalaksha extends from the main basin of the White Sea to the north-west and is almost entirely within the Arctic Circle. Parts of the Gulf are more than 200 m deep, making it the deepest part of the White Sea. To the north of the Gulf there are bare, smooth glaciated mountains and forest, mostly pine, which reaches down to the sea. Tree cover is broken by narrow coastal meadows, tundra, bare rock and swamps. The trees, which are characteristic of warmer latitudes, survive because they are shielded from cold winds by the *Varaka* hills.

The coastline of the Gulf of Kandalaksha is highly indented by bights, bays and fjords. There are also numerous small, rocky islands or skerries. As a Pomory saying puts it 'Our White Sea – islands galore, lots of places to lean against'. There are freshwater lakes close to the coast. The largest, Kovdozero, covers an area of approximately 600 km² and is now a reservoir. The rivers Niva, Kanda, Kolvitsa and Luvenga flow into the Gulf. This rugged shoreline creates a wide variety of natural conditions and habitats, so although the study area is not very large it is varied.

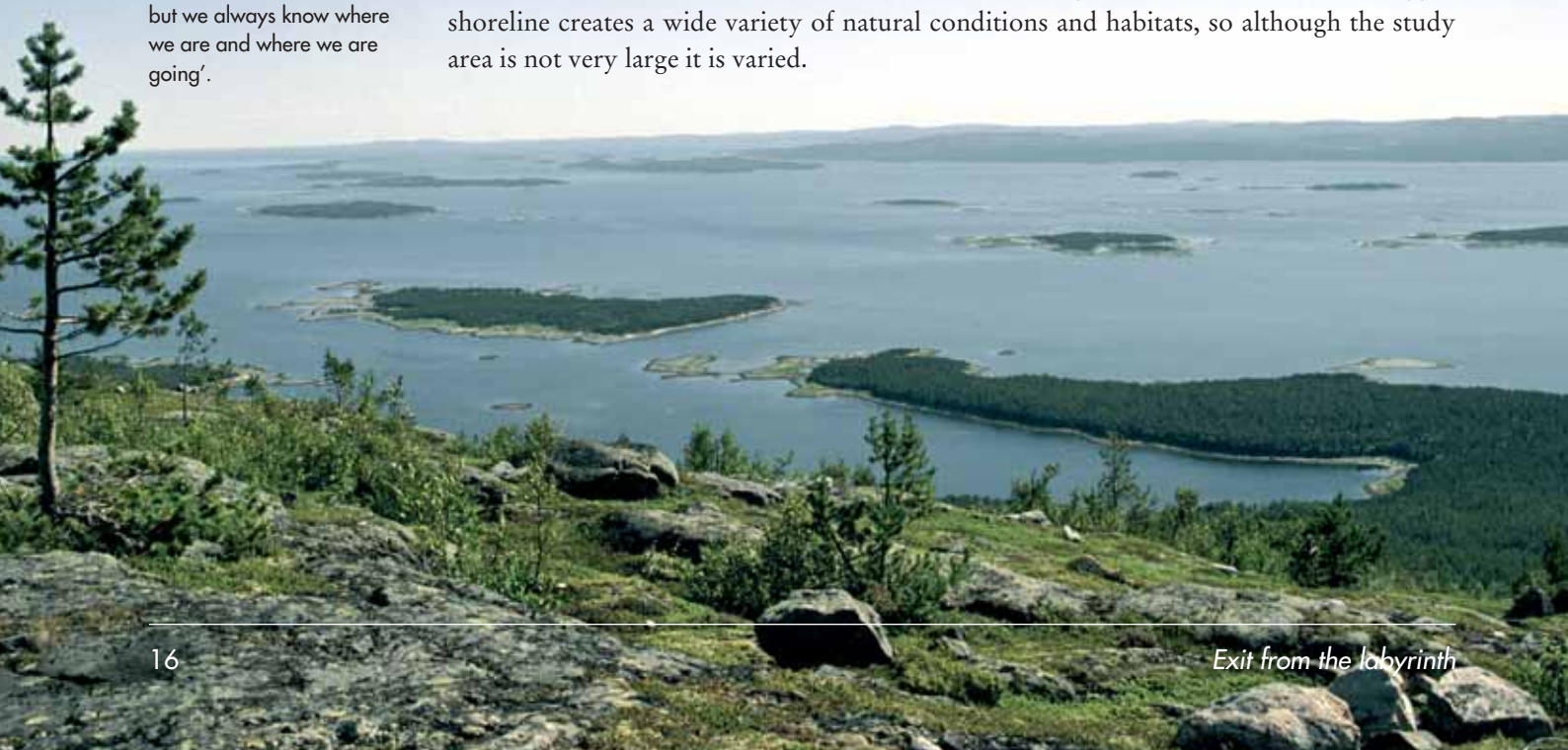


Fig. 5
Gulf of Kandalaksha, White Sea. Local seafarers say 'Each of our coasts is special; they live for themselves, but we always know where we are and where we are going'.

The coastal ecosystem is estuarine and used to have low biological diversity due to the limiting influence of the large freshwater input at the head of the Gulf, particularly during the spring thaw (Shilin *et al.*, 1998). Regulation of the River Niva has changed this, and the formerly low diversity estuarine ecosystem has become more diverse (see section 2.3, Unexpected benefits).

The Kandalaksha district has deposits of building materials, granite, mica, peat, apatite-nephelinic and rare-earth metal ores. Medicinal silt is mined on the coast of Palkin Bay.

Anthropogenic impact on the coastal ecosystems of the Gulf of Kandalaksha is marked. Of the 14.5 million $m^3$ of waste water discharged into the Gulf annually, 47% is insufficiently treated. Thus the Gulf receives 150 tonnes of organic waste, 160 tonnes of suspended matter, 1,600 tonnes of mineral waste and 2.8 tonnes of various metal ores each year. Waters in the upper parts of the Gulf are somewhat polluted with oil products. This has affected some seabirds and marine invertebrates. Specific problems associated with specific industries are discussed below.

## 2.2 Stakeholders

The Kandalaksha coast is an area of intense exploitation of natural resources. Industries include transport and port facilities, mining, generation of hydro-electricity, fish farming, fishing and forestry. It also has significant recreational potential for cultural, environmental and sport-based tourism. There is a children's holiday camp and health centre in Palkin Bay. The complex and sometimes antagonistic interactions among these industries and other stakeholders such as the local population and conservationists coupled with the rather complicated socio-economic management structure are typical of northern Russia. The complexity of these interactions makes Kandalaksha a noteworthy and challenging area in which to develop integrated coastal management.

The major stakeholders are described in more detail below.

Fig. 6
Kandalaksha commercial seaport.

**Kandalaksha commercial seaport**

The Kandalaksha commercial seaport is the largest state-owned port in Russia. Economics dictate that it should be expanded and re-built. Work, started in 2000, has the potential to harm the environment in the navigational channel. Measures to protect both the interests of the port and the environment add considerably to the costs of the project.

The port specializes in handling apatite concentrate that is mined locally. At the moment 15–20% of the freight handled is apatite, about 700,000 tonnes annually. Once reconstruction is complete, more than half of the freight will be apatite. Dredging work will increase the size of the ships that the port can accept from those with draughts of 9.8 m to those with draughts of 10.5 m (equivalent to a displacement of 30,000 tonnes). The White Sea and the Gulf of Kandalaksha are already badly contaminated by apatite ore.

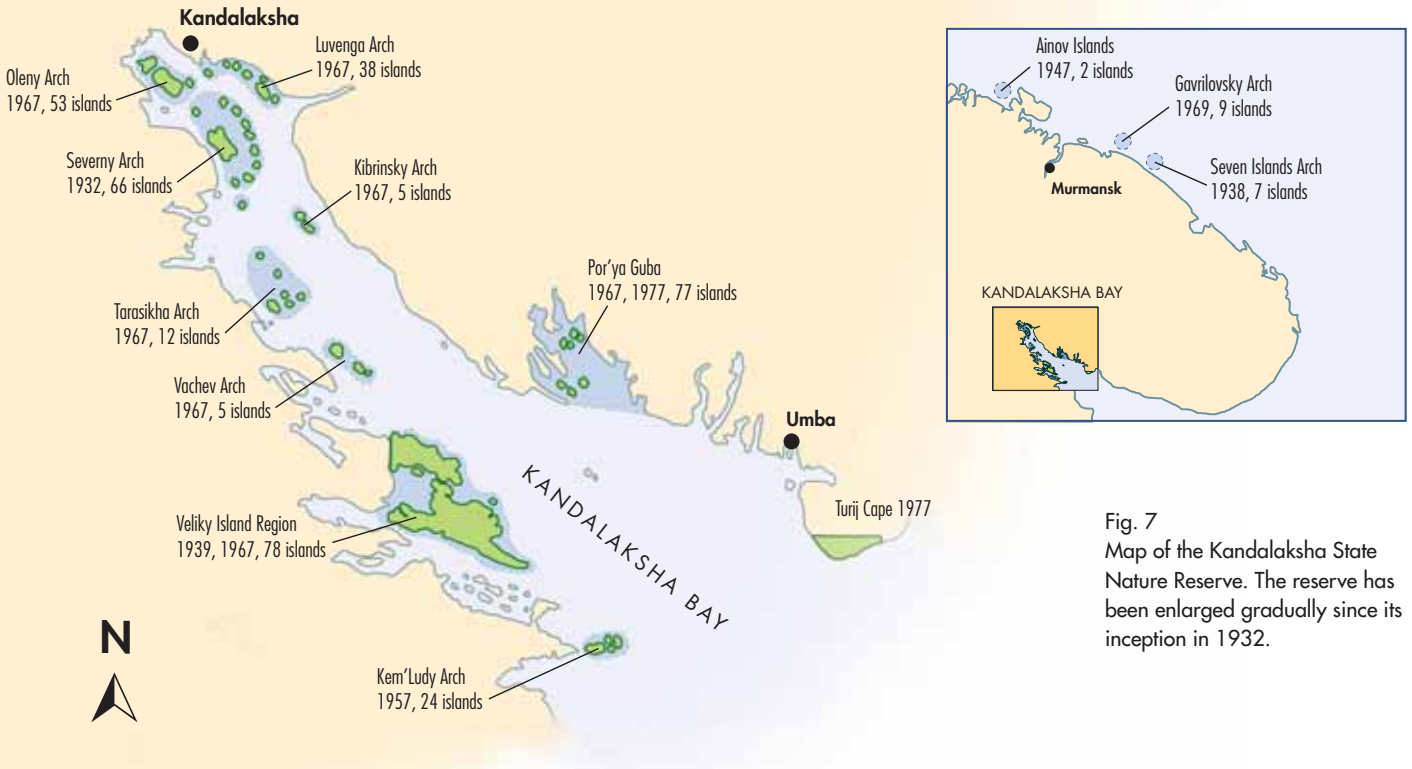



Fig. 7
Map of the Kandalaksha State Nature Reserve. The reserve has been enlarged gradually since its inception in 1932.

Fig. 8
The eider duck *Somateria mollissima* is the symbol of the Kandalaksha State Nature Reserve.

## Kandalaksha State Nature Reserve

The first section of the Kandalaksha State Nature Reserve was set aside in 1932 to protect nesting colonies of eider duck. The reserve was granted federal protection in 1939 and has been growing in size ever since. Today it covers 705 km², 70% of which is aquatic habitat. The reserve includes 350 islands in the Gulf of Kandalaksha and others off the Barents Sea coast of the Kola Peninsula. It offers protection to 32 species of land mammals, 10 species of sea mammals and 208 bird species. The Kandalaksha Gulf part of the reserve is inscribed on the Ramsar list of wetlands of international importance as a waterfowl habitat.

The principle objective of the reserve is the protection and study of the natural ecosystem of the islands and coastal areas of Kandalaksha. Scientific research has been carried out since the early 1930s. Data have been systematically published in *Annals of nature* since 1939, making this an important source of information on population dynamics and the state of the ecosystem.

### Box 1 Birds captured on camera

An employee of the Kandalaksha State Nature Reserve, Ryurik Gennadyevitch Chemyakin, displayed his wildlife photographs taken in the reserve at the Niva Town Cultural Centre. The subjects of the photographs are primarily birds: displaying, nesting, and caring for their young. The images highlight the instinct common to all creatures – the prolongation of the species.

Present at the opening of the exhibition on 16 October 2003 were N. A. Snigur, the director of the exhibition space, I. P. Tatarnikova, the director of the reserve's Department of Ecological Education, reserve employees, members of the mass-media, school children and project participants.

## Vitino seaport and the Belomorskaya oil terminal

The Vitino seaport is on the south-western Karelia coast of the Gulf of Kandalaksha on the narrow Ryashkov Salma Strait opposite the island of Oleny. A new fairway has been in operation since 1995 (Shilin *et al*., 1997) and has met all ecological safety criteria. The port is flushed by tidal currents so no stagnant water phenomena have been observed here.

The Belomorskaya oil terminal at the port offers storage and transhipment services for bulk oil cargoes such as petroleum, black oil and stabilized gas condensate en route to northern Europe. The two hectare site is capable of handling three tankers simultaneously. Handling of the petroleum products is fully automated and is controlled by a Russian-designed computer system. Stringent ecological criteria apply within the port, petroleum pollutants are inadmissible and the sewage treatment system is currently being rebuilt. A certifying commission conducts bi-annual technical check-ups of the petroleum facility.

The port is profitable despite the high cost of developing and maintaining non-polluting petroleum handling, transport and storage technologies. The proximity of various enterprises such as fish farms that are particularly vulnerable to petroleum pollution means that there is always some tension between the port and other users of the Gulf. This experience of maintaining a non-polluting port, demonstrating this fact to the satisfaction of other stakeholders and building trust for the future is unique in Russia.

Fig. 9
A super-tanker at the Belomorskaya oil terminal, Vitino seaport, summer 2001.

## Forestry and timber industry

The forests around the Gulf of Kandalaksha are predominantly coniferous: spruce and pine with some birch, aspen and other deciduous trees. Three companies work these forests: Kovda Timber Ltd., a joint-stock company; Arcticdrev, a public company; and a branch of the Karelian Timber-cutting Association. These companies have faced financial difficulties, but the significant forest reserves ensure that development is possible. Timber lost from floating rafts during transport is a feature of island and mainland shores in the Gulf of Kandalaksha. In some places it forms serious obstructions.

## Fish farming

***Knipovich Polar Institute of Marine Fisheries and Oceanography (PINRO) fish farm and Udarnik Ltd. fish farm***

The PINRO and Udarnik fish farms are in Palkin Bay. They rear the fast growing 'Kamloops' trout hybrid in cages in the bay. Annual production is 25–60 tonnes of fish. The facilities are profitable, and production could be raised to 100 tonnes per year.

Fig. 10 *(top)*
Cage aquaculture at the Kandalaksha fish farm makes use of warm, waste cooling water from the Kolskaya nuclear power plant.

Fig. 11 *(bottom)*
View of Palkin Bay : Aquaculture Kingdom.

Fig. 12
The Gandvik children's camp on a sea trip.

Fig. 13
Yu N. Ryzhankov, Director, Dr Sergey Lukyanov (RSHU) and Angelika Serdjuk (staff) at Gandvik.

One of the peculiarities of raising fish in the bay is that rather than growing faster in the summer when the water is at its warmest, the fish do better in autumn when warm surface waters are mixed with cooler deep waters by wind and storms (see section 4.1.2).

*Kandalaksha fish farm*

The Kandalaksha fish farm raises salmon commercially. It also helps to maintain caged trout production in Lake Imandra in the warm water discharged from the Kolskaya nuclear power plant. It is likely that this facility will, in the future, provide the fish farms in Palkin Bay with fry. One of the risks of operating the farm is the tendency for the local hydrological conditions to change with wind, tide and season (see section 4.1.2).

**Gandvik children's holiday camp**

The Gandvik children's holiday camp was established in the 1930s. It started as a health centre and later developed recreational facilities for the children of the Murmansk district to enjoy on holiday. It is in Palkin Bay, 1 km from Vitino port and the Belomorskaya oil terminal and 4 km from the settlement of Beloye More. The director, Yu. N. Ryzhankov, has recently overseen the restoration and re-equipment of the centre. It is now open all year round and can house 125 children and 50 staff. The centre's speciality is boat trips around the Kandalaksha archipelago. In summer 2003, 380 children from the Murmansk district came on holiday to Gandvik. Treatment with medicinal silt, extracted from Palkin Bay, will soon be available at the centre.

**Power stations**

In recent years electric power generation in Kandalaksha has been on the increase. There are hydro-electric power stations on the Nivsky and Kovdsky cascades and the Knyazhaya Guba. Industrial and domestic demands for electricity in the region are met by these power stations and by the Kolskaya nuclear power plant, which is inland on the Kola Peninsula; any surplus is transferred to Karelia, Finland or Norway.

**Aluminium factory**

The Kandalaksha aluminium plant has been in operation since 1951. It is powered by electricity from the local hydro-electric power stations and the Kolskaya nuclear power plant. In winter, when there is an anticyclone, an inversion layer sometimes forms over Kandalaksha and traps pollution. The aluminium factory is a major source of this pollution. Its effect is felt throughout the Gulf of Kandalaksha to the extent that vegetation on many islands has deteriorated. New installations to clean the air before it is released from the factory have resulted in annual reductions in the discharge from the plant, to the satisfaction of the local administration.

**Maripal company**

The Maripal company extracts active medicinal silt from the head of Palkin Bay. In July 1995 the bay was declared a 'first category sanitary zone' imposing strict environmental standards on other users of the bay to ensure that the silt meets pharmaceutical quality standards.

### Local population

The population of the Kandalaksha district is approximately 69,000, of whom 70% live in urban areas. Many are employed in the local industries, so although they might be concerned about their environment they depend on the continued viability of industry. Ultimately it is the local population who have most to gain from sustainable integrated coastal development.

## 2.3 Relationships between the stakeholders

The interactions between the various stakeholders in the Kandalaksha area are complicated.

| *Some interactions are beneficial:* | *Others interactions are detrimental:* |
|---|---|
| • the use of warm, waste water from the Kolskaya nuclear power plant by the Kandalaksha fish farm;<br>• the planned production of fry by the Kandalaksha fish farm to be raised by the Palkin Bay fish farms;<br>• the presence of a nature reserve close to the Gandvik camp;<br>• availability of local medicinal silt to the Gandvik camp;<br>• the Kandalaksha seaport that handles locally mined apatite;<br>• the aluminium factory that makes use of electricity generated by the local nuclear and hydro-electric power stations;<br>• RSHU students doing summer fieldwork use the PINRO Centre for Marine Environmental Studies;<br>• Mr Mitrofanov, Director General of the Vitino seaport and the Belomorskaya oil terminal gave five yachts to the Gandvik camp in 2003;<br>• oil terminal employees and their families are welcomed at the Gandvik centre for holidays. | • pollution of the waters of the Gulf of Kandalaksha by land-based activities and shipping;<br>• spilt ships' fuel accelerating sedimentation at the head of the Gulf; logs lost by the timber industry that clog the shores;<br>• eutrophication in the waters around the fish farms;<br>• widening the navigation channel to the Kandalaksha seaport, increasing its capacity to handle apatite concentrate, damaged the near-shore ecosystem of the Kandalaksha State Nature Reserve and the increased traffic will continue to affect the reserve. |

Fig. 14
Discussion of the ecological problems faced by the Kandalaksha State Nature Reserve, summer 2000.

There is also potential for conflict in the perceived dangers that one industry may pose to others. For example, the nature reserve, the Gandvik camp, the fish farms and the mining of medicinal silt in Palkin Bay are all vulnerable to pollution (wastes from ships, oil spills, untreated domestic and industrial waste water, nuclear contamination); the expansion of the Kandalaksha commercial seaport navigation channel may impact the local ecology.

Proving a direct impact is always difficult, so assuring others that problems that have not yet materialized have been anticipated, and that avoiding action has been taken and mitigation plans developed is problematic. Mechanisms that encourage communication and interaction among stakeholders and with local authorities will help to develop mutual understanding, lessen fears of harmful effects from other industries, build trust, and maybe lead to other possibilities for cross-industry aid and support. The development of integrated coastal management will help to bring this about.

## Box 2 Expensive neighbours

The presence of the Maripal medicinal silt extracting company in Palkin Bay has imposed considerable additional costs on its neighbours.

The Gandvik camp is required to prove that its activities do not pollute the environment or introduce harmful substances into the silt deposits. The results of chemical and bacteriological analysis of water near the camp must be sent to the regional administration several times a month. The camp does not discharge its waste water; instead it is stored in concrete containers and taken elsewhere for disposal.

Fig. 15
Vitino oil terminal.

Likewise the Belomorskaya oil terminal has had to contend with disposal of waste water. Two years and more than 300 million roubles have already been spent on up-dating its sewage plant and it is still not complete.

Recent work to straighten the navigation channel to the oil terminal benefited both the terminal (it can now accept larger tankers with capacities of up to 100,000 tonnes) and reassured its neighbours that the likelihood of accidents was reduced (the old channel wound its way around islands and shallows).

***Unexpected benefits***

The River Niva produces a quarter of the freshwater input to the Gulf. In 1937, it began to be regulated. In 1954, the Nivsky cascade (chain) of hydro-electric power plants further limited its runoff. Spring melt-water ceased to be the limiting factor on the distribution of marine organisms, and marine communities became established in the area. A ten-fold increase in the number of nesting birds that feed on small marine organisms was noted in the 1970s (Korjakin and Shkljarevich, 2001). In the 1980s and early 1990s, the highest density of eider duck broods was found here. Lugworms, *Arenicola marina*, are now dug as fishing bait, frozen and exported to countries with developed sport fishing such as Norway and Great Britain.

# 3 Cultural and historical background

## 3.1 Pre-Slavic period

Fig. 16
Nastja Ishenko-Jakonjuk, TV journalist, and Dr Michael Shilin, RSHU, at the Sami Labyrinth, summer 2001.

As the glaciers retreated the area around the Gulf of Kandalaksha was colonized by fir and pine trees, wolves, reindeer, elk, seals, walruses and polar bears. The first humans were the Sami. They hunted, fished, collected shellfish and traded. Signs of 36 settlements have been found at the head of the Gulf along the rivers Niva, Kanda and Kolvitsa dating from the 5th to the 2nd century B.C. The Sami named many of the topographical features of the Gulf (see Annex 1). The name of the Gulf derives from two Sami words: *kanda* meaning river or branch of a river; and *lakhta* meaning gulf. This early Sami population was sparse and their use of the forest, river and Gulf resources was sustainable. Their effect on the coastal ecosystem was insignificant.

## 3.2 Pomory culture

The Pomory are ethnic Russians from Novgorod who settled in the Kola Peninsula some eight centuries ago. The name Pomory derives from the Russian *pomorye* which means by the sea.

The population of Novgorod learned seamanship between the 9th and 12th centuries from the Varangians. They developed a marine-based economy in Lake Ladoga and Lake Onega. In the 10th and 11th centuries, people from Novgorod and Ladoga made reconnaissance trips to the land of the 'Lops and Samoyeds', as they called the indigenous peoples of the White Sea coast. By the end of the 11th century they had developed a trade in White Sea walrus tusk 'fish bone' with Tsargrad (later Constantinople).

The Russian incomers were able to establish themselves on the White Sea coast without provoking conflict with the local tribes because they, in the main, exploited marine resources, while the indigenous population still relied on coastal resources. Over the following three centuries, the two peoples integrated and began to form a distinctive culture of their own. In 1478, 'Lop Land' came under Moscow's rule, but it still maintained its Novgorod traditions and lifestyle.

Fig. 17
Typical Pomory village at the mouth of a river on the Gulf of Kandalaksha.

Fig. 18
The Church of St Nicholas, in the coastal village of Kovda, was built in 1705–1709. St Nicholas is the patron saint of seafarers.

Russian settlements, built in the Pomory wood cabin style, were founded at Kandalaksha, Kovda and Knyazhaya Guba in the 15th and 16th centuries. The first official mention of Kandalaksha is in the *Rostov annals* for 1526 which reports that 'Pomory and Lops from the Kandalaksha Bight of the River Niva arrived in Moscow to ask for their church to be blessed.' A monastery was built in Kandalaksha in 1554; it was demolished after the October Revolution of 1917. The population of Kandalaksha increased slowly. In 1563 there were 20 households, in 1782 there were 58.

The Pomory developed a way of life dependent on coastal resources. They used the forests for hunting and harvesting timber for houses and ship-building. They milled flour in a monastery-owned mill on the River Lupcha. They fished for salmon and herring in the White Sea and preserved them for export in salt extracted from sea water by boiling. They raised salmon in fisheries; the monastery ran eight fisheries, one on the River Luvenga, and there were another 16 in the Kandalaksha region run jointly by the monks and the local people. They harvested pearls from large river bivalves called pearl molluscs; a non-invasive way of determining whether a shell held a pearl ensured the continued well-being of the mollusc population. Pearls became part of the culture: they were given as wedding presents, they decorated icons, a husband's 'luckiness' or ability to provide for his family was gauged by his wife's pearl ornaments and embroideries.

Chronicles from this period testify to competition between the Pomory, the monastery and the state, for the Kandalaksha region and its resources; an indication that the region was prosperous (Alekseyev *et al.*, 2001). Unlike most of Russia, Kandalaksha was not invaded by the Mongol hordes in the mid-12th century. It was free to develop, prosper and trade in the following 250 years while most of Russia was under the Mongol yoke.

Maps of the White Sea first appeared in Europe in the 14th century. The early ones referred to the Gulf of Kandalaksha as the White Sea (*Lacus albus*), while the eastern part of the sea was called Gandvik. The Pomory traded raw and processed materials with Karelia, Finland, Sweden and Norway. Norway was their most important trading partner and a Norwegian-Russian trade-slang developed. In return for supplying the royal court in Moscow with salmon the Pomory were allowed to trade with England duty-free. Their key exports were marine mammal pelts and river pearls.

Religious and political influences have helped to make the Kandalaksha region prosperous. Serfdom has never existed in the region. Democracy, women's rights and stable family life all helped to establish a sound economy. Since the 16th century, the *pokrute* has been in use. This is a temporary employment contract that stipulates the rights and duties of both the worker and the employer. Church reform in the middle of the 17th century divided the Church; those who did not accept the reforms became known as 'old believers' and were forced to resettle in the borderlands of the Russian Empire. Old believers brought increased literacy to Kandalaksha. The Pomory created their own literature, songs and music. Written records of financial transactions were kept. Forward planning and mutual accountability began to be practiced.

A collective work of several generations of coastal dwellers, the *Book of marine routine*, records recommendations, practical advice and curious cases of coastal environmental management, what would now be called 'wise practices' (Shergin, 1984).

The book opens with a pentastich (a five line poem) that might serve as the epigraph to all the literature on integrated coastal management:

*This book is a manual for you here:*
*Remember your good ways,*
*The way to live by the sea*
*The wrath of God to fear*
*And don't be ridiculous!*

Another extract from the marine routine:

*The construction of a seafaring vessel, as to its hull or ribs, its backbone or keel, is governed by the nature of the ice-covered sea and its shallows.*

The Pomory developed a way of life that exploited coastal resources, but did not exceed the potential of the ecosystem to regenerate.

## 3.3 Increasing exploitation of coastal resources

The anthropogenic impact on the coastal area of the Gulf of Kandalaksha increased from the 17th century onwards as subsistence living gave way to increased commercialization and industrialization.

The numbers of marine animals decreased. The Pomory travelled further to hunt walrus, to the Murmansk coast of the Kola Peninsula and the islands of Spits Bergen and Novaya Zemlya. Uncontrolled hunting of eider ducks for their down reduced their numbers. The technique for detecting the presence of pearls in intact pearl molluscs was lost and the molluscs became rare. Herring fishing remained the principle way of making a living until the start of the First World War.

Ship-building and navigation developed. Navigation signs (*glyadni*), usually a cross or a cairn of stones indicating a safe fairway on entering a strait were set up. The second half of the 19th century, as in Europe and North America, saw the start of the industrial era. Steam-ships appeared and the bottom of bays and bights near anchorage sites became covered in coal clinker.

In the 1890s, two saw-mills were built in Kovda. One was owned by a Russian businessman the other by a Norwegian. A third, English-owned mill was built in 1901. Wastes from the mills covered the shores and sub-standard, reject timber clogged bays and inlets, sometimes even transforming islands into peninsulas.

With the outbreak of the First World War, all ports in the Baltic and Black Sea were closed to foreign trade. The need for alternatives was clear. The Kandalaksha seaport received its first ship the American steam vessel *Swerre* on 24 June 1915. The cargo was material to start the construction of the Murmansk railway, the *Murmanka* (see section 2.1).

The population remained sparse. Only 610 people lived in the Kandalaksha Volst or canton before the First World War.

## 3.4 Soviet period: change of priorities

Kandalaksha and its coastal area developed rapidly in the 1930s as work began on a chain of hydro-electric power stations on the River Niva. The Nivskaya power station made it possible to electrify the railway and develop new power-hungry industries. The first was the Integrated Chemical Works that treated apatite ore. It later diversified to produce goods for the trade fleet and coastal fishing plants and became the Experimental Machine-Building Factory.

This swift industrialization demanded manpower. The population was augmented by the forced migration of prisoners from Stalin's concentration camps. These migrants had limited rights of travel, so they remained in the Kandalaksha region. Industrial relations changed. The new workers, unlike the indigenous population, did not know the traditional work practices and lacked experience in exploiting local natural resources in a sustainable way. This increased anthropogenic load on the environment resulted in a sharp reduction in the numbers of eider duck; to such an extent that the Kandalaksha State Nature Reserve was established in 1932 to protect them (see section 2.2).

The Pomory were ordered to establish collectivized fish farms or artels that Stalin's administration named Seaman, The Red North, Communar, Beylomor (Russian for White Sea coastal dwellers) and Bezbozhnik (non-believer). They were subjected to various repressive measures. Independent businesses were closed. Gradually the villages emptied and the population of Kandalaksha became predominantly urban. In the 1930s and 1940s, tree felling replaced the use of marine resources as the principle industry in the region. In the 1960s, many Pomory villages had so few inhabitants that they were declared 'unpromising' and power, postal, telephone and telegraph services were cut off.

Fig. 19
Typical Pomory wooden house.

Kandalaksha's industrial infrastructure was not greatly affected by the 1940 Finland War or the 1941–1944 Great Patriotic War. Kandalaksha was not in the occupied zone.

More hydro-electric power stations were built after the war. In 1953, the Nivsky cascade was finished, and in 1955 the Knyazhegubskaya power station in Knyazhaya Guba was constructed. Two new settlements Zelenoborsky and Zarechensk were built to house the power station workers. These power stations helped to develop power-hungry, non-ferrous metal industries such as the large aluminium factory in Kandalaksha City.

Fish stocks in the Gulf of Kandalaksha and its tributary rivers fell. Harnessing rivers to generate power meant that salmon could no longer get to their spawning grounds. Hatcheries were built at Kandalaksha and Knyazhaya Guba to counteract this problem, however these are not salmon rivers and roe has to be imported. Local fish populations are not supported. Salmon spawning areas on untapped rivers also suffered as they became clogged with timber and tree bark, products of the timber industry.

In the 1970s, eelgrass, *Zostera marina*, a coastal marine weed, disappeared from the Gulf of Kandalaksha. The reason is unclear, but the effect has been a marked decline in the catch of White Sea herring as the eelgrass meadows were their spawning grounds.

Parts of the Gulf of Kandalaksha were closed to fishing and cargo vessels to provide anchorage and proving grounds for the navy.

Between 1960 and 1980 the Kandalaksha region became dependent on State aid. It had lost much of its fishing industry and the large scale industrial development was unable to support the increased population.

## 3.5 Transition period and beyond

1985 to 1995 was a period of change and instability in the Kandalaksha region and in Russia as a whole. The command economy, characteristic of the Soviet period, was gradually replaced by a market economy. It was a time of reflection, of searching for ways of achieving sustainable development.

Problems that had been hidden during the command economy period became apparent. The region was over populated and the population was concentrated in towns, leaving villages deserted. Traditional skills of husbandry of coastal resources had been lost. Instead there were many industries and economic activities that were not traditional or particularly suited to the region.

Fig. 20
Interior of the Pomory House Private Museum – a kitchen table with utensils.

The process of transforming the economy had both positive and negative aspects. Aboriginal culture was revived, small businesses were established, small private museums were set up and society became more democratic. There were other less welcome changes such as the growth of unemployment, crime, alcoholism and drug addiction (Kluikov, Korotkina and Lukyanov, 1998). Transportation costs rose such that it was not profitable to carry timber on the White Sea – Barents Sea Canal. Federal grants decreased or were abolished completely. It was unclear who, if anybody, owned the formally state controlled industries. The 'transition economy' was characterized by financial instability, high staff turnover and the exploitation of coastal resources for immediate profit without reference to long-term viability.

An upturn in the economy of the Kandalaksha region came with the discovery of the Shtokmanovskoe gas condensate field and the Prirazlomnoe oil field in the Barents Sea. Development of these reserves began in 1992 but full scale exploitation is yet to start. The economy and infrastructure of the whole of the Barents Sea coast developed to meet the needs of oil production, transport, storage and processing. In the Gulf of Kandalaksha, the Kandalaksha commercial seaport was opened to foreign ships in 1990; the navigation channel to the Belomorskaya oil terminal was deepened in 1995 and the terminal became fully automated; in 2000 modernization of the Kandalaksha Seaport started (see section 2.2).

Fig. 21
Super-tanker in the Kandalaksha skerries. In 1997, the first oil tanker with a 100,000 tonne cargo docked at the upgraded Belomorskaya oil terminal.

Economic stability and new found freedoms have resulted in a revival of interest in the past. A Pomory Association with Pavel Pavlovich Zhidkikh, a hereditary Kandalaksha Pomory, as its chairman is centred in Kandalaksha. The hope is to revitalize Pomory culture and restore the traditional way of life in coastal villages. Aspects of the Pomory lifestyle that relate to sustainable coastal resource-use and that might contribute to integrated coastal management are:

- a mixed economy that is sparing in its use of coastal resources;
- fairly uniform distribution of the anthropogenic load along the shore;
- seasonal working practices that allow resources to regenerate;
- use of fishing gear that spares small, young fish;
- traditional knowledge of fish breeding that might be applied to commercial species and large scale fish farms;
- the principle of mutual accountability among coastal stakeholders;
- stable families that raise their children to be respectful of the natural environment;
- openness to cultural contacts and willingness to form mutually beneficial relationships with other stakeholders in environmental management.

# 4 Ecological, social and economic setting

## 4.1 Ecology

Human activity has changed the ecology of the Gulf of Kandalaksha. Ironically, the regulation of the River Niva (see section 2.3, Unexpected benefits) has increased the biodiversity of the Gulf and counteracted some of the negative effects of industrialization (see sections 3.3 and 3.4) and post-industrial development (see section 3.5). However, positive benefit achieved by happy accident is not an ideal management system.

Development is sustainable if it results in profitable industries, an improvement in living standards and preservation of cultural heritage without harming the environment or exhausting natural resources (UN, 1992). Planning for sustainable development within a system of integrated coastal management means that ecological, social and economic factors need to be taken into account. The project started to study and record these factors at its inception in 1992 (see Annex 2).

### 4.1.1 Meteorological conditions

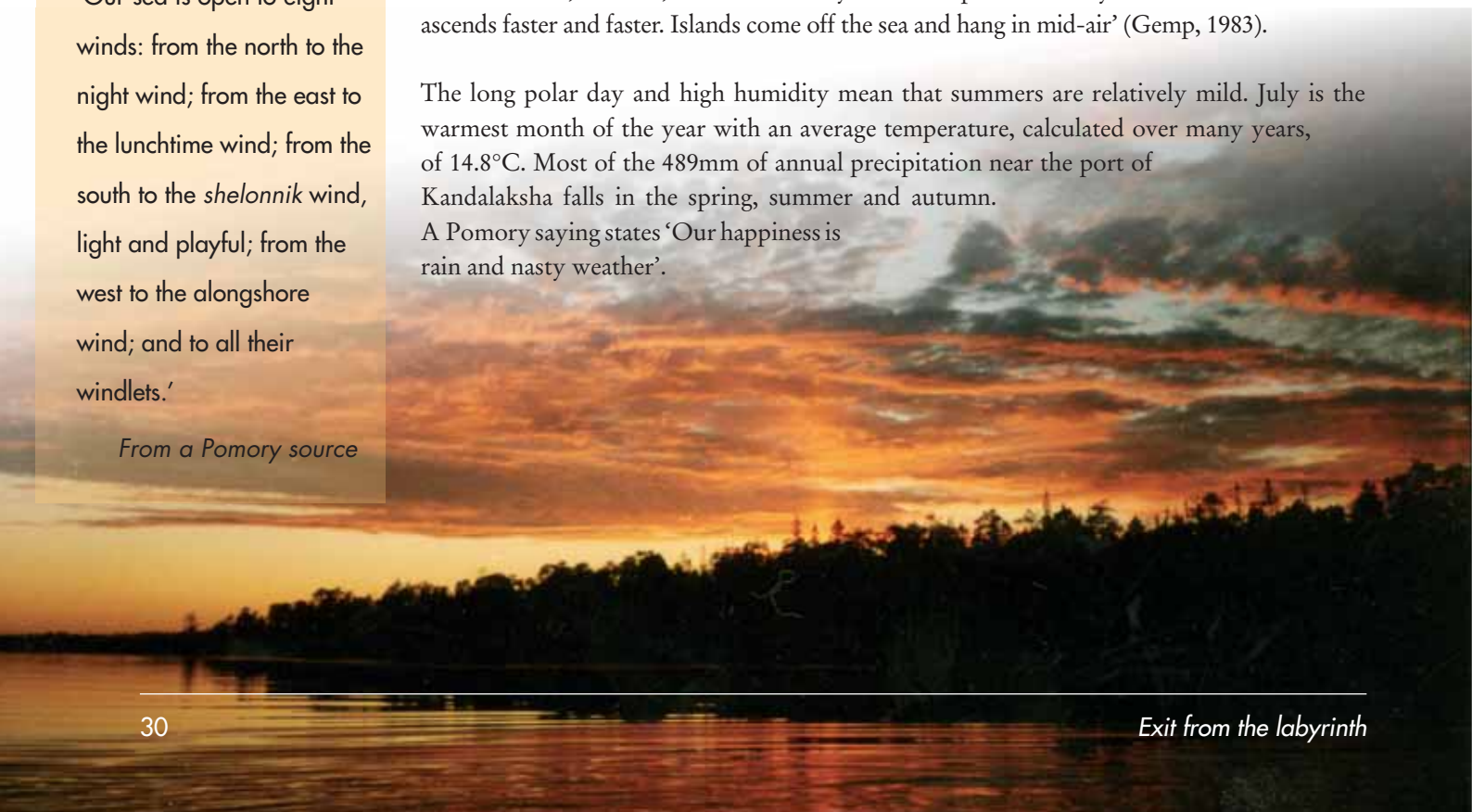
Weather conditions in the Gulf of Kandalaksha are governed by its latitude, its openness to the White Sea and the effect of the Kola Peninsula. A meteorological station in Kandalaksha records conditions at the seaport.

The Gulf of Kandalaksha lies almost entirely within the Arctic Circle. In June the sun does not set and in December it does not rise. The White Sea Mirage is a polar day phenomenon. Ksenia Gemp describes it thus: 'On summer *mezhennik* days, the sea is calm and smooth. The horizon starts to shiver, oscillate, break and slowly the lower part of the sky is covered in a haze that ascends faster and faster. Islands come off the sea and hang in mid-air' (Gemp, 1983).

'Our sea is open to eight winds: from the north to the night wind; from the east to the lunchtime wind; from the south to the *shelonnik* wind, light and playful; from the west to the alongshore wind; and to all their windlets.'

*From a Pomory source*

The long polar day and high humidity mean that summers are relatively mild. July is the warmest month of the year with an average temperature, calculated over many years, of 14.8°C. Most of the 489mm of annual precipitation near the port of Kandalaksha falls in the spring, summer and autumn. A Pomory saying states 'Our happiness is rain and nasty weather'.



The winter in Kandalaksha is severe. Strong winds come down from the , which according to the Federal Hydrometeorological Centre, is the windiest place in Russia. The White Sea does not benefit from the mitigating effects of the Gulf Stream and is noted for its harsh winter conditions. The Gulf of Kandalaksha is ice-covered for more than six months a year. So the Kandalaksha seaport, unlike Murmansk to the north, freezes in the winter. February is the coldest month; its average temperature is –12.1°C.

## 4.1.2 Hydrological conditions

Hydrological conditions at the head of the Gulf of Kandalaksha to Palkin Bay are studied annually by staff and students from the RSHU and PINRO during their summer expeditions (Lukyanov *et al*., 1997; Kluikov *et al*., 2000) (see Box 3, Summer fieldwork).

Tides in the Gulf of Kandalaksha are semi-diurnal. The average sea-level in the port of Kandalaksha is 1.25m above lowest low water (–0.4m in the Baltic system of sea-level heights). Waters from the Lupcha and Niva Rivers flow into the head of the Gulf and form a strong, permanent current in the surface waters close to the port, flowing south and then turning south-east at Voronya Bight. In narrows between islands, this current flows at up to 1 knot on the surface, but attenuates quickly with depth; at 5–10m there is a compensatory counter-current. The islands and the highly indented coastline of the Gulf reflect waves. Interference between these reflected waves results in standing waves or clapotis in some places, an uncomfortable sea condition in a small boat.

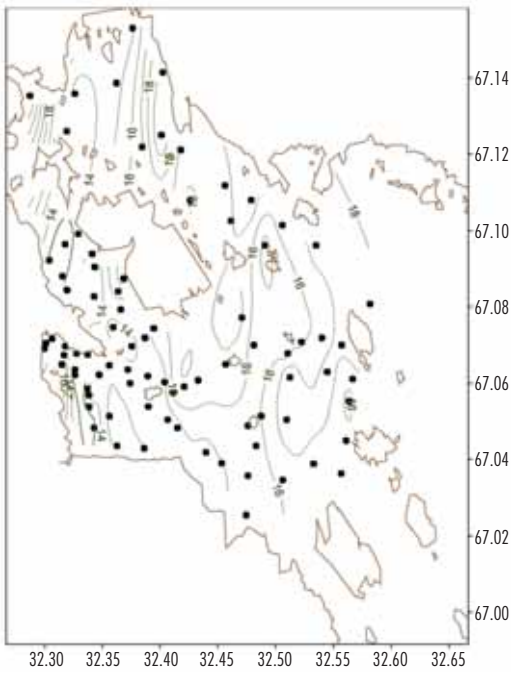
A key feature of the hydrology of the head waters of the Gulf during the summer is a region of rapid increase in water density with depth – a pycnocline. This is caused by spring melt water and summer rain water in the surface waters of the Gulf and the warming of these upper layers throughout the several months of polar day. The exact position of the pycnocline is variable depending on the tide and wind-driven up-welling and down-welling phenomena. It determines the distribution of basic hydrological and some hydrochemical parameters and is a limiting, abiotic factor for the aquatic coastal ecosystem.

The salinity of the waters of the Gulf of Kandalaksha is largely determined by freshwater runoff. The surface water layer, above the pycnocline (2–5m deep), has salinity values of 3–15‰ in the summer. At depths of 10m, below the pycnocline, salinity remains constant throughout the year at 22–26‰ (cf. seawater salinity of 30–40‰).

Water temperature in the port of Kandalaksha shows considerable seasonal variation: water surface temperature in winter is –1 to –1.5°C,

Fig. 22 *(top)*
Water surface salinity (‰), Gulf of Kandalaksha, typical summer distribution.

Fig. 23 *(bottom)*
Water surface temperature (°C), Gulf of Kandalaksha, typical summer distribution.



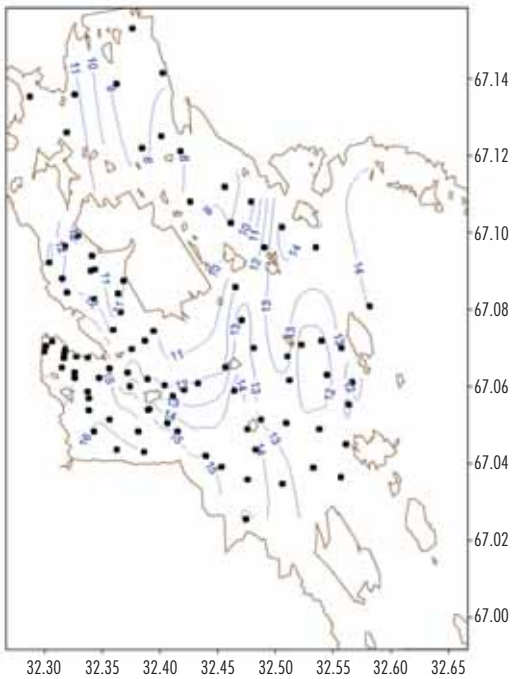



Fig. 24 *(top)*
Measuring the wind speed with an anemometer.

Fig. 25 *(bottom)*
Performing routine oceanological research.

## Box 3 Summer fieldwork

Students and staff from the RSHU have conducted fieldwork in the Gulf of Kandalaksha every summer since 1990. Each year about twenty students investigate the hydrological, hydrochemical, meteorological, ecological and socio-economic conditions in the Kandalaksha region. During the polar day, work continues 24 hours a day with staff and students working together in shifts. The students apply academic principles to complex natural and socio-anthropogenic processes, and participate in solving specific socio-economic problems as members of multi-disciplinary teams with their teachers. This develops their practical and communication skills as they prepare reports and discuss the results of their studies with specialists and end-users.

| | |
|---|---|
| 1990–1996 | Study of the hydrophysical characteristics (temperature, salinity, position of the thermocline, halocline and pycnocline) and hydrochemical parameters (dissolved oxygen, pH, mineral and biogenic content) in the Gulf of Kandalaksha. |
| 1996–2002 | Study of the biotic and abiotic factors which influence the ecosystems of the Gulf of Kandalaksha (mostly Palkin Bay). This study made it possible to track changes in the coastal ecosystem due to natural variability and human activity. (Kluikov *et al.*, 2000) |
| 1998–2003 | Examination of the social and economic situation on the coast of the Gulf of Kandalaksha. |
| 2000–2003 | Ecological assessment of the small coastal islands of Ryashkov, Lodeiny, Oleny and others. |

in summer (early August) it can reach 18.5°C. The steep vertical salinity gradient in the Gulf in summer hinders mixing of the water column and results in a thermocline. Deep water retains its winter temperature of 2–3°C, even dropping some years to –1°C.

Particular areas in the Gulf of Kandalaksha experience micro-hydrological conditions. The head of the Gulf has freshwater input from the Niva, Kanda, Luvenga and Kolvitsa rivers and other streams. This results in zones with different hydrological characteristics: one at the surface, close to the shore; and a second benthic one that separates brackish water from the more saline waters of the open Gulf. The boundaries of these zones move due to set-down and set-up phenomena: a few kilometres in the horizontal plane and some tens of metres along the vertical plane. There is also up-welling at the head of the Gulf influencing the thermocline and halocline such that they almost reach the surface. Horizontal temperature gradients of 1.5°C/km and salinity gradients of 1.5‰/km may be observed.

Water surface temperature in Palkin Bay is 2–3°C lower than in the centre of the Gulf. Cold benthic waters enter the bay as the tide rises and as the bay is shallow the entire water column mixes, particularly during autumn storms.

Hydrochemical properties of the water at the head of the Gulf of Kandalaksha recorded by RSHU students during their summer field work are included as Annex 3.

Fig. 26
Chief chemist, Olga Khaimina, on R/V *Dreyf*.

## 4.2 Sociological characteristics

The coastal region has great potential for development of its natural resources, but exploitation is not always conducted in a rational way. Surveys were initiated in 1999 in the expectation that understanding the demography and social dynamics of the population around the Gulf of Kandalaksha would help in determining how to plan for future, rational development. The social characteristics (age distribution, employment), perceived problems and satisfaction with various indicators of quality of life of the population were investigated (Kluikov, Korotkina and Lukyanov, 1998; Kelasjev *et al*., 2000). The surveys were conducted in the villages of Beloye More, Luvenga and Zelenoborsk and in Kandalaksha City. In total 429 people – 143 men and 286 women – were interviewed during the three year-long surveys.

Figure 27 shows the age distribution of the people surveyed. The large percentage of interviewees in the 40 to 50 age bracket reflects the influx of young people looking for work in industry in the 1970s and 1980s. The lack of young people in the sample may be a result of the failure of state industries, the lack of job opportunities and economic emigration (Kluikov *et al*., 1999; see also section 3.4). It might also be explained by the lack of universities and other higher-education possibilities in the area. Kandalaksha has branches of educational institutes from Moscow and St Petersburg for teaching accountancy, economics and law, but otherwise

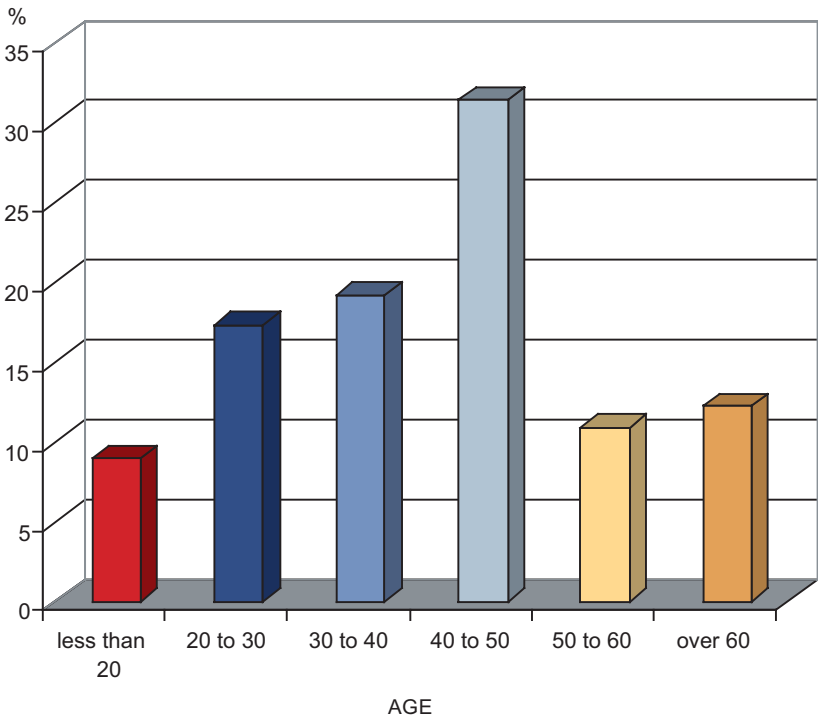



Fig. 27
Age distribution of the people surveyed.

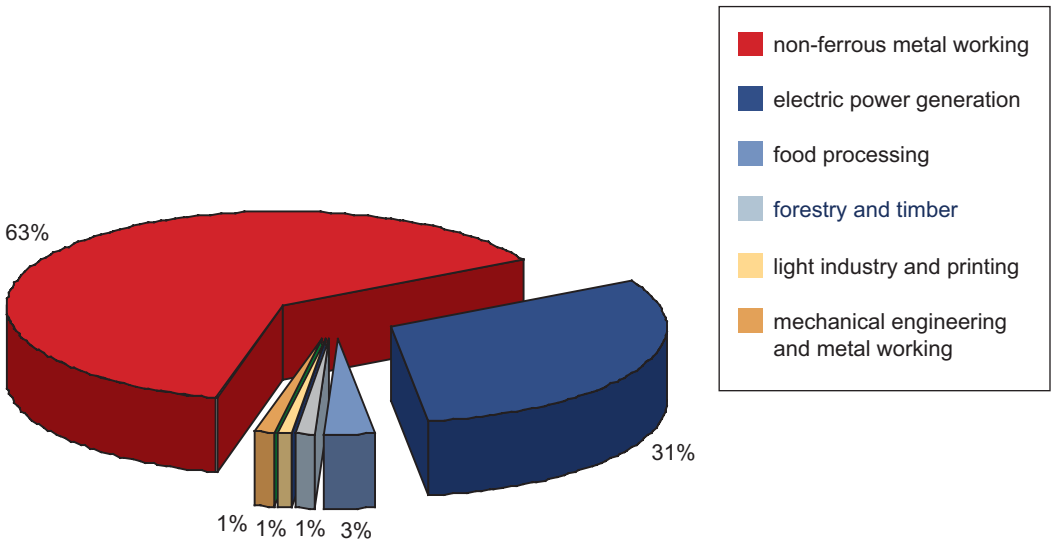
young people have to go to Murmansk, St Petersburg, Petrozavodsk or further to continue their education to the tertiary level. It is likely that once they have left they may never return. A fall in birth rate is apparently due to deliberate family planning.

A slight overall fall in the urban population reflects the economic changes that have taken place in the last 20 years. Large State-run industries have given way to a more diversified market economy and people have moved from old industrial centres back to villages abandoned during the Soviet era (see sections 3.4 and 3.5).

The concerns of the residents of Kandalaksha are shown in figure 29. Unemployment remained of primary importance throughout the three year survey period followed by alcoholism and poverty. These are inter-related problems. Other problems cited included public transport, delayed payment of wages, pensions, the local administration, the cleanliness of streets and the need for drug and alcohol awareness classes for children and teenagers. People were primarily concerned with providing the basic necessities of life, so it is natural that, for them, ecological problems receded into the background, particularly when the majority of the jobs available are in polluting industries (see figure 28). When questioned directly about pollution, most people agreed that it is a problem and everyone identified domestic waste and the seaport as major polluters. Kandalaksha is an industrial centre with a dense population and various industries that are detrimental to the environment (see section 2.2, Kandalaksha commercial seaport, and Aluminium factory).

Figure 30 illustrates the average per capita monthly income in the villages of Beloye More, Luvenga and Zelenoborsk. The average income across Russia in 1999 was 3,600 roubles per person per month; so more than 97% of the population of these small settlements in the Kandalaksha district have below average incomes. These income levels correlate with the dissatisfaction expressed on the levels of prosperity experienced by the survey participants (see figure 31). If the dissatisfaction with the education system is indicative of real problems, this means that poverty is likely to be a continuing problem for the next generation, as education and prosperity are usually closely linked. It is to be hoped that the relatively high degree of satisfaction with the state of the environment does not result in complacency and that the population can be mobilized to take their part in an integrated coastal management system. The pattern of content and discontent with the various quality of life indicators can be extrapolated to most settlements on the Kandalaksha coast of the White Sea.

Fig. 28
Distribution of employment among the various industries in the Kandalaksha area.



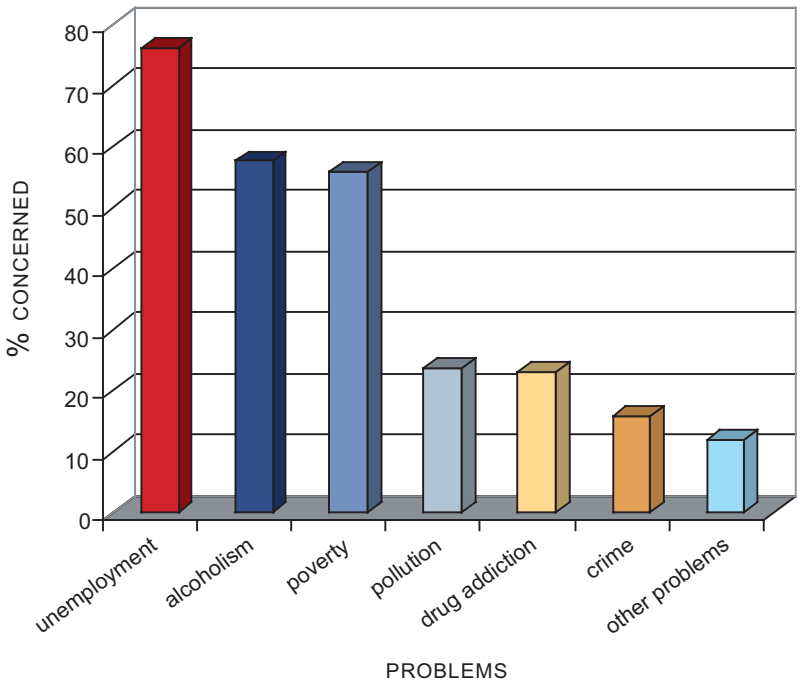



Fig. 29
Relative importance of various social problems according to the residents of the district of Kandalaksha, 1999–2000.

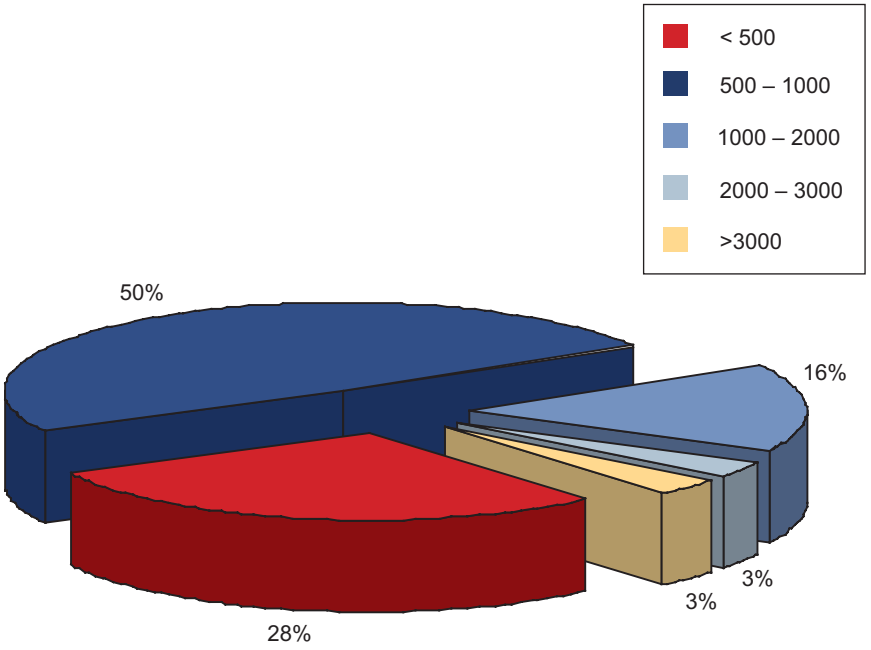



Fig. 30
Percentage of the population with various levels of monthly income (in roubles per capita), in 1999, in small settlements in the Kandalaksha district.

During the lifetime of the survey (3 years, 1999–2001), people's responses and attitudes changed. Initially their responses were based on direct personal wants and needs: stable employment, higher wages, higher standards of living, stable political situation, replacement of top executives. By 2001, they were thinking more broadly and were generally in favour of industrial development and tourism. In 2002, 24% of the population were calling for a new political administration. The role of industry as an employer and its potential for expansion was clear to 41% of the population.

Responses to the surveys show that the population in general does not believe it can influence development in the region. Social structures that allow people to unite to express their political opinions are lacking. Trade Unions supply this need in some of the large

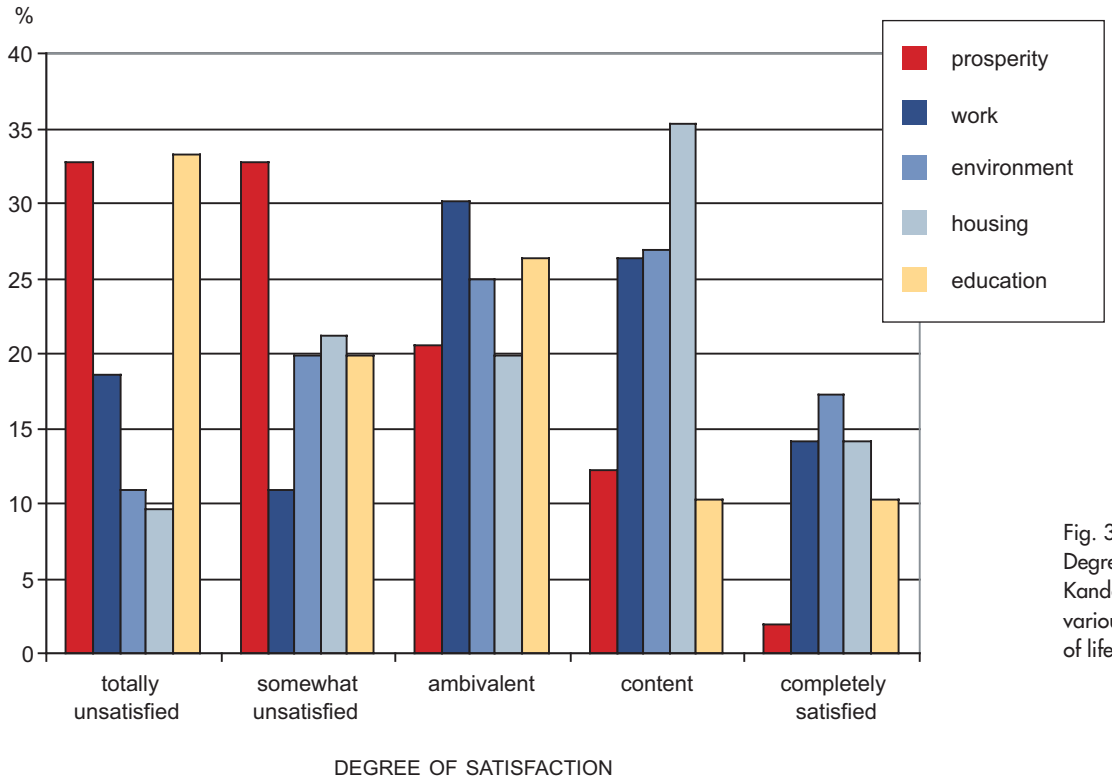



Fig. 31
Degree of satisfaction of Kandalaksha residents with various indicators of quality of life.

industries (aluminium plant, seaport, railway, hydro-electric power stations, timber), but their influence is city-based and only extends as far as direct employees. Some young people are discontented because of problems with cultural and entertainment facilities for their age group. A regional youth organization, the 'New Generation', has started four youth orientated projects: an 'International Ecological Camp'; 'Children to Children'; a pupil-teacher discussion forum; and a 'Youth Town Council'. It has no influence on regional authorities, but it may provide a platform for initiating political movement in the future. Businessmen are the most politically influential group. They have already tried to affect Russian Federation law on taxation at the regional level by lobbying deputies of the Regional Duma. An 'Association of Businessmen' is likely to be established to defend corporate interests. The regional branch of the Nature Protection Society is one of the few organizations that brings together different professions. This society and others, such as the Ecological Area Study Centre (youth branch), the Russian-Swedish organization 'Creativity and Self-Education', the Kandalaksha State Nature Reserve, the Committee for Natural Resources, forest farms, the Sanitary and Epidemiological Control, and the Fishery Inspection Service, have been able to influence the local town authorities in matters relating to environmental conditions and protection of the environment.

The Kandalaksha region is relatively well served as far as information services are concerned. The city has several newspapers; the most popular are *The Niva* and *The Evening Kandalaksha*. The road and rail networks allow for efficient delivery of newspapers and periodicals throughout the district. Almost the entire district is able to receive signals from the six leading Russian television companies. An Internet service will soon be available in Kandalaksha. This means that any debate relating to environmental issues or integrated coastal management is open to anyone in the district who reads a newspaper, watches television or connects to the Internet.

The problem of sustainable development and integrated coastal management is predominantly a management problem. One of the problems in Kandalaksha is the 'distance' between individuals concerned with their own lives and difficulties, and the local authorities and other stakeholders. Ecological problems are best dealt with in an open manner. Ways of involving a population that has felt excluded from development decisions are needed. These will include the promotion of self-organization within the population; development of the skills necessary for participation in the decision-making process; involvement in decision-making; and strengthening of local identity so that residents feel responsible for their land.

## 4.3 Economic situation

Production in the Kandalaksha region accounts for about 5% of the output of the Murmansk Oblast. The area has a market economy, but Soviet era economics are still apparent in the lack of diversity of its industry (see figure 28). Of its industrial output, 94% is generated by only two industries: non-ferrous metallurgy and electric power generation. Along with the railway these industries provide 40% of the region's profits. This narrow specialization has resulted in a considerable imbalance in the economy (Kononenko, 2000).

The Centre for Development and Support of Business and a branch of the Northern Chamber of Commerce and Industry have been operating in Kandalaksha since 1999 offering support to small- and medium-sized businesses and so encouraging industrial diversification. In the long-term, the City Administration plans to encourage tourism and small businesses that make use of local natural resources, such as processing wild berries, production of facing stone, production of raw materials for the manufacture of ceramics.

The Pomory used to say 'The sea is our field'. Sadly this is no longer true of the Gulf of Kandalaksha. There is a programme to revive coastal fishing which would represent a return to an old, sustainable way of life (see section 3.2). However, a number of problems need to be overcome: allocation of coastal and fishing areas (given the presence of the Kandalaksha State Nature Reserve); finance and construction of port facilities (Kovda Village is under consideration for this, Alekseyev *et al*., 2001); purchase of vessels and equipment; and a study of the legal aspects.

Fig. 32
Brown algae *Laminaria* being hauled onboard the research vessel.

The only natural resources that are fully used in Kandalaksha today are the water resources used to generate electric power. Others remain untapped or are not fully exploited. Mariculture could be expanded from the current salmon and trout production to include the brown algae *Laminaria*, mussels and other shell-fish. Sport-fishing could also be profitably expanded as could the extraction of medicinal silt in Palkin Bay.

If diversification and expansion of the industrial base in Kandalaksha is to prove profitable and sustainable in the long-term, considerable thought will need to go into determining a policy of integrated management. This policy will need to take into account ecological, social and economic factors as they are clearly interdependent. Effective coastal management requires the understanding and active involvement of the whole population; it is not a system that can be imposed.

# 5 Decision-making tools

Previous chapters described the ecological, social and economic setting, the industries and other stakeholders in the Kandalaksha district, their interactions and some of the benefits and problems that they bring to the region. All these groups and systems impact on each other to a greater or lesser extent.

Impact matrices and conflict matrices are tools that indicate cause and effect in a complex system such as the Kandalaksha district. They make it possible to quantify the impact of individual parameters, such as one industry, on the others and allow comparison of alternative development routes. Such tools provide a simple way for a group of people (the stakeholders of Kandalaksha) to compare a large number of options and reduce them to a few choices. So decision-making is simplified (while still including many variables), while involving all the interested parties and consensus is more likely to be reached. Results from the project field studies and surveys (cultural, historical, ecological, social and economic factors) were used to construct impact and interaction matrices.

## 5.1 Resource-user impact matrix

Table 1 is an impact matrix illustrating the effect of various resources on the economy, society and environment of Kandalaksha. The numerator indicates the degree to which a particular resource influences these matters (on a scale of 1 to 10, with 1 having little effect and 10 having a great effect). The denominator indicates the importance of the resource within the integrated coastal management system as a whole (on a scale of 1 to 10, with 1 being unimportant and 10 very important).

The matrix shows that the most significant resources in determining the socio-economic development of the region are transport and mineral resources (apatite and oil). They drive the industrial sector and in turn positively influence the development of coastal infrastructure, commerce, trade and the general welfare of the population. Coastal bio-resources are not of great economic significance except to the fishing industry, but they do have an

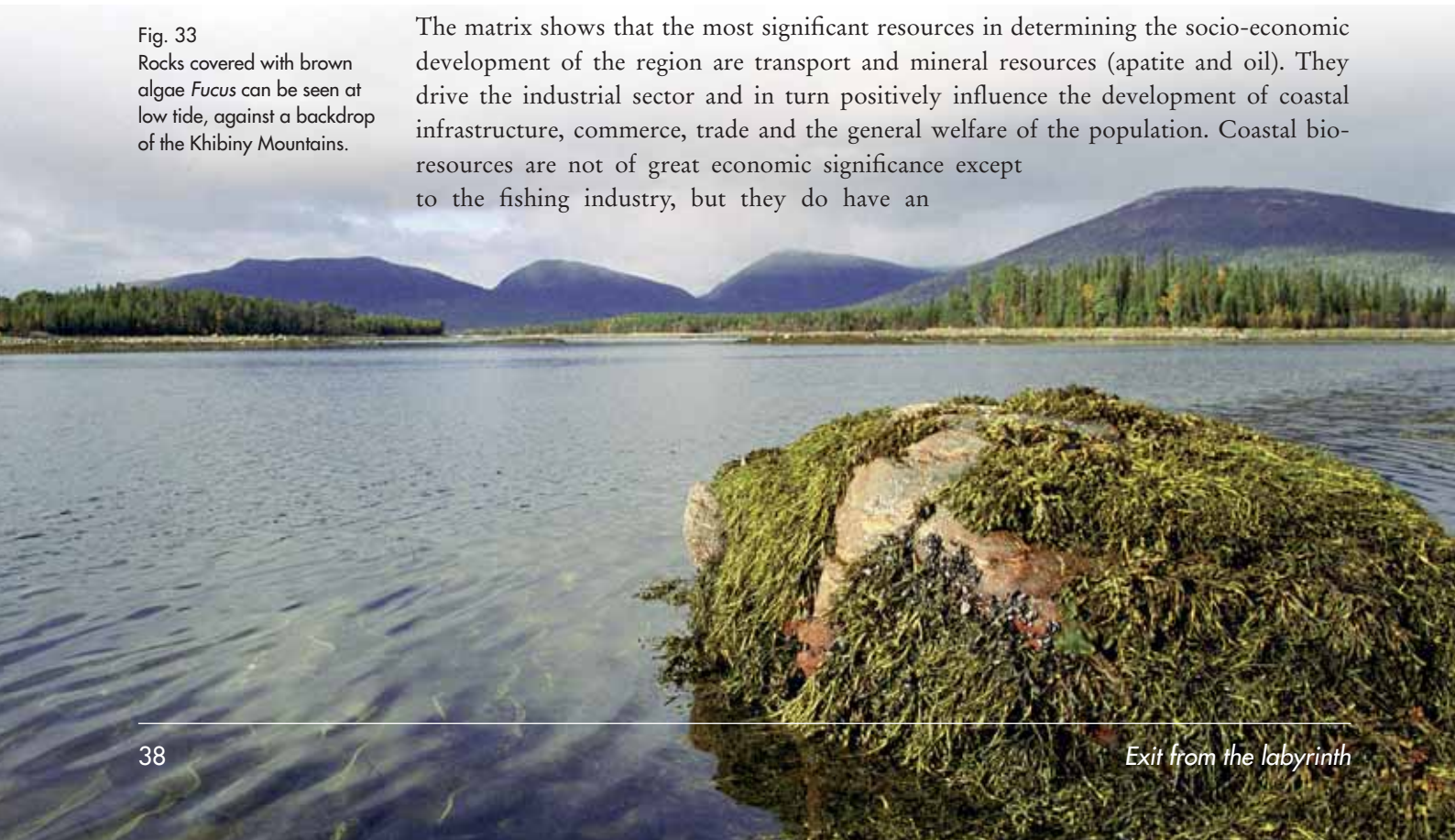


Fig. 33
Rocks covered with brown algae *Fucus* can be seen at low tide, against a backdrop of the Khibiny Mountains.

**Table 1** **Impact matrix to show the effect of various resources on the economy, society and environment of Kandalaksha**

| Resource | Impact on the economy | | | | | Impact on society | | Impact on the environment | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Industry | Coastal fishery | Transport (incl. shipping) | Tourism | Commerce and trade | Well-being of population | Development of coastal infrastructure | Natural background | Coastal ecosystem | Marine ecosystem | General pollution level (land, sea, air) |
| Transport | 9/9 | 4/5 | 9/9 | 3/5 | 7/8 | 4/9 | 9/9 | 3/5 | 3/5 | 4/6 | 6/6 |
| Cultural heritage and education level | 3/5 | 7/9 | 3/5 | 8/9 | 5/7 | 3/7 | 3/5 | 3/6 | 2/8 | 2/5 | 2/5 |
| Recreational potential | 2/6 | 5/9 | 3/6 | 10/10 | 5/7 | 3/5 | 4/6 | 3/5 | 3/8 | 2/6 | 3/7 |
| Coastal bio-resources | 3/5 | 9/9 | 2/5 | 6/7 | 4/7 | 3/7 | 5/7 | 2/5 | 3/4 | 7/9 | 4/7 |
| Mineral resources | 8/8 | 3/7 | 8/8 | 2/7 | 7/7 | 8/8 | 7/8 | 5/7 | 3/7 | 7/9 | 6/8 |
| Defence potential | 3/7 | 3/4 | 6/7 | 4/4 | 3/3 | 3/3 | 4/6 | 2/6 | 3/5 | 3/5 | 3/8 |

## Box 4 Example analysis of the resource-use impact matrix

The influence of 'cultural heritage and education level' on 'pollution level' in Table 1 is characterized by a ratio of 2/5. This is a measure of the degree to which the intellectual resources of the population are likely to affect the environment; specifically pollution. The sociological surveys (see section 4.2) indicate that the population of Kandalaksha is not well informed on environmental issues, does not participate much in solving coastal area problems, lacks information on the potential of integrated coastal management and as a consequence does not understand its own role in integrated management. This is why the current affect of educational levels on pollution was rated as 2; a weak influence. The potential significance of education levels on pollution was estimated as 5. This indicates that although intellectual potential is not the only factor determining pollution levels, it is important and should be developed as far as possible. Other local factors that contribute to pollution are industry and urban growth (development of infrastructure, refuse and waste-water). Yet other factors are beyond the control of municipal level management, such as the Kandalaksha Seaport and the navy which are administered at federal level. As local integrated coastal management systems cannot influence these activities, the effect of educating the public is limited.

important social influence in coastal communities that are trying to re-establish themselves by reviving coastal fishing and developing fish farms (Alekseyev *et al*., 2001; Shilin, 2001). Cultural heritage and education can potentially promote development in tourism and trade which in turn benefit the population in terms of employment and the material welfare of coastal residents.

The economy of the Kandalaksha district is based on its mineral and biological resources. Their use greatly influences marine and coastal ecosystems and overall pollution levels. So industries that are potential polluters come into conflict with businesses and activities that rely on marine and coastal bio-resources and the recreational potential of the area (see section 2.3).

## 5.2 Interaction/conflict matrix

Table 2 is an example of an interaction or conflict matrix. Column β lists the industries and activities that take place in Kandalaksha; row α restates them so that their interactions can be noted. Interactions between industries and activities are designated as follows:

+2 interaction is mutually positive
–2 interaction is mutually negative
+1 the activities of β benefit α
–1 the activities of β are detrimental to α
0 no direct interaction

Thus the matrix highlights interactions between different industries and activities and to the extent that detrimental interactions are made clear it is a conflict matrix.

The sum of the line for each activity $(P_1)_i$ characterizes the influence of that activity on others. If the sum is positive, the interests of the particular activity or industry coincides with those of the majority of other users. A negative indicates a conflict of interest. It should be noted that the matrix does not tell the whole story. For example recreational activities have a negative effect on many industries, but individuals benefit greatly from their hobbies, and tourists bring money and trade to the region. If the positive and negative effects even out, an industry is considered to be in a 'balanced conflict' with its neighbours.

The sum of the column for each activity $(P_2)_i$ characterizes the influence that all the other industries and activities have on one particular activity.

$$P_i = (P_1)_i - (P_2)_i$$

$P_i$ is the 'activity parameter' of a particular activity within the whole system; the greater the activity parameter, the greater the influence of that activity within the system.

Depending on the sign of the sum of a line $(P_1)_i$ and the activity parameter $P_i$ four types of relationship can be deduced (see Table 3).

**Table 2** Matrix for analysis of interactions among various coastal resource-users

| β \ α | Shipping | Operation of port terminals | Building new terminals | Bottom dredging | Rail and road transport | Coastal fishery | Aquaculture | Mineral resource mining | Sand and gravel recovery | Recreational activities | Navy | Marine sciences | Nature protection activities | Water-power engineering | **Sum of the line $(P_1)_i$** | **$P_i$** | **Type of relationship** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shipping | | +2 | +2 | +2 | +2 | 0 | 0 | +2 | 0 | 0 | +1 | +1 | +1 | 0 | +13 | +4 | A |
| Operation of port terminals | +2 | | +2 | +2 | +2 | –2 | –2 | +2 | +2 | 0 | +2 | 0 | –1 | 0 | +9 | 0 | 0 |
| Building new terminals | +2 | +2 | | +2 | +2 | –2 | –2 | +2 | +2 | –2 | +2 | +1 | –2 | +1 | +8 | +2 | A |
| Bottom dredging | +2 | +2 | +2 | | +2 | –2 | –2 | +2 | +2 | –2 | +2 | +1 | –2 | 0 | +7 | +1 | A |
| Rail and road transport | +2 | +2 | +2 | +2 | | 0 | +1 | +2 | +2 | –2 | +1 | +1 | +1 | 0 | +14 | +4 | A |
| Coastal fishery | 0 | –2 | –2 | –2 | +1 | | –2 | –2 | –2 | –2 | 0 | +1 | +1 | 0 | –11 | +4 | C |
| Aquaculture | 0 | –2 | –2 | –2 | 0 | –2 | | –2 | –2 | –2 | –2 | +2 | –1 | 0 | –15 | –2 | D |
| Mineral resource mining | +2 | +2 | +2 | +2 | +2 | –2 | –2 | | 0 | –2 | –2 | +2 | –2 | +2 | +4 | 0 | 0 |
| Sand and gravel recovery | +1 | +2 | +2 | +2 | +2 | –2 | –2 | 0 | | –2 | 0 | 0 | –2 | 0 | +1 | 0 | 0 |
| Recreational activities | 0 | 0 | –2 | –2 | –2 | –2 | –2 | –2 | –2 | | –2 | 0 | –1 | 0 | –17 | –2 | D |
| Navy | –1 | +2 | +2 | +2 | –1 | –1 | –2 | –2 | +1 | –2 | | +1 | –2 | 0 | –3 | –4 | D |
| Marine sciences | 0 | 0 | 0 | 0 | 0 | 0 | +2 | +2 | 0 | 0 | +1 | | +2 | 0 | +7 | –5 | B |
| Nature protection activities | –1 | –1 | –2 | –2 | –1 | –1 | –1 | –2 | –2 | +1 | –2 | +2 | | –1 | –13 | –4 | D |
| Water-power engineering | 0 | 0 | 0 | 0 | +1 | +1 | +1 | +2 | 0 | 0 | 0 | 0 | –1 | | +4 | 2 | A |
| **Sum of the column $(P_2)_i$** | +9 | +9 | +6 | +6 | +10 | –15 | –13 | +4 | +1 | –15 | +1 | +12 | –9 | +2 | | | |

$P_i = (P_1)_i - (P_2)_i$

**Table 3 Key for determining the types of relationships between coastal resource-users**

| $(P_1)_i$ influence of an activity on others / $P_i$ activity parameter/degree of influence on the whole system | Positive | Negative |
|---|---|---|
| Positive | **A** Positive influence on the system as a whole | **B** Positive influence on the system as a whole, but not a strong one |
| Negative | **C** Negative influence on other activities; its influence is greater than the affect of others on it | **D** Negative influence of the activity on others; influence of others on it is greater than its influence on them |

Each type of relationship has a characteristic propensity to conflict:

**Type A – slight danger of conflict**

The activity is of benefit to most other local activities so although there may be problems with specific industries the danger of conflict is minimal.

Shipping and hydro-electric power stations fall into this category. Shipping (marine transport) is essential to the socio-economic development of the region (see Table 1), but a price is paid in terms of pollution and environmental damage. Hydro-electric power stations make the aluminium factory in Kandalaksha viable. Its use of freshwater runoff has increased salinity at the head of the Gulf of Kandalaksha, which in turn has increased bio-productivity to the benefit of fish farms and the coastal fishing industry.

One of the major tasks in integrated coastal management is making sure that all the stakeholders work in harmony; an understanding of the underlying reasons for conflict is essential to ensure this.

**Type B – indifference to conflict**

The activity (e.g. marine science) is of benefit to most other local activities and has their support, so it is unlikely to provoke conflict and is ready to compromise if necessary. It may lobby for some interests over others, but not necessarily in the majority interest.

**Type C – compelled conflict**

The activity (e.g. coastal fishery) has a detrimental effect on other activities and is compelled or is ready to defend its interests.

**Type D – existing conflict**

The activity has a detrimental effect on other activities and a negative influence on the system as a whole. Conflict already exists.

Environmental protection agencies and the Navy fall into this category. The basis for existing conflict is their restrictions on other activities (e.g. restricted areas, bans on fishing).

### Type 0 – balanced conflict

The activity has an activity parameter of zero; its beneficial effects counter-balance its negative effects. It is likely to be willing to compromise as it already has regular partners who benefit from its activities, but it is also aware of the complexity of the system as it will have had to deal with the consequences of its negative effects on some other businesses and activities. This type of activity is likely to participate constructively in integrated coastal management.

# 6 Making integrated coastal management a reality

Fig. 34
Press conference in Murmansk with the assessment team.

## 6.1 Project assessment

All CSI projects are intended not only to be worthwhile in their own right, but to stand as examples of how a particular problem or set of circumstances has been managed. Assessment of the projects by teams made up of external professionals and people closely associated with the work is a method of ensuring that the projects remain focused, develop and expand.

During a workshop in Paris in 1998 entitled 'Towards wise coastal development practices' (UNESCO, 2000), wise practices were defined and a tentative list of wise practice characteristics was drawn up. This list was refined through discussions on the 'Wise coastal practices for sustainable human development' Internet forum and is included as Annex 4. These characteristics provide a framework for evaluation.

An assessment team visited the project site in July 2002. They toured some of the stakeholders' facilities (fish farms, the Belomorskaya oil terminal) and met and had discussions with representatives of local government, universities, research institutes, fish farms, the local media, NGOs and the Kandalaksha State Nature Reserve. Their assessment of the project is included as Annex 5.

The assessment document evaluates the work already completed, and makes suggestions for future activities and how the project might develop. Until 2002 project activities focussed primarily on a scientific description of the situation. The assessment

**Definition of wise practices**

Actions, processes, principles or decisions that contribute significantly to the achievement of socially equitable, culturally appropriate, economically sound and environmentally sustainable development of coastal regions and small islands.

Fig. 35
A PINRO salmon factory in Palkin Bay.

team suggested that some other disciplines, law and anthropology should be included. It recommended that the project should refocus on factors such as strengthening cooperation amongst stakeholders and conflict mitigation. It was hoped that greater cooperation between stakeholders would make integrated coastal management more possible and benefit the area economically.

Fig. 36
Nikolai Plink, Head of the Department of Integrated Coastal Management at the RSHU, giving a lecture.

## 6.2 Promoting small business management

Adult education is an important component of integrated coastal management. People need to be aware, or made aware, of how their actions and businesses impact on the environment and on other people's lives and livelihoods.

To this end a vocational course on 'Small business management in the coastal zone' was developed and run jointly by the RSHU and the Kandalaksha Employment Centre. The first course was run in October 2003. Students were offered a series of lectures and practical studies on the:

- legislation on land and water use in the coastal region of the Russian Federation;
- legal basis of small business activity in the Russian Federation;
- ecological aspects of running a business;
- economy and use of natural resources in the coastal area of the Kandalaksha region;
- creation and functioning of a small business in a market economy.

Fig. 37
Andrey Ivanov, Deputy Head of the Kandalaksha Administration, presenting certificates.

The students ran computer-based simulations of small business economics using a business computer game developed by Nixdorf Karl of the H. Nixdorf Fund. The course was specifically tailored to the needs and conditions of the Kandalaksha district. In all, 112 hours of lectures and practical sessions were offered over a two week period.

The Kandalaksha Employment Centre provided the teaching premises and selected the 16 students to attend the course. All of the students were at least high school graduates. Most of them were temporarily unemployed, but college teachers, employees of the Kandalaksha State Sanitary and Epidemiological Inspection Unit, and representatives from the 'Metallurgist' Cultural Centre and the 'Rosgosstrakh' State Insurance Company also enrolled on the course. A common factor among all the students was their interest in business activity in the Kandalaksha region.

The teaching was conducted by members of staff from the Oceanology and Integrated Coastal Zone Management Departments of the RSHU, the Kandalaksha Employment Centre, the Department of Economic Development and Trade of the Kandalaksha Administration, the Kandalaksha State Nature Reserve and the Kandalaksha Municipal Tax Office.

All the students completed the course and received an official certificate from the Ministry of Education of the Russian Federation and another certified by the Director of the UNESCO Moscow Office, Mr Philippe Quéau and RSHU Rector, Mr Lev Karlin.

At the end of the course the lecture materials and the Nixdorf Karl business simulation software were put at the disposal of the Kandalaksha Employment Centre. The students all expressed interest in continuing their studies in fields such as aquaculture, the ecological safety of the coastal region, strategic management of the coastal region and management of tourism.

Fig. 38
Working group meeting discussing the Strategic Plan for developing an ICM system in Kandalaksha, October 2003.

The Director of the Kandalaksha Employment Centre reported favourably on the course to a meeting of a Special Working Group on Integrated Coastal Management (see following section) held in the Local Kandalaksha Administration in late October 2003. All the participants in the course (staff and students) considered it an activity worth continuing. The RHSU considered it a success in that it developed a dialogue, within the framework of integrated coastal management, between local authorities and future business managers.

The course was held again in 2004. This time its focus was the development of tourism management, which is a priority for the Kandalaksha Local Administration.

More information on the course is available on the UNESCO website:
www.unesco.org/csi/act/russia/kandalaksha.htm

## 6.3 Municipal working group for coastal management

An integrated coastal management working group was created within the Administration of the Kandalaksha Municipality in 2003. The group included local decision-makers (members of the Kandalaksha Administration) and representatives from various organizations and businesses whose activities involve the use of coastal resources (port facilities, aquaculture, fishing), environmental protection (Kandalaksha State Nature Reserve) or relate in some other way to coastal development (RSHU, PINRO). On 5 May 2004, Mr V. Golubev, Head of the Kandalaksha Regional Administration, issued a decree making the working group permanent and mandating it to promote the implementation of wise coastal practices in the Gulf of Kandalaksha. The working group has a membership of 14, but is open to all coastal stakeholders interested in sustainable development.

The working group initiated an official survey of the northern part of the Gulf of Kandalaksha in 2004. The aim was to estimate the anthropogenic pressure imposed on the coastal ecosystem by the Belomorskaya oil terminal, the PINRO, Udarnik and Kandalaksha fish farms, the reconstruction of the Kandalaksha and Vitino seaports and other commercial activities. As the research institutes that conducted the studies have been certified by the working group, the resulting report was, according to Russian law, an official document that could be used for decision-making. No previous ecological surveys of the Kandalaksha area had such official standing.

The working group's role is to promote the integrated coastal management approach in Kandalaksha by continuing the dialogue between coastal stakeholders with conflicting interests and further developing and implementing wise coastal practices. UNESCO-CSI regards wise practice agreements as mechanisms for managing conflicts over coastal resource-use at the local level. The working group is valuable in ensuring that jointly agreeable decisions on coastal development are reached. The tasks of research organizations (and through them the UNESCO project) within the working group are to ensure that the debate is well informed (provide background data and information), to explore possible solutions (environmental, social and economic), to provide tools to help avoid the recurrence of conflict (see Chapter 5) and to interest the general public and the mass media in sustainable coastal development. In the long term this could lead to the establishment of an ethical code of practice in the region. Such ethical codes were discussed, with reference to the White Sea project among others, at a UNESCO workshop in Mozambique in November 2001 (UNESCO, 2002).

## 6.4 Strategic plan for the development of an integrated coastal management system in the Gulf of Kandalaksha

At a meeting on 26 October 2003, the working group discussed and approved a Strategic plan for the development of an integrated coastal management system in the Gulf of Kandalaksha that had been prepared jointly by the RSHU and the Kandalaksha Administration. The text of the Strategic plan is included as Annex 6.

The document gives an overview of the Kandalaksha district, its natural resources, environment, economy, industries and their sometimes competing interests. It explains the concept of an integrated coastal management system as it applies to the Gulf of Kandalaksha. Proposals for implementing the Strategic plan are also detailed as preparatory, practical and implementation phases. The major tasks and indicators of their fulfilment for each phase of the plan are discussed. Much of the data accumulated as part of the White Sea project feeds directly into the plan.

The absence of specific coastal jurisdiction in the Russian Federation makes it difficult to give the Strategic plan a legal status. One possibility is to include integrated coastal management in a General Strategic Plan for Municipal Development. Realization of this general plan has become one of the working group's major objectives.

**Box 5 Anticipated outcomes of the development of an integrated coastal management system**

- Legal recognition that the coastal area is an entity in need of special attention
- Public awareness of environmental and developmental issues and their active involvement in seeking solutions and in decision-making
- A unified plan of action for the coastal area (see Annex 6)
- Control of development within the coastal area so that all new development is sustainable
- Harmonious relationships between all coastal users
- A diverse coastal economy

# 7 Concluding remarks

The end of the Soviet era coincided with the start of the environmental monitoring exercises by students of the RSHU that laid the basis for the White Sea – Barents Sea project. Political changes led to economic changes; from a command economy with large State-run industries to a market-driven economy. This in turn affected the social structure of the Kandalaksha district. As these changes took place the project continued its environmental studies and broadened its interests to include social and economic factors. So a picture of a district undergoing massive changes emerges.

The project itself also evolved. It moved from recording and analysing data to active participation in developing an integrated coastal management system in Kandalaksha and motivating others to join in. It introduced the concepts of integrated coastal management, wise practices, consensus building, wise practice agreements and conflict management to Kandalaksha. Russia was slow to adopt these ideas initially because of its closed political system and later because its legislation does not recognize the coastal region as a discrete system in need of special legal and management systems.

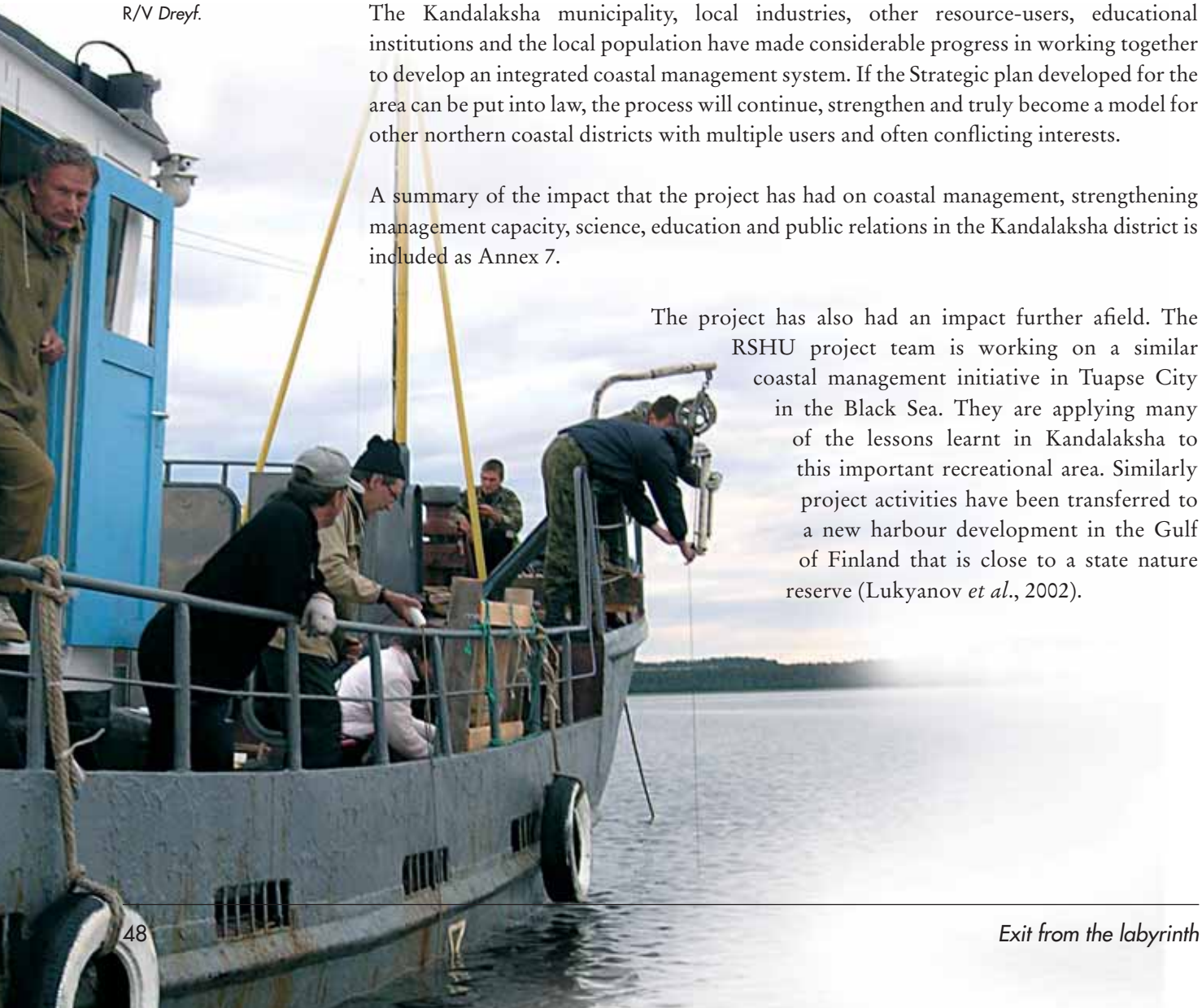


Fig. 39
Hydrological work on R/V *Dreyf.*

The Kandalaksha municipality, local industries, other resource-users, educational institutions and the local population have made considerable progress in working together to develop an integrated coastal management system. If the Strategic plan developed for the area can be put into law, the process will continue, strengthen and truly become a model for other northern coastal districts with multiple users and often conflicting interests.

A summary of the impact that the project has had on coastal management, strengthening management capacity, science, education and public relations in the Kandalaksha district is included as Annex 7.

The project has also had an impact further afield. The RSHU project team is working on a similar coastal management initiative in Tuapse City in the Black Sea. They are applying many of the lessons learnt in Kandalaksha to this important recreational area. Similarly project activities have been transferred to a new harbour development in the Gulf of Finland that is close to a state nature reserve (Lukyanov *et al.*, 2002).

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# Annex 1

## Local topographical terms

| Pomory | Sami | Definition |
|---|---|---|
| *Glyaden* (plural *glyadni*) | | Sign on the coast (usually a cross or a cairn of stones) indicating a safe fairway on entering a strait |
| *Guba* | | Large bight, bay |
| | *Kanda* | River, stream |
| | *Lambina* | Closed lake on an island |
| *Luda* | | Small, treeless island |
| *Lusha / Lukha* | *Lakhta* | Small, shallow bay |
| *Mezhennik* | | Calm, windless days in the middle of summer |
| *Navolok* | | Headland, peninsula |
| | *Salma* | Channel between an island and the mainland |
| *Tonya* | | Fishing station |
| | *Varaka* | Steep mountain on the coast, a sugar loaf mountain |
| *Vzvoden* | | Heavy sea |
| *Yagra* | | Shallow extending from the coast |

*Skerry:* a small, rocky island, too small for habitation – origin Old Norse

# Annex 2

## Time line of the project and related activities

| | |
|---|---|
| 1990 –1991 | Summer training of the students of the RSHU in the Gulf of Kandalaksha (mainly in Palkin Bay). |
| 1992 | The Baltic Floating University (BFU) – North project initiated under UNESCO's Training and Education in Marine Science programme. |
| 1992 –1996 | The RSHU, the Knipovich Polar Institute of Marine Fisheries and Oceanography and the Kandalaksha State Nature Reserve develop field research in coastal regions of the White Sea – Barents Sea. Early work concentrates on hydrological, hydro-chemical and hydro-biological monitoring in Palkin Bay and Kislaya Bay to provide hydro-meteorological support to local stakeholders and businesses and to contribute to a regional plan for sustainable coastal development. This 'Training through research' programme became an annual summer event (Plink *et al.*, 1995; Shilin *et al.*, 1997; Plink, 1998). |
| 1994 | Publication of 'Kola Arctic photo album' by S. Maisterman, Murmansk Publishing House. |
| 1996 | UNESCO's coastal regions and small islands platform created. |
| | First annual workshop on the 'Rational use of the northern seas' coastal zone', organized by the RSHU and the Kandalaksha State Nature Reserve. The workshops are held in the Kandalaksha region to discuss the summer field work, disseminate results, provide greater public awareness, build capacity and convince local authorities of the need for coastal management. (See annex 9 for a list of participating organizations.) Workshop papers, 25 articles by local stakeholders, scientists and students were published by the RSHU in Russian. |
| | Advanced field course on coastal studies held in the summer as part of the BFU programme. |
| 1997 | Workshop on 'Teaching Integrated Coastal Management' held in St Petersburg in May. |
| | BFU planning meeting held in St Petersburg in May. |
| | Advanced field course on coastal studies held in the summer as part of the BFU programme. |
| | Second annual workshop on the 'Rational use of the northern seas' coastal zone' (August). Workshop papers published by the RSHU (in Russian and English). |
| 1998 | The first undergraduate course on integrated coastal management in Russia is initiated at the RSHU. |
| | Third annual workshop on the 'Rational use of the northern seas' coastal zone'. Workshop papers published by the RSHU (in Russian and English). |
| 1999 –2000 | Socio-economic research into the development of small businesses in the Kandalaksha region to replace large, State-run industries of the past. |
| | Fourth and fifth annual workshop on the 'Rational use of the northern seas' coastal zone' (June and August). Workshop papers published by the RSHU (in Russian and English). |
| 1999 – 2003 | RSHU students examine the social and economic conditions in the Kandalaksha coastal region. |

| | |
|---|---|
| 2000 | Project refocused on coastal management and the socio-economic problems of the Murmansk District and Kandalaksha Bay. New title: 'Sustainable coastal development in the White Sea – Barents Sea region, northern Russia'. |
| | Chair in Integrated Coastal Management established at the RSHU. |
| | Exhibit on sustainable coastal development in the museum of Polarny, Murmansk region (May). |
| | Experimental field training course for undergraduates: 'Small island ecology and biogeography' held in the White Sea in July and August. Continues into 2003. |
| | Results of the project presented at a conference on 'Integrated coastal area management and its integration with marine science' held in St Petersburg in September (Shilin *et al.*, 2000). |
| 2000 – 2003 | RSHU students investigate the hydro-physical and hydro-chemical characteristics of the rivers and streams that run into Palkin Bay (Kluikov *et al.*, 2000). |
| | Sixth and seventh annual workshop on the 'Rational use of the northern seas' coastal zone' (July). Workshop papers published by the RSHU (in Russian and English). |
| 2001 | Project gains support from the Russian Ministry of Industry, Science and Technology through its 'World Ocean' programme as part of the project 'Optimization of relationships between different resource-users in the coastal zone of the Russian Seas and analysis of national marine policy'. |
| | Publication of 'Elaboration of a strategic planning methodology for the wise coastal development of northern seas'. RSHU. 109 pp (Russian). |
| | Exhibition 'Chef-d'oeuvres from the rubbish heap' held in Polarny in October and November to highlight the virtues of sustainable living by making practical use of rubbish and so raising public awareness on environmental issues. |
| | Paper presented at the UNESCO-CSI workshop in Maputo, Mozambique, in November: 'Coastal conflict resolution in the White Sea - Barents Sea: case study on aquaculture' (Shilin, 2001). |
| | An environmental awareness course, the 'School of young ecologists', held in the City of Polarny in November and December. |
| 2001 – 2003 | RSHU integrated socio-ecological-economic research carried out in Kandalaksha (Karlin *et al.*, 2002). |
| 2002 | Summer environmental education course for children at the Gandvik health centre in Palkin Bay. |
| | Assessment of the project by an international team (July) (see Annex 5). |
| | Press conference in Murmansk to highlight project activities. |
| | Joined the UNESCO/UNITWIN Network WiCoP-Europe (August). |
| | Murman State TV and Radio Company produce a programme based on the project assessment (September). |
| | Belomorskaya oil terminal, appreciating the need for long-term environmental monitoring of their operation, negotiate with the Kandalaksha State Nature Reserve to undertake this work. |
| | Publication of 'The potential of a regional conceptual framework for the coastal zone of the White Sea and Barents Sea.' RSHU. 96 pp (Russian). |
| | Publication of 'Results of a social investigation in the coastal zone of Kandalaksha Bay, White Sea'. RSHU. 37 pp (Russian). |
| | Publication of brochure 'Regional approach for the sustainable coastal development and wise coastal practices in the region of the White Sea'. RSHU. (English and Russian). |

| | |
|---|---|
| 2003 | Summer environmental education course for children at the Gandvik health centre. |
| | Integrated Coastal Management Programme for the Gulf of Kandalaksha initiated. The project involves students from the RSHU. |
| | Training course on the development of small businesses in the coastal zone organized by the Kandalaksha employment centre and the RHSU. Financial aid, UNESCO-CSI. |
| | ICM working group created within the local Kandalaksha Municipality administration. Membership includes representatives from the port, oil terminal and the local nature reserve. |
| | Integrated Management System for the coastal zone of the Gulf of Kandalaksha discussed and adopted at an ICM working group meeting (October). |
| | Impact assessment of the apatite terminal in the port of Kandalaksha initiated. |
| | Publication of 'Aborigines of the coastal zone: to conciliate those irreconcilable' in the Kandalaksha newspaper 'NIVA' in September. |
| | Exhibition of wildlife photographs of the Kandalaksha State Nature Reserve in the Niva Cultural Centre in October. |
| | Publication of a brochure 'Regional approach for the sustainable coastal development and wise coastal practices in the region of White Sea', in November, in English and Russian. |
| | Results of the project presented at the UNESCO/UNITWIN WiCoP-Europe meeting held in Roja, Latvia, in December. |
| | RSHU publishes a series of four text books in Russian on how to achieve sustainable development in the coastal zone. |
| 2004 | Publication of one of the RSHU text books in English: 'Legal provision for integrated coastal zone management' by Eremina and Stetsko. |
| | Publication of an updated project summary. |
| | Eighth annual workshop on the 'Rational use of the northern seas' coastal zone' (July). |
| | Second training course on the development of small businesses in the coastal zone – this time concentrating on the development and management of tourism which is a priority in the Kandalaksha region. |
| | A permanent 14-strong working group to promote the implementation of wise coastal practices in the Gulf of Kandalaksha is established by the Kandalaksha Regional Administration in May. It includes representatives from the local administration, local and regional coastal users, environmental NGOs and research organizations. |
| | UNESCO/UNITWIN WiCoP-Europe workshop on 'Ports and sustainable development' held in St Petersburg, in May. |
| | Results of the project presented at a UNESCO/UNITWIN WiCoP-Europe meeting held in Cadiz, Spain. |
| | Publication of 'Exit from the labyrinth', in Russian, giving project details. |

# Annex 3

## Hydrochemical properties of the water at the head of the Gulf of Kandalaksha

| | Surface water | Deep water |
|---|---|---|
| Summer temperature (°C) | 10–14 | 3–6<br>(at 10m depth) |
| Salinity (‰) | 15–20 | 21–24<br>(at 10m depth) |
| Relative content of dissolved oxygen (%)<br><br>ml/l | 110–115<br>(except Palkin Bay <100)<br><br>7.3–7.8 | 85–100<br><br>6.9–7.7 |
| pH | 8.05–8.15 | |
| Total alkalinity (mg-equiv/l) | 1.0–1.4<br>(except Palkin Bay 0.8–1.6) | |
| Nitrite (μg/l) | <1 | |
| Silicon (μg/l) | 540–1000 | 600–800 |
| Phosphate (μg/l) | *>45 head of the Gulf<br>*25 northern shore of Oleny Island to eastern Ryashkov Salma<br>5–15 Palkin Bay western Ryashkov Salma | #17–47<br>(at 10m depth) |
| * Abnormal values according to earlier studies that did not record values approaching 45μg/l until depths of 15m | | |
| # Phosphate levels decrease down to a depth of 5m, which corresponds with maximum phytoplankton numbers | | |

# Annex 4

## Wise practice characteristics

- **Long-term benefit:** The benefits of the activity are still evident 'x' years from now and they improve environmental quality.
- **Capacity building and institutional strengthening:** The activity provides improved management capabilities and education for the stakeholder groups, as well as knowledge and efforts to protect the local coastal/marine environment.
- **Sustainability:** The activity adheres to the principles of sustainability (the extent to which the results will last, develop and continue once the project has ended).
- **Transferability:** Aspects of the activity can be applied to other sites in and/or outside the country.
- **Interdisciplinary and intersectoral:** The activity fully incorporates all relevant disciplines and all sectors of society.
- **Participatory process:** Transparent participation of all the stakeholder groups as well as the involvement of individuals is intrinsic to the process.
- **Consensus building:** The activity should benefit a majority of the stakeholder groups, whilst bearing in mind that in some cases certain under-privileged groups may need to be treated as special cases.
- **Effective and efficient communication process:** A multidirectional communication process involving dialogue, consultation and discussion is needed to attain awareness.
- **Culturally respectful:** The process values local traditional and cultural frameworks while also challenging their environmental validity.
- **Gender and/or sensitivity issues:** The process accounts for the many aspects of gender and/or other sensitive issues.
- **Strengthening local identities:** The activity provides a sense of belonging and self-reliance at various levels.
- **National legal policy:** The activity adheres to current government environmental, economic, legal and social policies.
- **Regional dimension:** The activity should embody the regional economic, social and environmental perspective.
- **Human rights:** The activity should provide freedom to exercise fundamental human rights.
- **Documentation:** The activity and the lessons learnt are well documented.
- **Evaluation:** The activity is assessed to determine the extent to which ICM has been achieved and/or wise practice characteristics have been used.

# Annex 5

## *Field project assessment*

## Sustainable coastal development in the White Sea – Barents Sea region, northern Russia

**Date of assessment**

Site visit: 14 to 20 July 2002
Assessment completed: draft 9 November 2002

**Assessment conducted by**

Ms Gillian Cambers, UNESCO-CSI consultant, Mr Evalds Urtans, Latvian Fisheries Research Institute (not closely associated with the project);
Mr Lev N. Karlin, Rector, Mr Nikolai L. Plink, Head of Department of Integrated Coastal Management, Mr Alexander Averkiyev, Dean of Oceanography, Mr Michael Shilin, Associate Professor, Department of Oceanography, Russian State Hydrometeorological University (RSHU) (all closely associated with the project);
Mr Uli Graebener, UNESCO-Moscow Office (associated with the project).

**Project documentation**

1. Russian State Hydrometeorological University. 2001. Elaboration of a strategic planning methodology for the wise coastal development of northern seas. 109 pp. (Russian).
2. Russian State Hydrometeorological University. 2002. The potential of a regional conceptual framework for the coastal zone of the White Sea and Barents Sea. 96 pp. (Russian).
3. Russian State Hydrometeorological University. 2002. Results of a social investigation in the coastal zone of Kandalaksha Bay, White Sea. 37 pp (Russian).
4. Russian State Hydrometeorological University. 2002. Regional approach for the sustainable coastal development and wise coastal practices in the region of the White Sea. Brochure (English and Russian).
5. Maisterman, S. 1994. Kola Arctic photo album. Murmansk Publishing House.
6. Field project summary.
7. Shilin, M. 2001. Coastal conflict resolution in the White Sea – Barents Sea: case study on aquaculture. Paper presented at the UNESCO-CSI workshop in Maputo, 19–23 November 2001. 2 pp (English).

**Assessment activities**

*Discussions and meetings with:*

- Russian State Hydrometeorological University – Mr Lev N. Karlin, Rector, Mr Vladimir Vorobyov, Vice-President, Mr Nikolai L. Plink, Head of Department of Integrated Coastal Management, Mr Alexander Averkiyev, Dean of Oceanography, Mr Michael Shilin, Associate Professor, Department of Oceanography.
- Murmansk Office of the Ministry of Natural Resources – Mr Nikolay Bitchouk.
- Knipovich Polar Institute of Marine Fisheries and Oceanography (PINRO) – in Murmansk: Mr Vladimir Chernook, Research Director, Mr Vladimir Borovkov, Deputy Director and Head of the Centre of Marine Environment; in Beloye More village near Kandalaksha: Mr Yevgeniy Kluikov, Supervisor of the Students' Field Practice.
- Kandalaksha City Administration – Mr Askar Jabasov, First Vice-Head, Ms Estella Didrich, Expert, Department of Ecological Development.
- Udarnik Fish Farm (Beloye More) – Mr Vladimir (Grigorjevich) Klimtchouk, Ms Tamara Klimtchouk.
- Kandalaksha Fish Farm and the Cage Culture at the Kolskaya Nuclear Power Plant – Mr Alexander Popov.
- Murman State TV and Radio Company – Ms Anastassia Ishenko Jakonjuk, Ms Elena Rakhimova, Commentator, Mr Kostya Kozar, Cameraman. (Ms Rakhimova and Mr Kozar accompanied the assessment team during the entire field visit from 16–19 July 2002.)
- Kandalaksha Children's Summer Camp – Mr Nikolay Ryzhankov, Director.
- Fish Farmer – Mr Andrey Borovkov (graduate of RSHU).
- Pomor – Tour (non-governmental organization) – Mr Paul Zhidkikh.
- Kandalaksha State Nature Reserve – Mr Alexander Chavgoun, Director, Mr Alexander Karjakin, Deputy-Director.
- Arctic Salmon Farm at the Hydropower plant Verchnetulomskaja, near Murmansk – Mr Victor Nesvetov.
- Russian Branch of Birdlife International – Ms Helena Lebedeva.

*Seminar at the Kandalaksha State Nature Reserve (18 July 2002):*

- 'Rational exploitation of the resources of the coastal zone of northern seas'. There were 12 presentations given by students and lecturers from RSHU, individuals from PINRO, the Russian Branch of Birdlife International, Kandalaksha Administration and others. After each presentation there was a discussion. There were approximately 50 persons present from the Kandalaksha City Administration, RSHU, St Petersburg University, PINRO, media (Murman State TV, Kandalaksha Radio Company, and the local *Niva* newspaper), Russian Society of Nature Protection, Kandalaksha State Nature Reserve, and the Russian Branch of Birdlife International. (Local stakeholders use this annual seminar as an opportunity to present and discuss results, ideas and concerns.)

*Field visits:*

- Udarnik Fish Farm, PINRO fish farm, Kandalaksha Children's Ecological Summer Camp, Centre of Marine Environment in Beloye More village (outside Kandalaksha).
- Belomorskaya oil terminal (boat trip).
- Kandalaksha fish farm.
- Cage culture at the Kolskaya Nuclear Power Plant.
- Arctic salmon farm at Hydropower Plant Verchnetulomskaja (outside Murmansk).

*Press conference (19 July 2002) at the PINRO Office, Murmansk:*

- Representatives of TV (one State and four private channels), radio and print media.

**Constraints**

The visit was very well planned. However, meetings were not held with some of the more problematic stakeholders such as the authorities at the Belomorskaya oil terminal, the Kandalaksha Harbour and the Kandalaksha State Fish Inspection.

## Field project assessment

The RSHU has been involved in environmental monitoring in the White Sea – Barents Sea region for ten years, while this present project, which focuses on coastal management and has a significant socio-economic component, has been ongoing for only two years. Due to their overlapping nature, these two initiatives have not been separated for the purposes of this assessment. There was some difficulty in distinguishing between those achievements which resulted from the project activities and those which would have taken place anyway.

The sixteen characteristics, used to define 'wise practices', are used here to assess this field project. A qualitative scale is used as follows:

**None:** The field project activities to date do not comply with this characteristic and/or the characteristic is not relevant.
**Slightly:** The field project activities to date have begun in some preliminary way to satisfy this characteristic.
**Partially:** The field project activities to date have gone some significant way towards fulfilling this characteristic.
**Fully:** The field project activities to date have gone the full way to complying with this characteristic.

**This assessment is based only on the activities undertaken to date, and does not include those planned for the future.**

**Have the project activities ensured long-term benefit?**

**Partially**

The long-term benefit of the project activities can be seen in the ongoing interaction of scientists, businessmen, government administrators, teachers and environmentalists. For example, the Kandalaksha City Administration plans to establish a working group comprising representatives of different stakeholder groups to begin implementation of various coastal management initiatives. University students at all levels (bachelors, specialists, masters and PhD) have benefited by conducting their research and field practice in the Kandalaksha area and working on specific coastal problems. School children from St Petersburg and Kandalaksha have been involved in project activities, e.g. through the Kandalaksha Children's Ecological Summer Camp.

**Do the project activities provide for capacity building and institutional strengthening?**

**Fully**

The project has provided for institutional strengthening in that it contributed to the recent establishment of the Chair in Integrated Coastal Management at RSHU (established in 2000). This is the first integrated coastal management department in Russia and produces 15 young specialists every year, who then go out to work in other agencies and institutions. Improved capacity for environmental management was also apparent within certain stakeholder groups; e.g. as a result of the project activities, the managers of the Belomorskaya oil terminal appreciate the need for long term environmental monitoring at their operation and have negotiated with the Kandalaksha State Nature Reserve to undertake this monitoring. Annual seminars, during which the research findings of the students and senior researchers are presented and discussed with interested stakeholders, also provide for capacity building. School children from the Kandalaksha and St Petersburg areas have also benefited from their involvement in the project activities. However, capacity building needs to be enhanced among certain key groups, e.g. fishermen, and further links need to be established with regional government organizations in the area.

**Are the project activities sustainable?**

**Partially**

Many of the educational activities are sustainable, particularly in view of the establishment of the Chair in Integrated Coastal Management at the RSHU. A start has been made in transferring environmental knowledge to local administrators and key stakeholders such as the managers of the Belomorskaya oil terminal. The project has contributed to sustainable private sector activities especially in the field of aquaculture, and to some extent in ecotourism, both creating ecologically-friendly income sources in a relatively weak economic environment.

**Have the project activities been transferred?**

**Fully**

The project activities, including the socio-economic components, have been transferred to Tuapse City in the Black Sea where the 'Big Sotchi' is a major recreational area for Russians. Here the RSHU project team is working on a similar coastal management initiative to the one in the White Sea – Barents Sea region, and applying many of the lessons already learnt. Furthermore, the project activities have been transferred to a new harbour site in the Gulf of Finland, where there is a similar situation with a state reserve positioned close to a harbour (Lukyanov *et al*., 2002). Persons from northern Germany have also expressed interest, since similar situations exist there with conservation areas close to major harbours. Many of the project experiences have been included in a book *Ecological monitoring of the coastal zone of Polar Seas* (Pogrebov and Shilin, 2001).

**Are the project activities interdisciplinary and intersectoral?**

**Fully**

The project activities have included many different disciplines, including oceanography, hydrology, biology, ecology, social sciences and economics. In addition, different universities have been involved in the project. However, there is also a need to include the disciplines of law and anthropology in future activities. All major societal sectors have been involved including government, non-governmental organizations (NGOs), private sector, media, youth and civil society. Additional efforts need to be made in the future to involve, as far as possible, all levels of government and to keep them fully informed.

**Do the project activities incorporate participatory processes?**

**Partially**

Participatory approaches have no real tradition in Russia and existing green NGOs have limited membership. The project activities have involved meetings and discussions with individual stakeholder groups, although in the Kandalaksha area many NGOs are fairly new and just getting established. The annual seminars held in Kandalaksha also provide stakeholders and others with the opportunity to discuss issues and findings in an open forum.

**Do the project activities provide for consensus building?**

**Partially**

The project activities have helped to develop consensus within certain groups of stakeholders, e.g. those involved in aquaculture. Conflict issues were defined, round-table discussions were initiated and compromise agreements negotiated and implemented. Similar efforts are starting to ensure that proposals to deepen and improve the Kandalaksha harbour do not conflict with the goals of the Kandalaksha State Nature Reserve. In many of these cases, the RSHU team have acted as moderators or as a third party and have helped to facilitate the consensus building process.

**Do the project activities include an effective and efficient communication process?**

**Fully**

Effective communication has been a key component of the project activities and has included one-on-one discussions and dialogues, seminars and meetings. There has also been extensive media coverage of the project activities, this has included radio and television programmes, newspaper articles and leaflets. In this respect, the UNESCO sponsorship helps to get the attention of the media. A team from the Murman State TV and Radio Company participated in the assessment field visit to Kandalaksha (16–19 July 2002) and will produce a programme based on the visit to be aired in September 2002. In addition, a press conference was held in Murmansk at the end of the assessment visit (19 July 2002) to highlight the project activities.

**Are the project activities culturally respectful?**

**Partially**

Many of the people living in the Kola Peninsula are not from this area, but have moved there, often in search of higher paying jobs. In order to survive they have had to develop special characteristics such as self-sufficiency and independence. Thus, partly as a result of the climatic rigors of the Arctic north, people native to the area and outsiders have become integrated to a large extent, and cultural traditions therefore have to be viewed in this special context. The project activities have included cultural traditions and other issues concerning the Pomors who are native to this area.

**Do the project activities take into account gender and/or sensitivity issues?**

**Fully**

While the project was not designed to focus on gender or sensitive issues, they have been fully taken into account within the activities. In the Russian north, men and women undergo the same hardships and often do similar jobs, e.g. women sometimes do heavy work such as road building. Other sensitive issues have been included, e.g. the Kandalaksha Children's Summer Camp also includes children from socially disadvantaged backgrounds and they are also involved in the project activities.

**Do the project activities strengthen local identities?**

**Partially**

The project activities, in helping stakeholder groups solve their own problems, also help to promote self-sufficiency, and thereby strengthen local identity. Many of the stakeholders, including those from the private sector and the local administration, expressed appreciation for the project and its various activities and took personal pride in being associated with the RSHU and UNESCO.

**Do the project activities shape national legal policy?**

**Partially**

The project activities are closely followed by the Russian Ministry of Industry, Science and Technology in Moscow, and the project is seen as a testing ground for the Ministry's integrated coastal management programme. The Ministry is directly involved in the development of a new national law for integrated coastal management and thus the project activities contribute to the discussions, both for and against, the new law. The project activities have helped to shape policy at a more local level, e.g. they are contributing to the preparation of an Ecological Code for the City of Kandalaksha. In addition, after the annual seminars, proposals for action are put forward to the Kandalaksha City Administration.

**Do the project activities encompass the regional dimension?**

**Slightly**

In the context of this project, the regional (international) dimension encompasses the Barents Region, which includes the northern parts of Norway, Finland and Sweden, as well as regions of Murmansk and Arkhangelsk. (In Russia, the regional dimension is viewed as an administrative zone.) The project is at too early a stage to have included the regional dimension, although the recently created UNESCO-CSI university twinning network, which includes universities from Spain, Portugal, Italy, Latvia and the RSHU in Russia, will strengthen this characteristic.

**Do the project activities provide for human rights?**

**Slightly**

The project activities take into account the local Pomors, who in some of the more isolated villages of the Kola Peninsula, depend on natural resources in the sea and forest for subsistence. However, by doing this they are in violation of several laws. Thus the project contributes to addressing basic human rights of access to food, clothing, and housing – Article 25.1 of the Universal Declaration of Human Rights [1].

[1] Article 25.1. Everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the face of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.

**Have the project activities been documented?**

**Fully**

The project activities have been fully documented. The documentation includes scientific reports, reports of seminars, published academic papers, leaflets, compact discs and videotapes. There is a need to widen the international visibility of this project by publishing selected material in English as well as in Russian.

**Have the project activities been evaluated?**

**None**

This is the first project evaluation.

## Synthesis and list of main issues from the assessment

1. While the project activities to date have been fully interdisciplinary and intersectoral, there is scope for including other disciplines (law and anthropology) and involving additional stakeholder groups.
2. Project activities have focused on scientific descriptions of the situation. In the future, more emphasis needs to be placed on strengthening cooperation among the stakeholders, conflict mitigation and the joint development of strategies.
3. Future activities should focus on expanding the project so that it provides real socio-economic benefit for people living in the coastal areas. This might include such benefits as job creation and income generating activities.

## Future project activities

Future activities have been divided into two groups, those that should be implemented in the near future, and those that can either continue or be considered at a later date.

Activities for immediate implementation:

1. Update the summary of the field project (last update 5 October 2001).
2. Prepare two articles for the Wise Coastal Practices for Sustainable Human Development forum, each 500–750 words long, and each to define and discuss one or more of the wise practices that are emerging from the project activities.
3. Prepare text in English (50–75 pages in length), photographs and figures for a future UNESCO-CSI publication in the papers/info series, describing the project activities and especially focusing on management aspects. (A draft table of contents to be agreed by RSHU, UNESCO-Moscow Office and UNESCO-CSI. The layout and publication of this document will be undertaken by UNESCO-CSI).
4. Work with the Kandalaksha Administration to establish a working group, including representatives of government, NGOs, private sector, civil society and youth, to develop a working framework for integrated coastal management in the Kandalaksha Bay area. This working group would focus on specific issues, e.g.:

- Providing assistance in managing environment/development conflicts such as the planned developments at the Kandalaksha harbour;
- Preparing a tourism plan;
- Facilitating tourism activities, e.g. a tourism information centre, a webpage, training of guides.

Stages in this activity would involve:

- Identifying the members of the working group and discussing with them their involvement;
- Arranging a venue and schedule for regular meetings;
- Facilitating the meetings, assisting with agenda preparation and follow-up.

5. Strengthen the capacity of the RSHU in small business management, so that in the future these skills can be transferred to stakeholders in the Kandalaksha region.

Other activities:

6. Assist with the finalization of the Ecological Code already under preparation by the Kandalaksha City Administration.
7. Define and develop wise coastal practices in the Kandalaksha Bay area and prepare public awareness materials in cooperation with local media to disseminate these wise practices.
8. Continue the RSHU student field practice and research in the Kandalaksha area so that the information base is continually expanded and shared with local stakeholders, and the students continue to benefit from applied research activities.
9. Build associations within specific stakeholder groups, e.g. between fishermen, people involved in aquaculture, fish processors and fish marketers.
10. Work with the Kandalaksha State Nature Reserve and other initiatives to map the sensitivity of the coastal area.

# Annex 6

*(Unofficial translation of the formal Russian agreement)*

## Strategic plan for the development of an integrated coastal management system in the Gulf of Kandalaksha

The coastal area belonging to the territory of the Kandalaksha municipality is an area of intensive exploitation of natural resources in the interests of various economic activities which include sea transport, port facilities, housing, cultural and health complexes, water treatment systems, recreation and environmental protection. The city of Kandalaksha is on the eastern coast of the Gulf of Kandalaksha. It is an industrial city with a population of about 50,000, with a developed urban infrastructure and municipal economy. The principal industries of the municipality are power generation, nonferrous metallurgy, machine-building and metal-working, forestry, wood-working and fishing. The port of Kandalaksha is the largest seaport on the White Sea. The Kandalaksha State Nature Reserve, which is of federal significance, falls within the administrative borders of the Kandalaksha municipality. The coastal area has considerable recreational potential due to its stunning scenery and the possibilities for active holidays (tourism, sport fishing). Rational use of coastal resources could become the basis for accelerated socio-economic development of the municipality.

The intensive economic activity has a considerable impact on the environment throughout the municipality, including the coastal area of the Gulf of Kandalaksha. The annual volume of waters discharged into the Gulf of Kandalaksha is about 14.5 million $m^3$, of which 47% are insufficiently treated. Thus, the Gulf annually receives about 150 tonnes of organic waste, 160 tonnes of suspended matter, 1,600 tonnes of mineral waste, 2.8 tonnes of various metal ores.

As a result, the coastal area of the Gulf of Kandalaksha has become a place where there is a conflict of interests among various stakeholders, and even among environmental protection agencies.

These circumstances dictated the need for a local (municipal) integrated coastal management (ICM) system for the Gulf of Kandalaksha to provide for the rational use of natural resources, maintenance of ecological stability, incorporation of social and economic factors, and minimization of extreme natural and anthropogenic impacts.

## The concept of integrated coastal management within the municipal system of the Gulf of Kandalaksha

*(General provisions)*

The ICM system is a system of legal, economic, moral and other instruments controlling relations among various stakeholders, including users of diverse marine and coastal resources, federal agencies, the residents living within the limits of the coastal area and other persons bound by economic, industrial or public relations within the framework of coastal development. Realization of the ICM system implies the following:

- Coordination through the development of horizontal and vertical integration processes, horizontal integration being important at the planning stage, and vertical integration at the implementation stage;
- Adoption of a common policy of action (development alternatives) by all stakeholders in the coastal area, aimed at solving coastal problems in the interests of its sustainable development;
- Improving existing and introducing new regulatory mechanisms;
- Involvement of the public in the decision-preparing and decision-making process relating to problems of coastal development;
- Harmonization of relations among various stakeholders in the coastal area.

The concept of creating a municipal ICM system for the Gulf of Kandalaksha is based on several principles:

- **Interdisciplinary** – making use of the experience gained in different scientific disciplines including natural, economic and socio-humanitarian sciences;
- **Multisectoral** – taking into account the interests of all sectors of the economy and sections of the population.
- **Integrated** – considering the coastal area as a system consisting of interacting natural, economic and social components.
- **Municipal** – defining the possibilities and local targets for the development of a specific stretch of the coastal area under municipal jurisdiction.

The ICM system for the Gulf of Kandalaksha should be based on the general methodology of the integrated management approach to development of coastal areas such that:

- The system objective is to coordinate strategic sectoral planning in the interests of the general sustainable development of the coastal area.
- The system should employ ecological criteria as key parameters in defining and making decisions.
- The system should promote the development of democratic forms of public participation so that the public can influence the decision-making process, spiritual, cultural and historical heritage can be conserved, and improvement made in ecological conscientiousness of the population.
- The ICM system should take into account regional features, facilitating the adaptation of the ICM system at the regional level.

## Implementation of the strategic plan for the development of integrated coastal management in the Gulf of Kandalaksha

*(Plan of action)*

The strategic plan for development of an integrated management system in the coastal area of the Gulf of Kandalaksha has three phases.

### 1. Preparatory phase

In the preparatory phase, a number of activities need to be carried out targeted at initiation of the programme including:

- Inventory of the current state of the coastal area of the Gulf of Kandalaksha;
- Estimate the demand for natural resources on the part of existing stakeholders in the coastal area;
- Estimate future demand for natural coastal resources based on the development plan;
- Economic evaluation of the coastal area of the Gulf of Kandalaksha;
- Assessment of the role of the coastal area in the socio-economic development of the municipality;
- Identify existing problems and priorities for their solution;
- Implement theoretical and *in-situ* investigations to determine the interaction among various components of the coastal area; analyse and identify coastal problems;
- Define coherent management units, including the boundary of the coastal area of the Gulf of Kandalaksha;
- Analyse relationships among diverse stakeholders and assess the potential for conflict;
- Analyse existing programmes and projects relating to the coastal area of the Gulf of Kandalaksha;
- Disseminate the idea of ICM.

The following serve as indicators for implementation of the preparatory phase:

- Creation of a Geographic Information System (GIS) database of the Gulf of Kandalaksha coastal area, containing information on all industries in the coastal area, areas of non-commercial use, cultural and historical monuments, recreational zones, the population, infrastructure, distribution of natural resources and other data describing the current state of the coastal area;
- Discussion and approval of the document defining major policy actions in the Gulf of Kandalaksha coastal area;
- Solution of the boundary problem (legal definition of the limits of the coastal area);
- Analysis of macroeconomic and social indicators of municipal development, with special emphasis on its coastal component;
- Acceptance and approval of the 'Strategic plan for development of the ICM system of the Gulf of Kandalaksha';
- Development of a 'Plan of integrated activities' to solve the problems of the Gulf of Kandalaksha coastal area;
- Investment proposals for projected commercial activities connected to development of the coastal area;
- Publication of popular books about the state and problems of the coastal area and methods for their solution; highlighting ICM in the Gulf of Kandalaksha in the mass media;

- Organizing a working group at the Kandalaksha Administration for realization of the ICM programme that would include representatives of the authorities, key resource-use organizations, educational establishments, public organizations, mass media and other concerned groups.

**2. Practical phase of integrated coastal management realization**

The practical phase consists of implementing diverse projects to solve the problems defined by the policy of actions in the coastal area of the Gulf of Kandalaksha. As well as applying an integrated approach to planning for the Gulf of Kandalaksha coastal area, the practical phase includes:

- Development of specific projects relating to the solution of coastal area problems;
- Development of vertical and horizontal integration;
- Building organizational structure for ICM in the Gulf of Kandalaksha;
- Creation of a GIS database 'The Gulf of Kandalaksha coastal area';
- Development of a system to measure the efficiency of project implementation;
- Development of proposals for creating an integrated monitoring system.

The following serve as indicators for the implementation of the practical phase:

- Transition from fragmentary planning to communicative management and coordination;
- Involvement of the public in the decision-making process;
- Starting the implementation of specific projects to solve coastal problems;
- Creation of an ICM organizational structure;
- Introduction of the 'Gulf of Kandalaksha Coastal Area' GIS to the municipal management system;
- Local mass-media informational support for ICM of the Gulf of Kandalaksha.

**3. Implementation phase**

The implementation phase in the development of ICM is aimed at consolidation of the results from previous stages, transition from an initiative basis for ICM to a normative one. This includes:

- Implementation of specific projects within the framework of ICM of the Gulf of Kandalaksha;
- Zoning of the coastal area of the Gulf of Kandalaksha;
- Creation of an integrated monitoring system for assessment of the effect of the ICM projects in the coastal area of the Gulf of Kandalaksha;
- Improvement of local legislative and normative bases;
- Development of investment policy to support the coastal area enterprises.

The following serve as the indicators of implementation of the implementation phase:

- Transition from sectoral management to intersectoral harmonization of relations;
- Examples of positive experiences in ICM methodology;
- Involvement of the public in the decision-making process connected to the ICM of the Gulf of Kandalaksha.

# Impact of the White Sea – Barents Sea project in the Gulf of Kandalaksha

**Impact on coastal management:**

- Consultation of the key coastal resource-users on possible techniques of reduction and control of the anthropogenic impact on the coastal area;
- Propagation of nature-protecting technologies and the wise practices experience in coastal resource-use;
- Organization of a dialogue between different coastal resource-users;
- Development of proposals for the General Strategic Plan for development of the Kandalaksha municipality;
- Environmental impact assessment conducted for the apatite-concentrate handling terminal at the Kandalaksha Commercial Seaport.

*The total effect*: accumulation of useful expertise in introduction of ICM initiatives.

**Strengthening the management capacity:**

- Establishment of the Working Group for the project at the Administration of Kandalaksha and conducting its first meetings;
- Development and approval of the Strategic ICM Plan for the pilot area;
- Inclusion of a special ICM section in the General Strategic Plan for development of Kandalaksha.

*Cumulative effect*: increased sustainability of the project.

**Scientific impact of the project:**

- Building a database on the coastal area of the region;
- An evaluation of the ecological and socio-economic situation;
- Analysis of the existing and potential conflicts and their mitigation;
- Construction of matrixes of impact and interaction among coastal resource-users;
- Development of integrated monitoring methods for the coastal area of the Arctic seas.

*Cumulative effect*: creation of the scientific and methodological basis for realization of ICM initiatives.

**Education:**

- Organization of students' field practice, training them in practical skills in application of ICM technologies;
- Holding classes for school children at the 'Gandvik' Children's Centre;
- Organization of a vocational training course in 'Small Business Management in the Coastal Zone';
- Holding an annual workshop 'Rational exploitation of the coastal area of the northern seas';
- Correspondence education for local coastal resource-users (at the RSHU).

*Cumulative effect*: improvement of the local population's educational level and raising their awareness about problems of the coastal area.

**Public relations:**

- Publication of the project information in the local press (the town of Kandalaksha);
- Preparation of a booklet about the project (in Russian and English);
- Organization of working meetings and round-table discussions with local stakeholders;
- Dissemination of ICM ideas based on the project monitoring results;
- Organization of a press-conference in Murmansk related to the project monitoring results and discussion of its outcomes.

***Cumulative effect***: improvement in the level of awareness in the local population about the project initiatives and ICM methodology.

# Annex 8

## Partners in the project

- Administration of the Municipality of Kandalaksha
- Employment Centre, the City of Kandalaksha
- Children's Holiday Camp 'Gandvik', City of Kandalaksha
- Kandalaksha State Nature Reserve, the City of Kandalaksha
- N. M. Knipovich Polar Research Institute of Marine Fisheries and Oceanography (PINRO), the City of Murmansk
- Interministerial Ichthyologic Commission, Moscow and St Petersburg
- Marine Biological Station, RAS Zoology Institute (the Cape of Kartesh, Gulf of Kandalaksha)
- Organization 'Lenmorniiproject', St Petersburg
- Belomorskaya (White Sea) Biological Station, Moscow M. V. Lomonosov State University (the settlement of Poyakonda, Kandalaksha Gulf)
- Marine Benthos Ecology Laboratory, St Petersburg Youth Creativity House, St Petersburg
- Suomenlahti Friends Society SULA, Helsinki, Finland
- Association of Protected Areas of North West Russia, Petrozavodsk
- Russian State Hydrometeorological University, St Petersburg

# Annex 9

## Participating organizations at workshops on the 'Rational use of the northern seas' coastal zone'

Seven international workshops on the 'Rational use of the northern seas' coastal zone' have been held at the Kandalaksha State Nature Reserve headquarters in the City of Kandalaksha. Reports on the first five workshops have been published and another to cover the 6th and 7th workshops is in preparation. The reports detail the problems facing environmental protection agencies and the industries that exploit natural resources. They also include the results of research work in the region and the papers given by graduate and undergraduate students in the workshop seminars.

Representatives from the following organizations have attended the workshops and contributed to the reports.

1. RAS Belomorskaya (White Sea) Zoology Institute, Biological Station (Cape of Kartesh);
2. Belomorskaya (White Sea) Biological Station of Moscow M.V. Lomonosov State University (the settlement of Poyakonda);
3. Belomorskaya (White Sea) oil tank farm (the settlement of Beloye More);
4. Biology Faculty, Moscow M.V. Lomonosov State University (Moscow);
5. The RAS Kola Scientific Centre Mining Institute (the town of Apatity);
6. The committee for environmental control, Kandalaksha, Murmansk Oblast;
7. 'Vitino' Seaport Joint-Stock Company (the settlement of Beloye More);
8. RAS Zoology Institute (St Petersburg);
9. RAS P.P. Shirshov Institute of Oceanology (Moscow);
10. Kandalaksha State Nature Reserve (Kandalaksha);
11. The Committee for Natural Resources in Murmansk Oblast (Murmansk);
12. The Marine Benthos Ecology Laboratory, St Petersburg Palace of Youth Creativity (St Petersburg);
13. Murmansk Prospecting Expedition;
14. Murmansk State Pedagogical University (Murmansk);
15. Murmansk Marine Biological Institute, RAS Kandalaksha Research Centre (Murmansk);
16. Murmansk Regional Veterinary Laboratory (Murmansk);
17. The research and information centre for bird identification tagging, RAS Ecology Evolution Institute (Moscow);
18. Vyärrio Research Station, Finland;
19. The Research Station of the Gulf of Bothnia, University of Oulu, Finland;
20. Public movement 'For Kutsu', Salla, Finland;
21. The Polar Alpine Botanical Garden Institute, RAS Kandalaksha Research Centre;
22. Petrozavodsk State University (Petrozavodsk);
23. Polyarnozorinsky Department, the Russian Geographical Society;
24. Knipovich Polar Institute of Marine Fisheries and Oceanography (Murmansk);
25. Russian State Hydrometeorological University (St Petersburg);

26. Russian Research Institute of Cultural and Nature Heritage, Ministry of Culture/ RAS;
27. St Petersburg State University (St Petersburg);
28. Environmental Protection Society of Finland, Forestry Research Institute;
29. 'Gandvik' Sport and Health-Improving Camp (Beloye More);
30. 'Udarnik' Ltd. (Beloye More);
31. The Central Kola Prospecting Expedition;
32. Department of Geography, University of Georgia, Athens (USA);
33. Gulf of Finland Environment Society – SULA (Helsinki, Finland);
34. Humboldt University, Berlin Department of Specialized Botany (Germany);
35. Office of the Finnmark County Governor (Finland);
36. University of Rostok, Zoological Department (Germany)

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