

**Intergovernmental Oceanographic Commission
Russian State Hydrometeorological University**

Baltic Floating University Facility



SUMMARY REPORT

**IX International Training through Research Cruise
(RV "Sibiriakov" August 1 - August 19, 2001)**

&

**International expedition in coastal waters of the Gulf of Finland
(Catamaran "Centaurus II" July 12 - August 5, 2001)**



St. Petersburg

2001

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Part 1

IX International Training through Research Cruise

RV “Sibiriakov” (August 1 - August 19, 2001)

Multidisciplinary research in the Baltic Sea and its coastal areas in August 2001 onboard HRV “Sibiriakov” was carried out within the framework of cooperation between Russian State Hydrometeorological University (RSHU) and Head Department of Navigation and Oceanography of Ministry of Defence of the Russian Federation. The survey was aimed at realisation of the international IOC/UNESCO “Floating University” and “TEMA” (Training Education and Mutual Assistance) programmes, Federal Target Program “World ocean”, international project of Ministry of Science and Technologies of the Russian Federation: “Complex research of a coastal area and training of personnel within the framework of UNESCO programs”, Federal Target Program “Integration”: “Field research of dumped chemical weapons influence on the ecosystem of the Baltic Sea, involving students, PhD students and specialists from Oceanology Institute of the Academy of Sciences of the Russian Federation”, programs of Ministry of Education of the Russian Federation, agreement on cooperation with “Sevmorgeo” company: “Evaluation of geoecological situation in the Eastern part of the Gulf of Finland and on the Kaliningrad shelf according to the results of hydrochemical and hydrobiological monitoring”.

Objectives of the expedition

Basic *scientific* objectives of the expedition were to study hydrophysical, hydrochemical and hydrobiological processes in the Baltic Sea and its coastal areas, to carry out geomonitoring in the Gulf of Finland and on the Kaliningrad shelf and to reveal the influence of dumped chemical weapons on the state of marine environment. Among the main research items were:

- data collection and analysis of hydrophysical, hydrochemical and hydrobiological characteristics in research areas;
- study of spatial-time variability of hydrophysical characteristics on the oceanographic polygons and at the points of the Baltic monitoring system (HELCOM-stations);
- study of spatial-time variability of basic hydrochemical parameters, such as content of dissolved oxygen, hydrogen parameter, alkalinity, nutrients;

- evaluation of poisoning substances content and intensity of corrosion processes through determination of arsenic content and sum of metals in bottom sediments and near bottom waters in the areas of chemical weapons dumping in Bornholm Deep;

- complex evaluation of geocological situation in the Eastern part of the Gulf of Finland and evaluation of character of antropogenic load spreading from the Neva Bay (St.–Petersburg region) to the Gulf of Finland Proper (using data from the points in the Eastern and Western parts of the Gulf);

- geomonitoring on the Kaliningrad shelf;
- study of species structure and spatial distribution of phyto- and zooplankton biomass;
- chlorophyll ‘a’ definition.

Educational tasks of the expedition included:

- application of the “training through practice and research” principal by involving students from different countries in field research;
- thematic lectures and seminars, also using video materials;
- field practice for RSHU students and for students from Universities of Spain, Portugal, Great Britain and Sweden;
- discussion of results obtained during the concluding seminar.

General organisational objectives were:

- to hold the mid-cruise seminar in Stockholm dedicated to discussion of preliminary results of research and presentation of scientific projects by students of European Universities;
- to hold “round table” dedicated to the issues of sustainable development of the Baltic region.

Expedition was held onboard HRV “Sibiriakov” from August 1 till August 19 (see Appendix 1 for positioning). The vessel has made a call to Stockholm (August 6 – 9).

Expedition participants

Scientific crew included 38 members: lecturers and employees of the Oceanography Department at RSHU (13 persons), “Sevmorgeo” company (3 persons), Academy of Sciences of the Russian



International crew of students onboard RV “Sibiriakov” in Kronshtadt (Russia)

Federation (1 person), Scientific Research Institute of Television (2 persons), students of the Oceanography Department at RSHU (5 persons), students from the Universities of Cadiz (Spain) and of Aveiro (Portugal) (4 and 4 persons, accordingly), 2 students from the Plymouth University (Greta Britain), and 1 student from Uppsala University (Sweden) (see Appendix 3).

Theoretical part of the educational process

The following lectures have been given before and during the expedition:

Prof. G. Shapiro (Institute of Marine Studies, University of Plymouth, GB)	<ol style="list-style-type: none"> 1. Internal waves in the shelf seas. 2. Heating - mixing balance on the shelf.
Dr. D. Pilgrim (Underwater Science Laboratory, University of Plymouth, GB)	Development of underwater video techniques at the University of Plymouth.
Prof. A. Rybalko (Sevmorgeo, Russia)	<ol style="list-style-type: none"> 1. Sedimentation processes in the Baltic Sea. 2. Hydrogeochemical processes in areas of chemical weapons dumping.
Prof. O. Korneev (Sevmorgeo, Russia)	Parameters of general atmospheric circulation.
Prof. G. Frumin (RSHU, Russia)	<ol style="list-style-type: none"> 1. Recent environmental problems of the Baltic Region. 2. Ecological risks 3. Influence of chemical weapons dumped into the Baltic Sea after the World War II on the state of marine environment.
Dr. M. Shilin (RSHU, Russia)	<ol style="list-style-type: none"> 1. Physical Geography of the Baltic – video, discussion. 2. Life in the Baltic Sea – video, discussion. 3. Eutrophication of the Baltic Sea – video, discussion. 4. The Baltic Region in History – video, discussion. 5. Industrial Emissions and Toxic Pollutants – video, discussion. 6. Toxicology – the Environmental Impact – video, discussion. 7. Sustainable Development in the Baltic Region – round table.
Dr. P. Provotorov (RSHU, Russia)	About thermochaline structure of the Baltic Sea.
PhD R. Vankevych (Centre for Ecological Monitoring, Russia)	<ol style="list-style-type: none"> 1. Organisation of observations dataset. 2. Filed data processing in GIS. 3. Visualisation of datasets.

Work in laboratories onboard the vessel

All the students are always involved into work of laboratories onboard the vessel. Everyone had the opportunity to get acquainted with equipment and was provided with theoretical background in every laboratory and expressed real interest in participating in fieldwork. HRV "Sibiriakov" has 5 main laboratories for: geology, chemistry, hydrology, biology and meteorology.

Geology lab. Geoecological works included complex study of bottom sediments, near-bottom and silt waters. Samples were taken with a grab and a core sampler to obtain sediments column and near-bottom waters. Samples taken were used to carry out geochemical analyses of sediments, oil content analyses and heavy metals analyses. All samples were fixed with nitrogen



Students working in the chemistry lab acid.



Sampling for phytoplankton

Express-analytical studies of bottom sediments, silt and near-bottom waters onboard the vessel included determination of water temperature, dissolved oxygen content, pH, Eh and conductivity.

Chemistry lab. There was a big diversity of work in this laboratory. The following characteristics were determined: dissolved oxygen concentration, alkalinity, pH, concentration of phosphates, nitrites, nitrates and silicates. Knowledge of methodology and practical skills of students were widely used there.

Biology lab. In this laboratory in order to control eutrophication processes complex phytoplankton study was carried out, including: determination of phytoplankton biomass and biodiversity,

chlorophyll 'a' concentration (using Mini Back Scate fluorimeter), water colour and transparency measurements. Students participated in sampling and conservation of phytoplankton samples, in measurements of water colour and transparency and in chlorophyll 'a' determinations.

Hydrology lab. SBE-19 SeaCat CTD-system was used to obtain continuous temperature, salinity and density profiles. CTD was accomplished by automatic bottle cassette SBE-32. It consists of 12 bottles with volume of 1.7 litres each. Students learned how to work with software designed to operate CTD-system, how to extract data from CTD's memory and to process them.

Meteorology lab. Students learned how standard meteorological observations are carried out, how telegrams are drawn up with special codes and where they are sent. They have got acquainted with faximile equipment for receiving weather charts and with experimental equipment "Syuzhet-M" for receiving satellite images. During the expedition 65 satellite images from NOAA 12 and NOAA 14 satellites and 30 faximile weather charts from Offenbach radio centre (Germany) were obtained. Satellite images were used to make short-term weather forecasts more accurate.

This year one more laboratory was introduced – *data processing laboratory*, equipped with computers with installed GIS software. Students had free access to this laboratory and learned the main principles and methods of field data processing.

Seminar in Stockholm

August 6, 2001 the vessel has made a call to Stockholm. BFU participants have visited Stockholm University, where lecturer of the University Dr. O. Savchouk held an excursion. The trip was organised with assistance of adviser for education of the embassy of the Russian Federation in Sweden I. Larin.

August 7 the mid-cruise seminar started its work (see Appendix 2). Secretary General of National Commission of UNESCO in Sweden A. Fallk, adviser for science and technology V. Arkhipov, lecturer of Stockholm University Dr. O. Savchouk, scientific staff of the expedition and students participated. The working part of the seminar was opened by the chief of the BFU 2001 expedition T. Eremina, who spoke about the BFU program and its tasks. Then A. Fallk has marked in his speech that he is especially glad to welcome an international crew of experts who carry out practical ecological research of the Baltic sea. Now many are ready to speak about ecological problems of the Baltic, but not many are engaged in practical activities. Mr. Fallk has expressed a wish about extending the spectrum of problems under investigation

and the firm belief that the collected materials of research will be of large scientific and applied importance. All the speakers expressed approval and support to the BFU program. Then the students of foreign Universities presented their scientific projects, the RSHU student spoke about the results of research in the Gulf of Finland.

After a break Dr. O. Savchouk has read a lecture about the problem of eutrophication of the Baltic Sea. In the evening ambassador of the Russian Federation in Sweden N. Sadchikov has arrived onboard HRV "Sibiriakov". He has examined the vessel, has got acquainted with work of the BFU program.



Visit to Uppsala University

August 8 the director of the "Baltic University" program Prof. L. Ryden organised a visit to Uppsala University. At faculties of Plant Ecology, Hydrology and Meteorology lectures were read about scientific work conducted by these faculties.

Preliminary research results

During the expedition 74 hydrological stations were carried out in total, among them 72 stations with full complex of hydrochemical definitions and 20 stations with geocological measurements.

On the basis of data collected, processed and analysed it is possible to make the *following conclusions*.

Fields of temperature and salinity in the Eastern part of the Gulf of Finland are normal for the summer season. Maximal warming of the surface layer up to 19.5 °C is marked in the Southern part of the Gulf, the salinity is increased in the western direction from 2 up to 4 ‰. Cold intermediate layer (CIL) is traced at stations with depths of more than 50 m, that correspond to the depth of penetration of autumn - winter convection in the Gulf of Finland.

Thermochaline structure of waters on the HELCOM-section is composed of three (four - at stations with depths exceeding 60 m) layers: upper homogeneous on temperature, salinity and density, intermediate cold and deep. Intermediate water mass consists of a seasonal thermocline and underlying CIL. The differences in values of T and S on twice repeated (with

a week interval) stations are insignificant and on temperature do not exceed 0.5 °C, on salinity - 0.2 ‰ in the upper layer.

As a whole, background thermochaline structure in August 2001 is typical for summer season and is close to average multiannual. No indicators of recent inflows of water from the North Sea are observed.

Primary processing of *hydrochemical* and *hydrobiological* observations gives the following results:

- content of dissolved oxygen in upper layers is close to saturation. In deep layers content of oxygen is sharply decreased, quite often achieving analytical zero. In 31 % of samples obtained from near-bottom layers percent of saturation of water with oxygen is less than 10 %, and in 74 % of samples- less than 50 %. Practically, deficit of oxygen in near-bottom layers is characteristic for all deep water stations (depth more than 50 m). At stations BY 11 (H = 204 m), BY 15 (H = 116 m), BY 19 (H = 135 m), BY 20 (H = 172 m), BY 21 (H = 115 m), BY 28 (H = 173 m) and BY 29 (H = 180 m) content of oxygen is equal to zero;

- in near-bottom layers of deep parts of the Sea periods of waters renewal take turns with stagnation phenomena, when oxygen is completely spent and accumulation of hydrogen sulphide takes place. So, on the station BY 11 on the depth of 200 m (close to the bottom) content of hydrogen sulphide was 1.45 ml/l;

- rather low concentrations of phosphates (values from 0 up to $10.6 \cdot 10^{-6}$ g/l) and nitrates (values from 0 up to $26.9 \cdot 10^{-6}$ g/l) are observed in the surface layer. In deep layers below the jump of density content of phosphates due to the process of regeneration of organic matter is sharply increased up to a maximum at the bottom ($187.8 \cdot 10^{-6}$ g/l on the station 40F). Concentration of nitrites is very low (maximum value $14.1 \cdot 10^{-6}$ g/l in the surface layer on the station BY21 and $13.1 \cdot 10^{-6}$ g/l in the near-bottom layer at the same station);



Spanish student presenting results obtained in the chemistry lab

- due to intensive river run-off sea waters have high concentration of dissolved silicon reaching its maximum in the surface layer on the station BY 21 ($240 \cdot 10^{-6}$ g/l) and in the near-bottom layer on the station BY 20 ($2185 \cdot 10^{-6}$ g/l). For silicon the most typical distribution is an increase of concentration with depth;

- long-term development of anaerobic processes in Bornholm Deep indicates the absence of water inflow from the North Sea during last years. In this case bottom sediments are completely lifeless and conditions for migration of chemical components, including products of destruction of dumped German trophy chemical weapons and corrosion of bodies of shells and bombs, are favourable. This, probably, explains the fact, that practically in all samples taken (in Bornholm Deep) the sum of metals (semiquantitative express - definition) was rather significant, and at three stations in silt and, partially, in near-bottom waters (stations BH1, BH3, BH4) arsenic was found. Chemical poisoning substances can be its possible source, arsenic has never been found in Bornholm Deep before;

- in the near-bottom waters (+1 m) of Bornholm Deep increased concentrations of lead are marked at all stations (see the Table). Station BH-1 especially stands out due to increased content of arsenic. On cadmium increased concentrations are observed at the point BH-5 in the centre of polygon. In comparison with 1995 maximum lead concentration in this area has increased almost in 7 times, and zinc - in 1.5 times. At the same time concentrations of cadmium and copper have clear tendency to decreasing. Final conclusions can be formulated after data on geochemistry of silt waters and bottom sediments are obtained.

Content of heavy metals ($\cdot 10^{-6}$ g/l) in near-bottom waters of Bornholm Deep (2001)

№	Station №	Cd	Pb	Zn	Cu
1	BH-1	not/found	782.87	367.86	3.3
2	BH-2	n/f	88.78	47.88	1.28
3	BH-3	n/f	113.73	177.12	n/f
4	BH-4	0.75	137.32	32.56	n/f
5	BH-5	1.72	75.96	67.46	4.58
6	BH-8	0.51	76.8	255.32	n/f
7	BH-9	n/f	5.76	11.22	2.06
8	Maximum Permitted Concentration	1.0	10.0	100.0	5.0

- phytoplankton of the Baltic Sea Proper in comparison with phytoplankton in the Gulf of Finland and, especially, its Eastern part was characterised by rather low taxonomic diversity. Almost everywhere small-cellular cryptomonades had the leading position and only

in the Gulf of Finland blue-green *Nodularia spumigena* and *Aphanizomenon flos-aquae* - traditional dominants of summer plankton - also prevailed. General phytoplankton biomass varied within the limits of 0.07-3.28 mg/l;

- benthic organisms were observed in the Eastern part of the Gulf of Finland. On sections 5F - 7F and 8F - 11F the community, typical for the area of muddy bottoms, *Macoma balthica*, was found. The number of this mussel achieves here 5 - 7 spc/sq.m. Average size of a specimen – 1.5 cm. Apparently, it is possible to explain the absence of other species by presence of black silts indicating anaerobic conditions. On a section 22F - 29F the community of *Pontoporeia affinis*, on clay bottom was found. The density of population reaches 40 spc/sq.m;

- samples taken in the Baltic Proper did not contain alive benthic organisms. In Gotland Deep near-bottom suspension - with a smell of hydrogen sulphide, benthos is absent. In Bornholm Deep sediments are of black colour, with pronounced smell of hydrogen sulphide. On the only station BH-1, where in the sample of bottom sediments light oxidated layer was found, macrobenthos was also absent. In the sediments layer of light colour empty shells are widely present showing the existence here of mussels settlements in the recent past. The similar picture is observed on the Kaliningrad polygon. Comparison of these results with data from last year's researches permits to make a conclusion that the situation in deep water areas of the Baltic Sea can be characterised as stably unfavourable for benthic communities.

All data collected have passed primary processing, and are available in the form of tables, diagrams, vertical sections and charts.

During the cruise for the first time in practice of expedition research at RSHU transfer of collected data and results of primary processing was realised in a mode of real time through the Internet to the WEB-site of the University. Thus the information obtained onboard the HRV “Sibiriakov” just in some hours after sounding became accessible to any user of the global network. Data transmission was carried out with the help of radiomodem “Nokia” with velocity of 9600 Kb/s, in areas of the Baltic Sea covered by operators of the cellular telephone companies.

Part 2

International expedition in coastal waters of the Gulf of Finland

(Catamaran “Centaurus II” July 12 - August 5, 2001)

The BFU field research programme for the coastal areas of the eastern Gulf of Finland has been implemented by the VI research cruise of the sailing catamaran Centaurus-II in July - August, 2001. The expedition activities were concentrated in the areas adjacent to the southern and northern coasts of the eastern Gulf of Finland and situated in close vicinity to Leningrad Nuclear Power Plant (Koporye Bight) and to the site of large-scale engineering works related with Ust-Luga Port construction (Luga Bight). The programme of the expedition was agreed with the Finnish Institute of Marine Research, Helsinki.

Objectives of the expedition

The main objectives of the expedition were as follows:

- study of thermohaline structure of the Luga-Koporye region and determination of spatial distribution of basic hydrochemical characteristics (concentration of dissolved oxygen, hydrogen ions, nutrients) through performing a complex surveying over the standard grid of oceanographic stations (the ‘BFU polygon’, see Appendix 2) with the aim of estimating the regime of mentioned parameters and their variation from year to year;
- collection of plankton, benthos and sea bottom samples in Koporye Bight, Luga Bight and Viborg Bay with the purpose:
 - to estimate the taxonomic composition as well as the biomass and abundance of dominant plankton species at the grid of hydrobiological stations to study their inter-annual variations in the area under investigation;



Catamaran “Centaurus II”

- to estimate the taxonomic composition and abundance of dominant benthos species with special attention to supposed introducents (invasive species);
- to assess the occurrence of toxic phytoplankton species and to study the presence and bioaccumulation of algal toxins in the tissues of molluscs and other marine organisms;
- to analyse sea bottom samples and the tissues of marine organisms for the presence and concentration of heavy metals (HM).

Expedition participants

The scientific crew partially changed during the cruise. The total amount of participants was 37, including 27 students (23 students from RSHU, 2 students from the University of Cadiz, Spain, and 2 students from the University of Aveiro, Portugal). Together with RSHU specialists and students a hydrobiologist from the Zoological Institute (Russian Academy of Sciences) took part in the expedition.



International crew of the catamaran

Educational work

Educational work during the cruise included:

- lectures onboard the catamaran on environmental and ecological problems of the Gulf of Finland;
- training in practical field oceanographic works;
- diving instructive exercises with special emphasis on yielding common comprehension of conventional signals, commands and replies as well as underwater work regulations for Russian, Spanish and Portuguese students-divers;
- meeting with teachers and students from the ecological school № 7 (Sosnovyi Bor) and a joint trip onboard the catamaran with training field works;
- international seminar in Sosnovyi Bor.

Seminar

The seminar on methods of underwater research was held on the basis of ecological school № 7 in Sosnovyi Bor on July 21, 2001 with the basic lecture by Prof. D.A. Pilgrim (Plymouth Environmental Research Centre, University of Plymouth, United Kingdom) dedicated to two topics:

- 1) Estimation of optical coefficients from diver observations of visibility, and
- 2) ROV (Remotely Operated Vehicle) image scaling with laser spot patterns.

The list of participants included:

- students (12) and researchers (10) from the Russian State Hydrometeorological University (Russia),
- the lecturer and students (2) from the University of Cadiz (Spain),
- students (2) from the University of Aveiro (Portugal),
- students (7) from the University of Lodz (Poland)
- students and teachers from the ecological school № 7 (Russia).

Prof. A. Nekrasov (RSHU) introduced main environmental problems of the Gulf of Finland. Dr. G. Gogoberidze (RSHU) gave a report about the principal objectives and preliminary results of the VI cruise of Centaurus-II. Reports about their activities were given by Dr. A. Izquierdo (University of Cadiz), Mr. Tiago Repolho (University of Aveiro), Mr. P. Moniemski (University of Lodz), Mrs. L. Serdyukova (school № 7).

Preliminary research results

Thermohaline structure and hydrochemical characteristics

Hydrological conditions in the Luga-Koporye region were determined by rather warm and very calm weather during the most of July. The surface water temperature and salinity in the middle of July were typical for the end of the month (18–19°C and 3.0–3.5‰) while the depth of the upper mixed layer remained small – not more than 4–6 m. Intensive heating together with low mobility of upper layers resulted in formation of littoral strip with higher temperatures bordering some parts of the coastline. At the same time, the signs of upwelling (reduced surface temperature of about 16°C) can be seen in some near-shore places in the Luga Bight indicating the relative dynamism of deeper and near-bottom waters ($T \approx 3-4^{\circ}\text{C}$, $S \approx 4-5\text{‰}$) moving along two bottom troughs from the north to the south.

Oxygen and hydrogen ions concentrations were found close to their normal values. The concentrations of nutrients generally answered existing water quality normative requirements

for fishing areas. Content of nitrates was lower than in preceding years with the highest values being related to the mouth of the Luga river. Content of phosphates was a little higher than in preceding years but remained within the existing requirements. The concentrations of nitrites were practically negligible.

Collection and preliminary analysis of plankton, benthos and sea bottom samples allowed:

- to get an estimation of total abundance of zooplankton and macrozoobenthos. For the moment the analysis of phytoplankton and more detailed taxonomic determinations are not yet fulfilled and are to be performed in the nearest future for being then compared with the data of



Diving in the Gulf of Finland

preceding years;

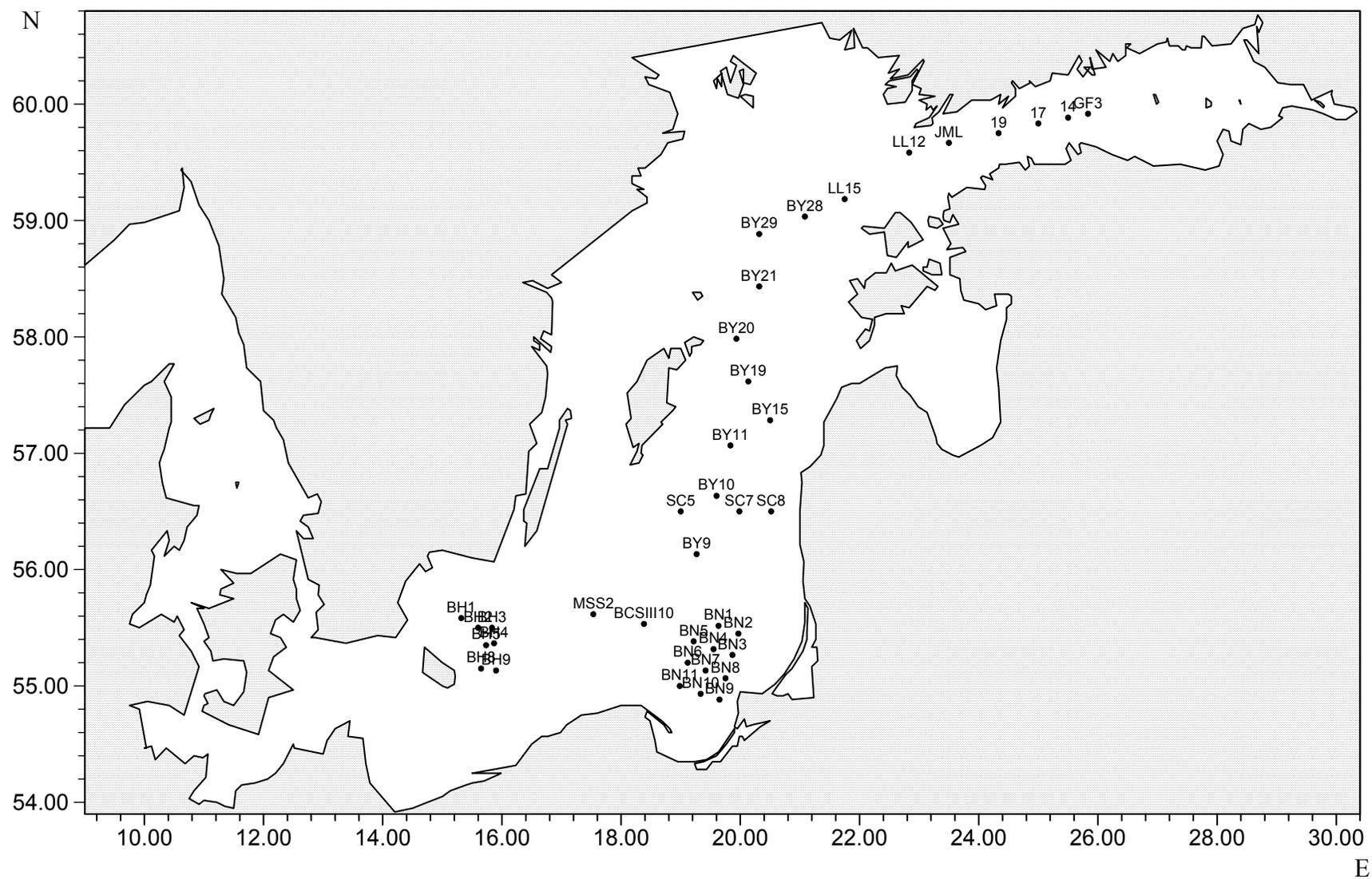
- to bring out the introducents among the benthos species, like *Cercopagis* and *Dreissena*, with their maximum abundance in the eastern part of Luga Bight and in the vicinity of Sosnovyi Bor. An estimation of *oligohaete index* was made for Koporye and Luga Bights indicating the unfavourable ('questionable') ecological state of some areas mainly adjacent to the mouths of the rivers (Luga et al.);

- to prepare samples of phytoplankton, mussels and fish for analysis for algal toxins in their tissues and to forward these samples to the Finnish Institute of Marine Research;

- to take and analyse for heavy metals (Cd, Cu, Zn, Mn, Pb) samples of sea bottom sediments (two samples from the Luga Bight and two ones from the Viborg Bay) and one sample of fish tissues (from the Luga Bight). The HM distribution was estimated showing that HM composition in Luga-Koporye region and Viborg Bay are similar, but the concentrations are higher in the latter.

APPENDIX 1.1

Scheme of hydrological stations, BFU'2001 expedition



APPENDIX 1.2

PROGRAM OF THE MID-CRUISE SEMINAR “MANAGING THE SEA”

1st day: August 6, 2001

Visit to the University of Stockholm, Department of Marine Ecology.

Lecture by Dr. Oleg Savchouk:

MANAGING THE SEA.

2nd day: August 7, 2001

WORDS OF WELCOME

1. Dr. Tatjana Eremina, RSHU, Head of the Expedition: Opening the Seminar.
2. Valerij Arkhipov, Russian Embassy in Sweden, Counsellor for Science and Technology: Words of Welcome.
3. Anders Fallk, UNESCO General Secretary in Sweden: PERSPECTIVES OF THE FUTURE CO-OPERATION.
4. Alexander Pyshkin, “Sibiriakov”’s Captain: ALEXANDER SIBIRIAKOV, NORDENSHELD’S POLAR TRIP AND INTERNATIONAL COLLABORATION ON THE SEA.
5. Dr. Michael Shilin, RSHU: Introducing the international students’ team.

STUDENTS’ PRESENTATIONS

1. Andrej Rakov, RSHU
PRELIMINARY RESULTS OF OCEANOGRAPHIC OBSERVATIONS IN THE GULF OF FINLAND.
2. Cecilia Elizabeth Enriquez de Marino, Plymouth University, Great Britain
SEDIMENT TRANSPORTATION BY MESOSCALE EDDIES.
3. Carmen Casado Martinez, and Francisco Lopes Castejon, University of Cadiz, Spain
MARINE SCIENCES: A BET FOR THE FUTURE THAT BECAME TRUTH.
4. Luis Miguel de Almeida Tomas, University of Aveiro, Portugal
SYNOPTIC CHARACTERISATION OF THE LONGITUDINAL GRADIENTS OF THE RIA DE AVEIRO.

Coffee- break

Lecture by Dr. Oleg Savchouk, Stockholm University (Sweden):
MODELLING THE EUTROPHICATION PROCESS.

3^d day: August 8, 2001

Visit to the University of Uppsala, Departments of Aquatic Plants Ecology, Hydrology, Meteorology, and the Baltic University Program staff.

Lunch

LECTURES:

Prof. Lars Ryden

INTERNATIONALISATION OF THE EDUCATION IN THE BALTIC SEA REGION,
AND THE BALTIC UNIVERSITY PROGRAM.

Prof. Kerstin Wallstroem

PLANTS ECOLOGY OF THE BALTIC SEA.

Svenja Bosse

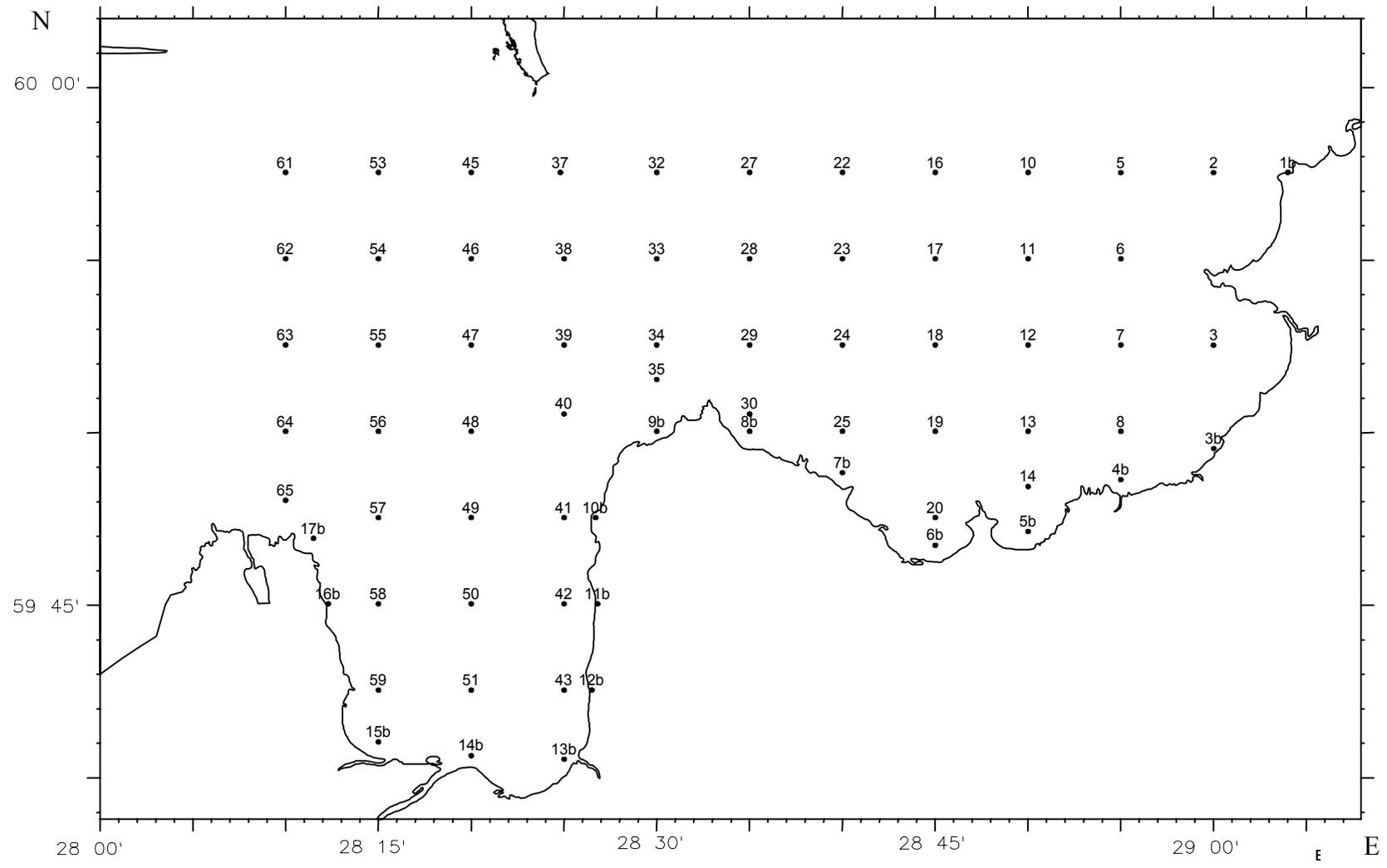
EPILOTHIC DIATOM COMMUNITIES IN THE BOTHNIAN GULF.

Dr. Lars Christian Lundin

MODERN PROBLEMS OF THE HYDROLOGICAL AND METEOROLOGICAL
SCIENCE

APPENDIX 2

Oceanographic surveying in Luga and Koporye Bights. Position of stations..
(Catamaran Centaurus-II, July,2001)



APPENDIX 3

L I S T

of the BFU 2001 scientific and students crew
(HRV “Sibiriakov” 01.08.2001 – 19.08.2001)

№	Name, country	01.08-06.08	09.08-19.08
1	Dr. Tatyana Eremina (Russia)	+	+
2	Dr. Alexander Averkiev (Russia)	+	+
3	Yuri Sherbakov (Russia)	+	+
4	Sergey Vilenkin (Russia)	+	+
5	Alexey Isaev (Russia)	+	+
6	Larisa Rusina (Russia)	+	+
7	Dr. Michael Shilin (Russia)	+	+
8	Dr. Victor Frolov (Russia)	+	+
9	Prof. Alexander Rybalko (Russia)	+	+
10	Dr. Natalya Fedorova (Russia)	+	+
11	Dr. Petr Provotorov (Russia)	+	+
12	Prof. Grigory Frumin (Russia)	+	+
13	Prof. Oleg Korneev (Russia)	+	+
14	Dr. Dmitry Gustoev (Russia)	+	+
15	Tagir Lakhov (Russia)	+	+
16	Alexey Nikiforov (Russia)	+	+
17	Svyatoslav Tyuryakov (Russia)	+	+
18	Andrey Rakov (Russia)	+	+
19	Elena Ryabova (Russia)	+	+
20	Alexandra Drogan (Russia)	+	+
21	Andrey Skutin (Russia)	+	+
22	Igor Nilov (Russia)	+	+
23	Michael Kovchin (Russia)	+	+
24	Gleb Eremin (Russia)	+	+
25	Cecilia Elizabeth Enriquez de Marino (Mexico)	+	+
26	Clare Hynes (Great Britain)	+	+
27	Luis Miguel de Almeida Tomas (Portugal)	+	+
28	Joana Cardoso Ferreira (Portugal)	+	+
29	Luisa Gabriela Sousa Santos (Portugal)	+	+

№	Name, country	01.08-06.08	09.08-19.08
30	Joao Carlos da Conceicao Melo (Portugal)	+	+
31	Francisco Lopez Castejon (Spain)	+	+
32	Carmen Casado Martinez (Spain)	+	+
33	Pablo Antonio Lara Martin (Spain)	+	+
34	Irene Olive Samarra (Spain)	+	+
35	Gernot Reismann (Austria)	-	+
36	Roman Vankevich (Ukraine)	+	+