



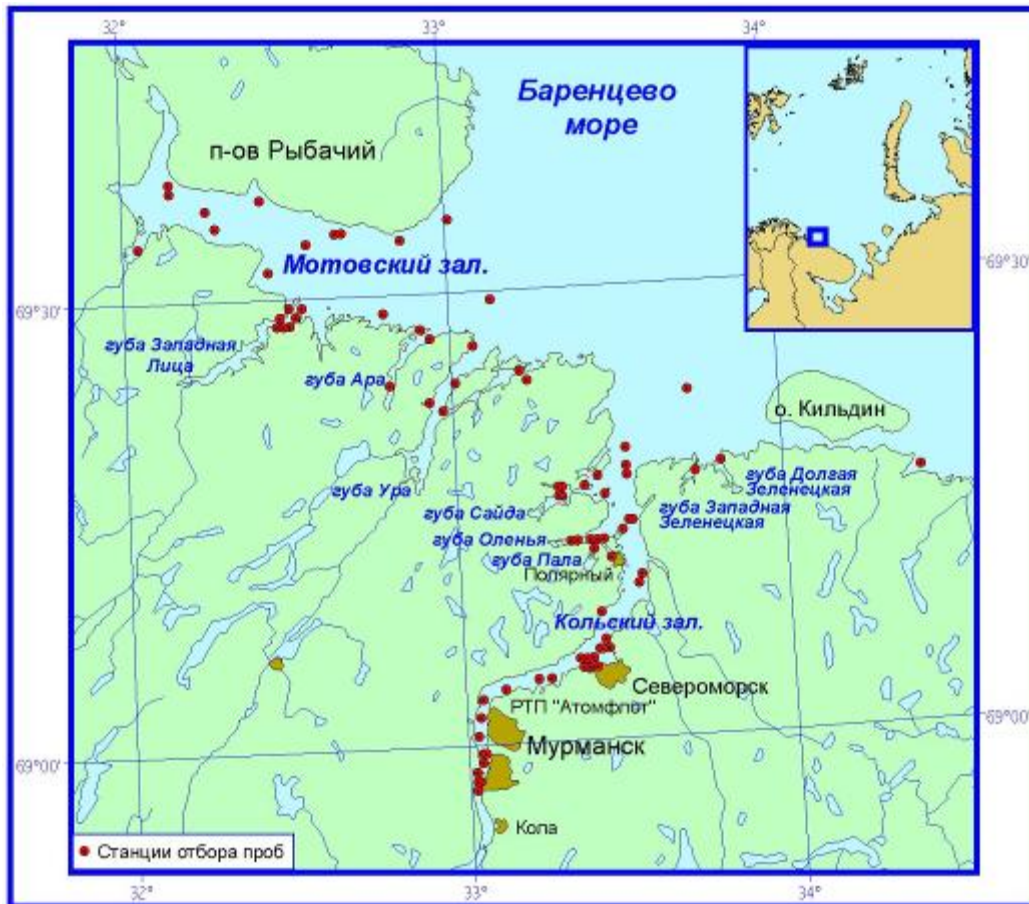
RADIOECOLOGICAL MONITORING OF THE BARENTS SEA COASTAL ECOSYSTEMS

Denis MOISEEV

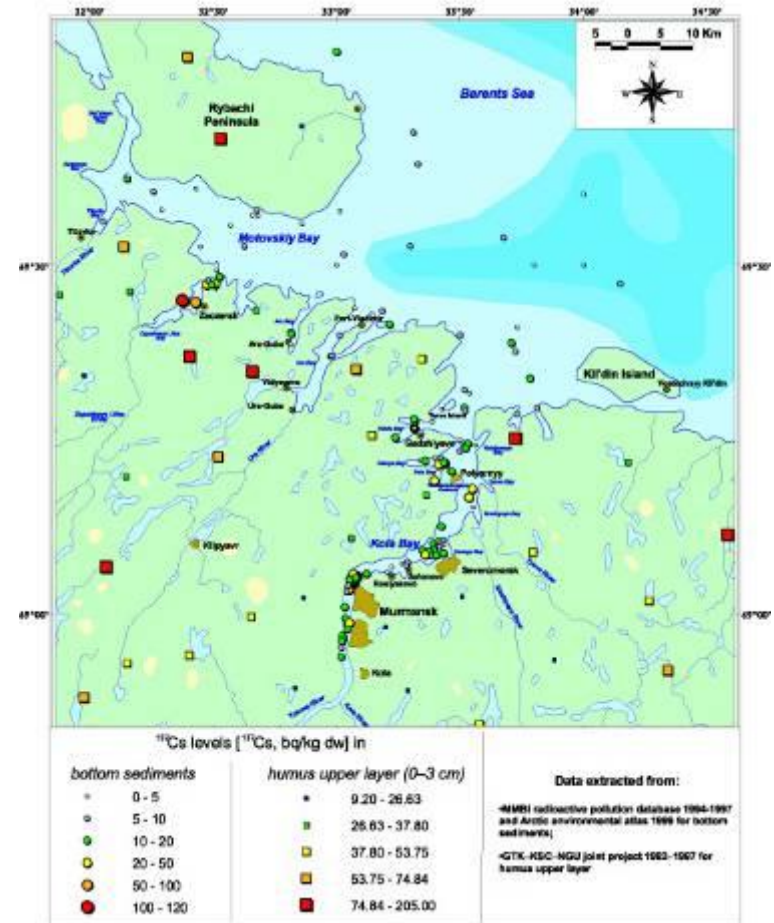
MMBI, MRB of RGS

5 October 2017

MMBI Radioecological Research in 1990-2000s



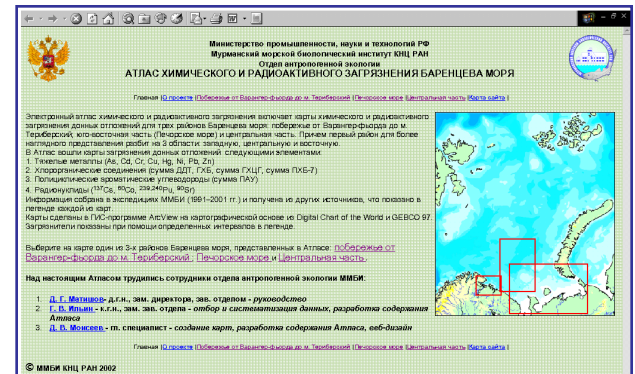
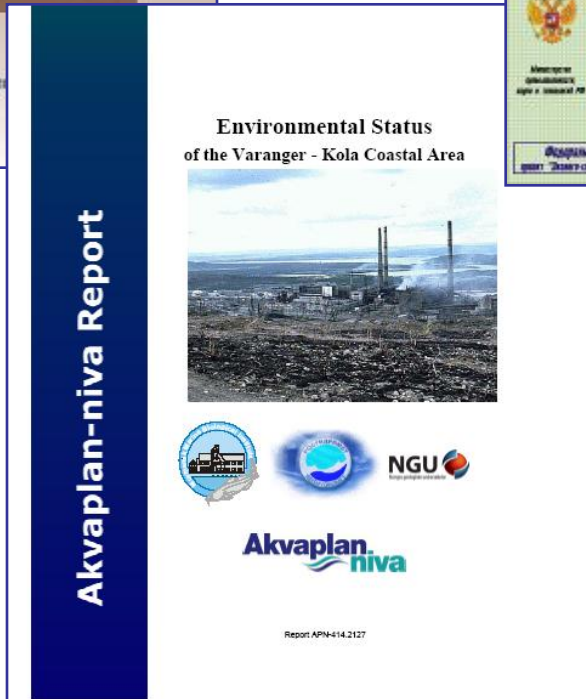
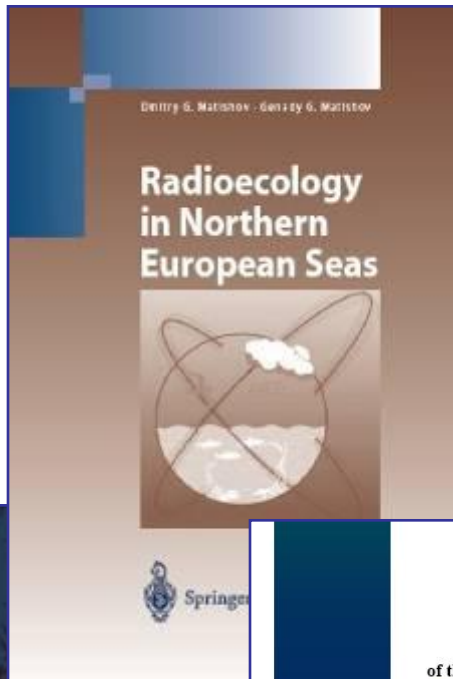
Карта-схема станций отбора проб донных отложений в экспедиции ММБИ на ГС-440 в 1996 г.



GS-440



Database. 1990-2000s



«Environmental Status of the Varanger – Kola Coastal Area», 2003



Akvaplan-niva Report

**Environmental Status
of the Varanger - Kola Coastal Area**

Report APN-414.2127



Atlas of the Chemical and Radioactive Pollution of the Barents Sea, 2003

<http://pollution.mmbi.info>

← → ↻ 🏠 pollution.mmbi.info

🔍 ☆ 🛡️ ☰



Министерство промышленности, науки и технологий РФ
Мурманский морской биологический институт КНЦ РАН
Отдел антропогенной экологии



АТЛАС ХИМИЧЕСКОГО И РАДИОАКТИВНОГО ЗАГРЯЗНЕНИЯ БАРЕНЦЕВА МОРЯ

Главная | [О проекте](#) | [Побережье от Варангер-фьорда до м. Териберский](#) | [Печорское море](#) | [Центральная часть](#) | [Карта сайта](#) |

Электронный атлас химического и радиоактивного загрязнения включает карты химического и радиоактивного загрязнения донных отложений для трех районов Баренцева моря: побережье от Варангер-фьорда до м. Териберский; юго-восточная часть (Печорское море) и центральная часть. Причем первый район для более наглядного представления разбит на 3 области: западную, центральную и восточную.

В Атлас вошли карты загрязнения донных отложений следующими элементами:

1. Тяжелые металлы (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)
2. Хлорорганические соединения (сумма ДДТ, ГХБ, сумма ГХЦГ, сумма ПХБ-7)
3. Полициклические ароматические углеводороды (сумма ПАУ)
4. Радионуклиды (^{137}Cs , ^{60}Co , $^{239,240}\text{Pu}$, ^{90}Sr)

Информация собрана в экспедициях ММБИ (1991–2001 гг.) и получена из других источников, что показано в легенде каждой из карт.

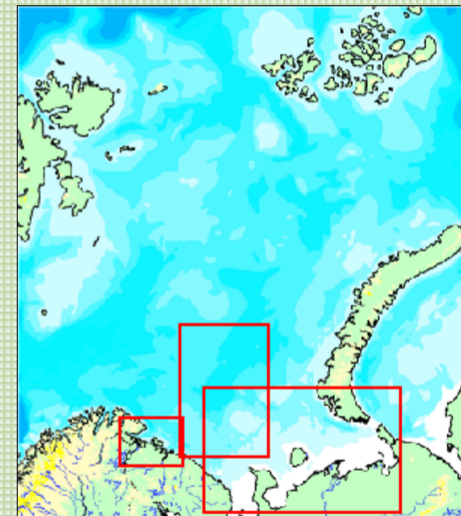
Карты сделаны в ГИС-программе ArcView на картографической основе из Digital Chart of the World и GEBCO 97. Загрязнители показаны при помощи определенных интервалов в легенде.

Выберите на карте один из 3-х районов Баренцева моря, представленных в Атласе: [побережье от Варангер-фьорда до м. Териберский](#); [Печорское море](#) и [Центральная часть](#).

Над настоящим Атласом трудились сотрудники отдела антропогенной экологии ММБИ:

1. [Д. Г. Матишов](#) - д.г.н., зам. директора, зав. отделом - *руководство*
2. [Г. В. Ильин](#) - к.г.н., зам. зав. отдела - *отбор и систематизация данных, разработка содержания Атласа*
3. [Д. В. Моисеев](#) - гл. специалист - *создание карт, разработка содержания Атласа, веб-дизайн*

Главная | [О проекте](#) | [Побережье от Варангер-фьорда до м. Териберский](#) | [Печорское море](#) | [Центральная часть](#) | [Карта сайта](#) |

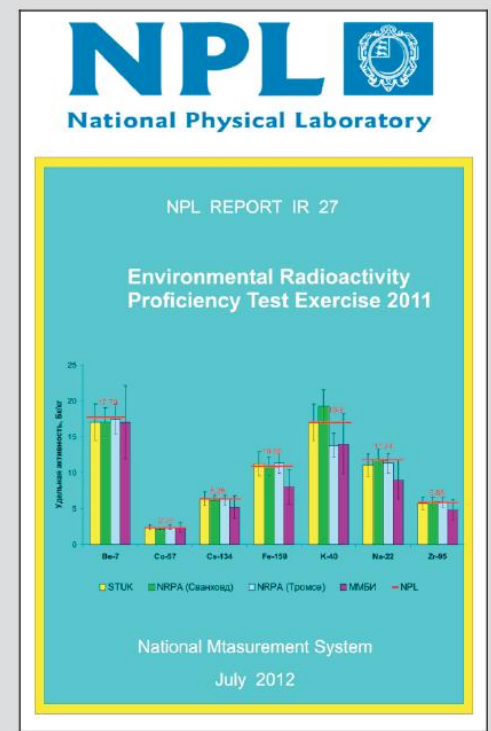
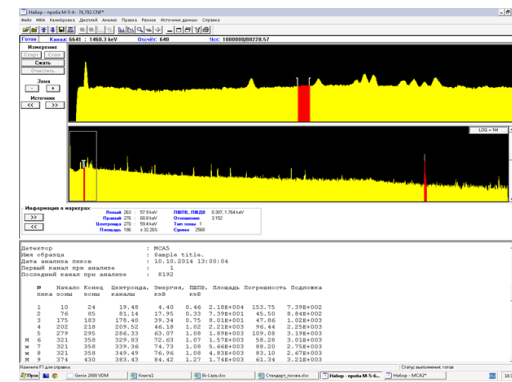


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Последнее обновление: 22.04.2003

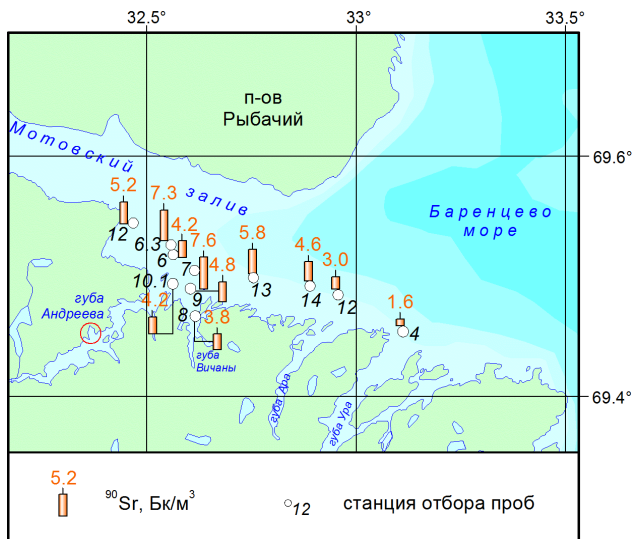
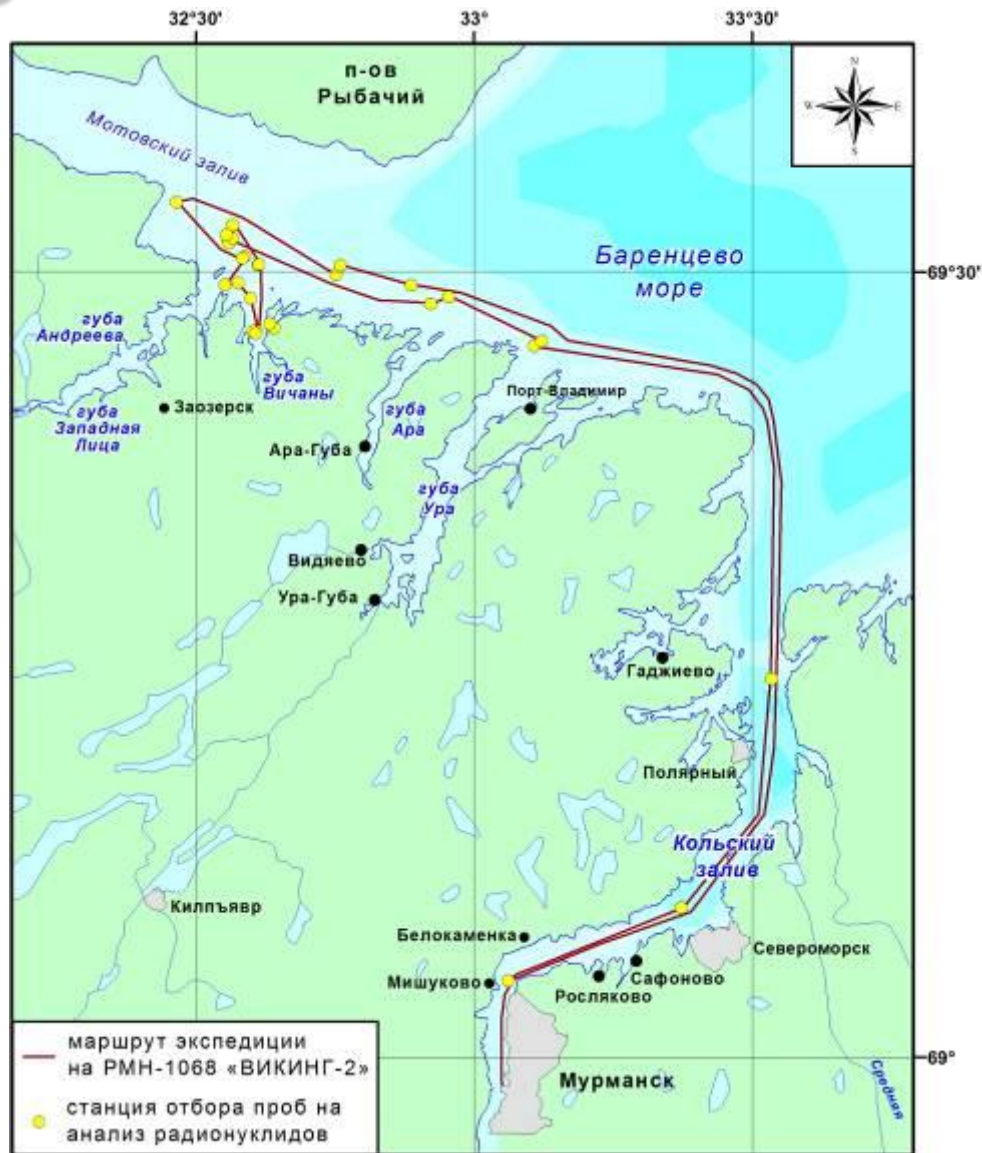


Radiochemical Lab in MMBI



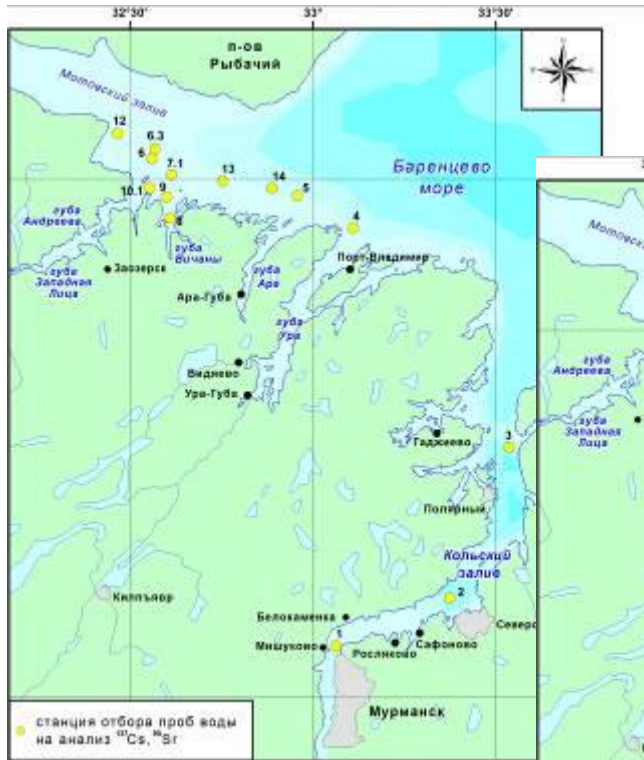
Expedition on board m/v "Viking 2".

4-9 August 2013

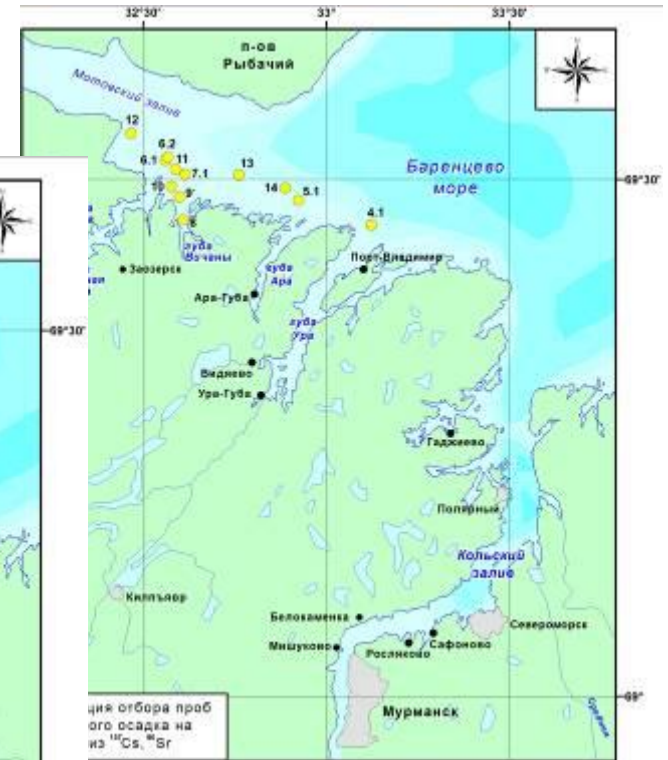


Sampling

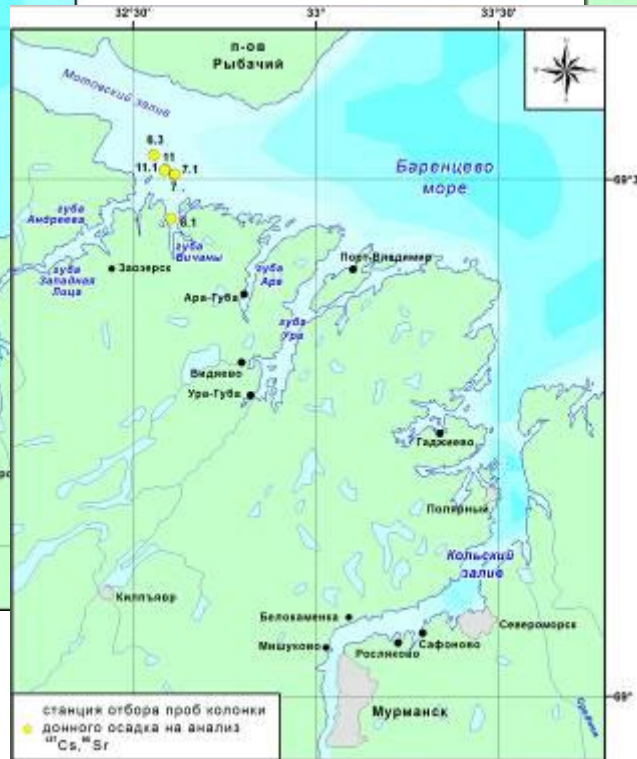
Seawater, 0 m



Bottom sediments (0-2 cm)



Cores of bottom sediments

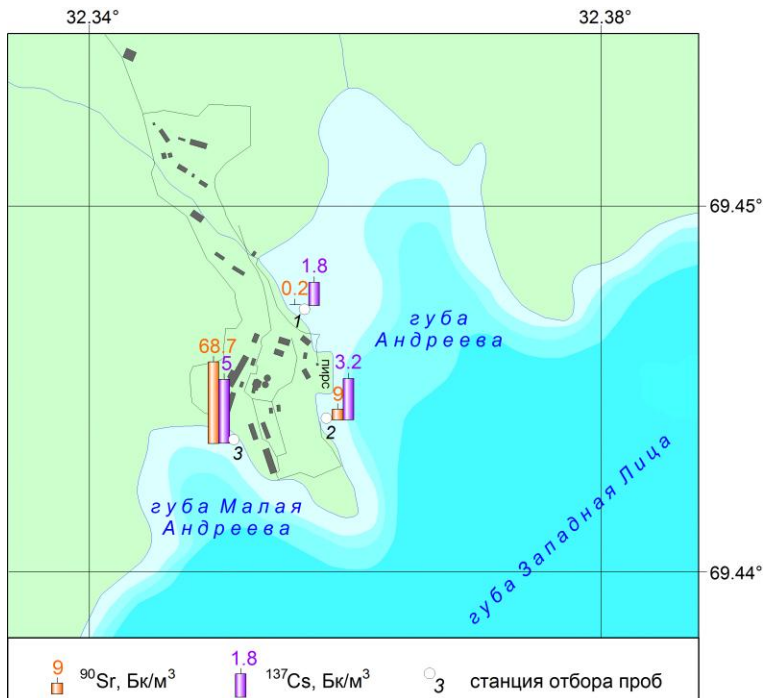


Algae

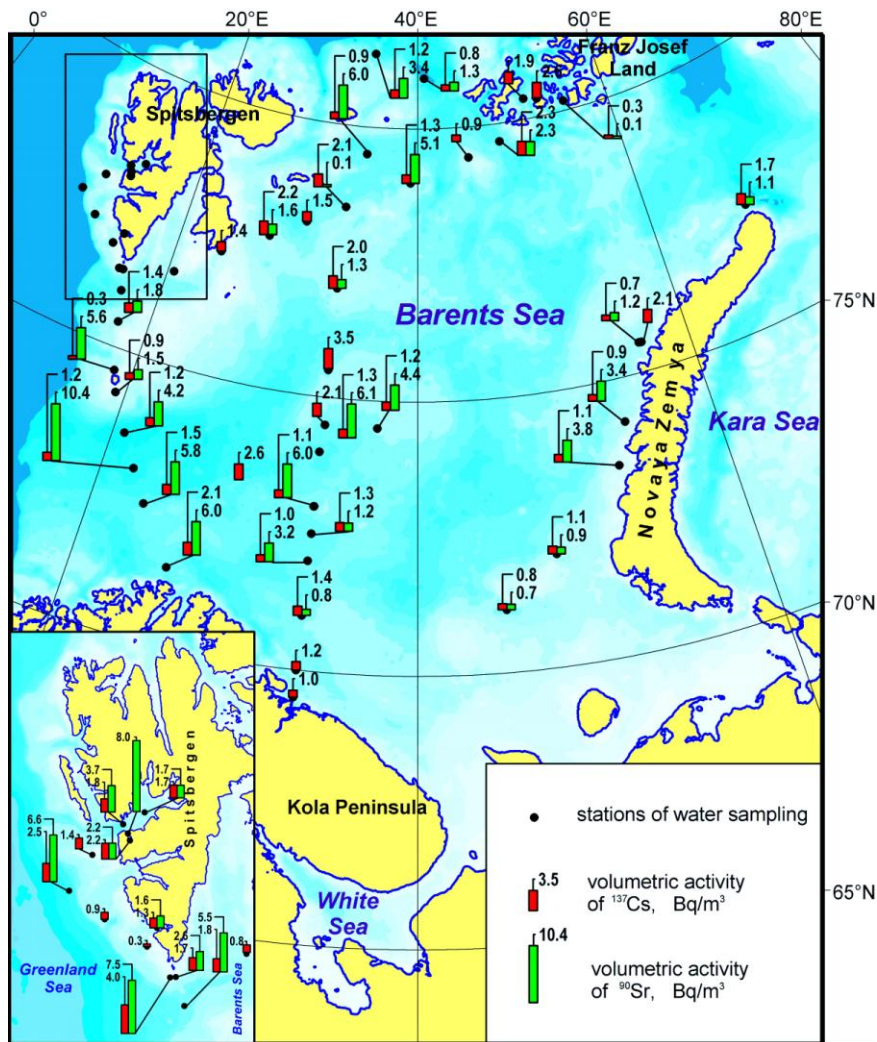


Sampling in the Area of Andreeva Bay, 28 October 2014

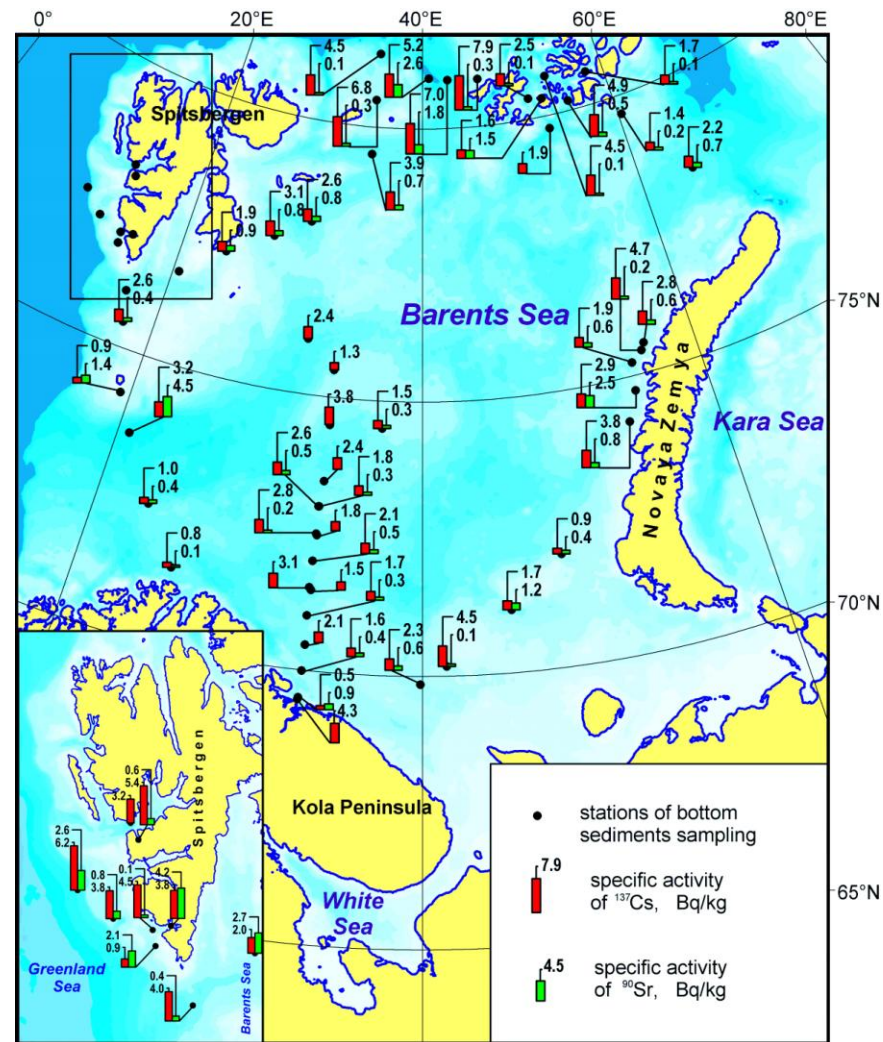
- Seawater, 0 m
- Bottom sediments (0-2 cm)
- Cores of bot. sed.
- Algae



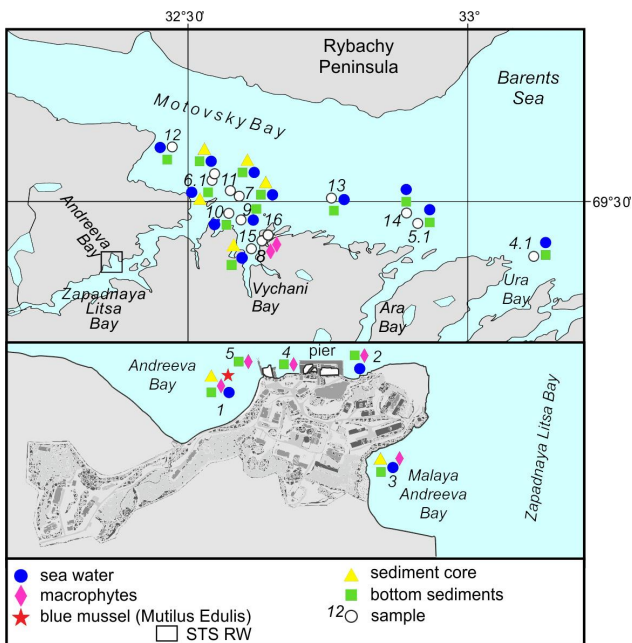
Volumetric activity of the ^{137}Cs and ^{90}Sr in the Barents Sea and the fiords of Svalbard surface waters



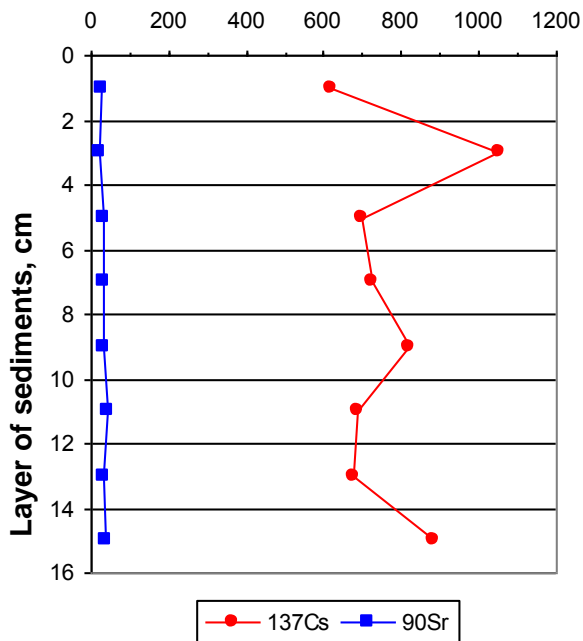
Specific activity of the ^{137}Cs and ^{90}Sr in sediment samples of the Barents Sea and the fiords of Svalbard



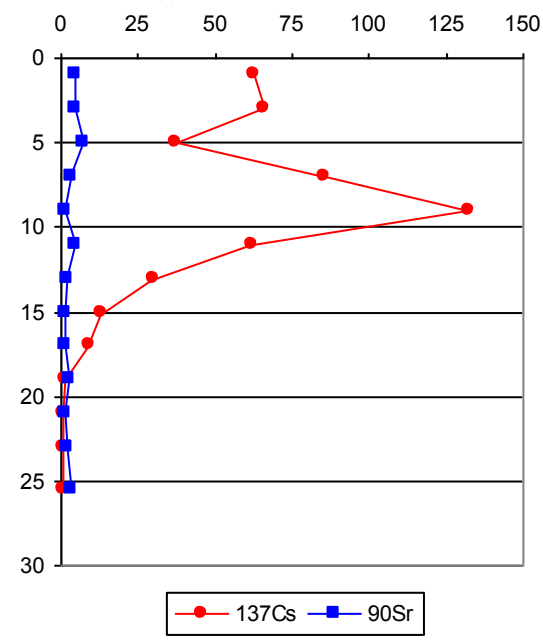
Vertical profiles ^{137}Cs and ^{90}Sr in sediment columns of Andreeva and Malaya Andreeva Bays and marine coastal



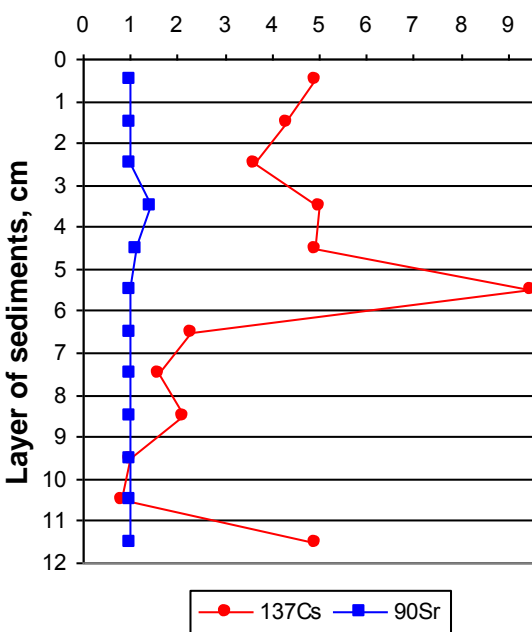
Column № 3 of Andreeva Bay, Bq/kg



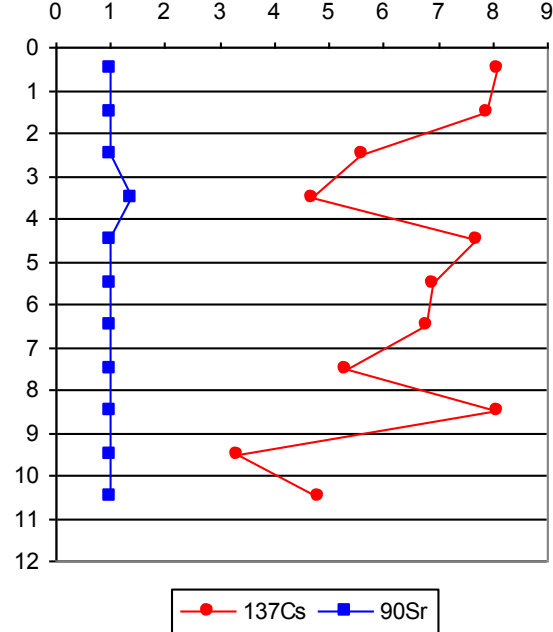
Column № 1 of Malaya Andreeva



Column № 6.3 of Motovskiy Bay, Bq/kg



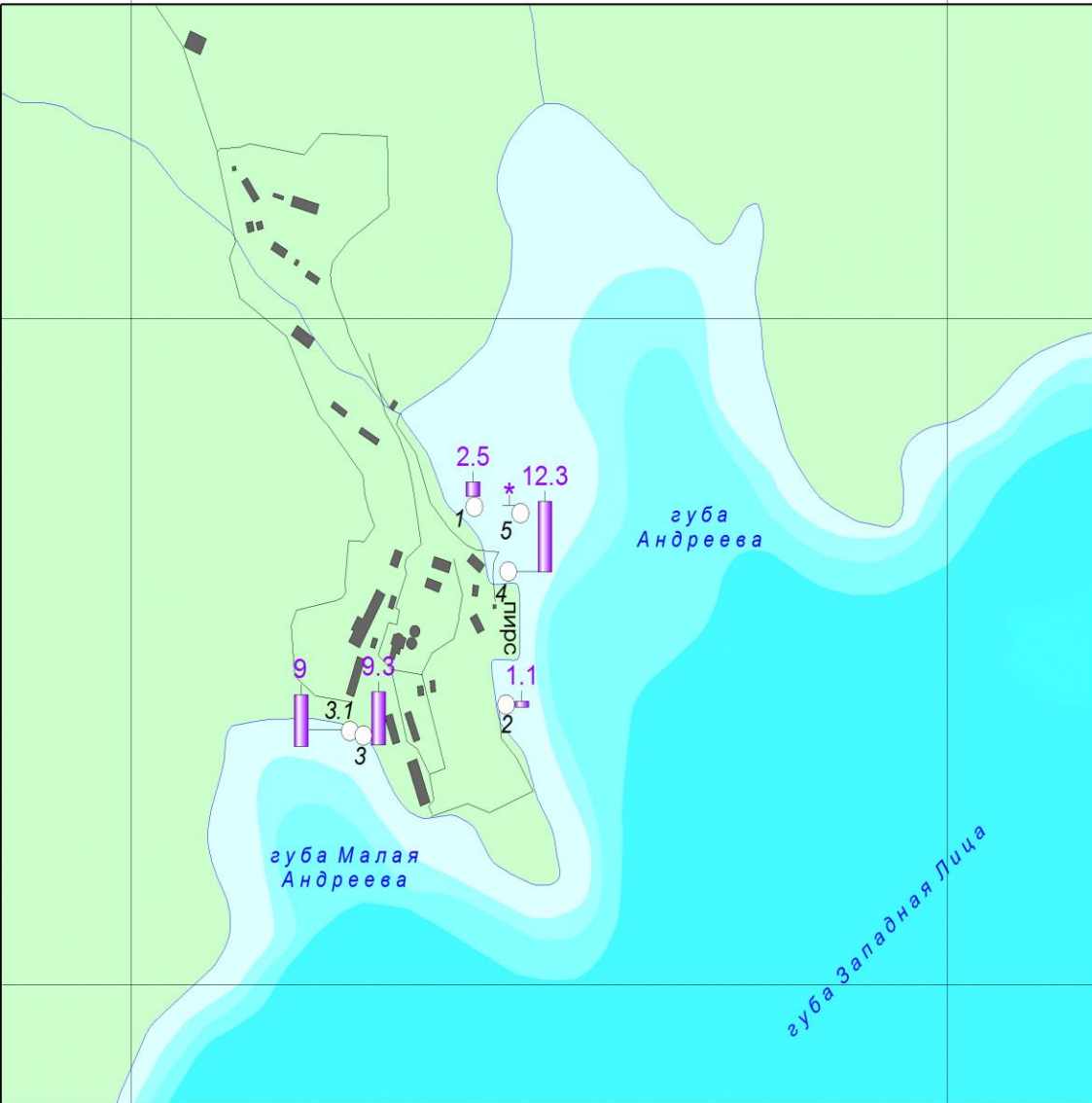
Column № 7 of Motovskiy Bay



Activity ^{137}Cs in sea algae-macrophytes of Andreeva and Malaya Andreeva Bays, 2014

32.34°

32.38°



69.45°

69.44°



9

^{137}Cs , Бк/кг

* < МДА

3

станция отбора проб

Database in ArcGIS

The screenshot displays the ArcGIS Desktop interface with a map of the Murovskiy Gulf. The map shows a green landmass labeled 'Рыбная' and a blue sea labeled 'Муровский залив'. Numerous red and blue dots are scattered across the map, representing data points. The interface includes several windows:

- Table:** A data table with columns: Год, Объект, Станция, Широта, Долгота, ШиротаЮ, ДолготаЮ, ID. The table contains 24 rows of data for the year 1996.
- Identify:** A window showing the coordinates of the selected location: 33° 41.825' E, 69° 30' 48.972" N.
- Table of Contents:** A window on the left showing the map layers: Муровский, Объект, sediment, and Топонома.
- Catalog:** A window on the right showing the file system structure, including folders like 'Итого' and 'База_2013.xls', and files like 'sediment.shp', 'water.shp', and 'Андреева_База.mxd'.

Год	Объект	Станция	Широта	Долгота	ШиротаЮ	ДолготаЮ	ID
1996	данные отловов	3	6924.89	3312.82	69.415	33.214	
1996	данные отловов	4	6934.57	3300.77	69.578	33.013	
1996	данные отловов	5	6934.24	3236.46	69.571	32.668	
1996	данные отловов	6	6933.40	3251.51	69.558	32.859	
1996	данные отловов	7	6934.19	3240.89	69.57	32.682	
1996	данные отловов	8	6931.55	3226.92	69.526	32.448	
1996	данные отловов	9	6928.86	3247.91	69.481	32.797	
1996	данные отловов	10	6934.87	3217.46	69.578	32.291	
1996	данные отловов	11	6936.23	3215.4	69.604	32.267	
1996	данные отловов	12	6937.31	3208.1	69.622	32.152	
1996	данные отловов	14	6933.31	3234.15	69.558	32.569	
1996	данные отловов	15	6936.45	3225.76	69.608	32.429	
1996	данные отловов	18	6928.56	3230.70	69.483	32.513	
1996	данные отловов	19	6929.68	3252.96	69.496	32.55	
1996	данные отловов	20	6928.31	3226.43	69.472	32.474	
1996	данные отловов	20	6928.31	3226.43	69.472	32.474	
1996	данные отловов	20	6928.31	3226.43	69.472	32.474	
1996	данные отловов	20	6928.31	3226.43	69.472	32.474	
1996	данные отловов	20	6928.31	3226.43	69.472	32.474	
1996	данные отловов	20	6928.31	3226.43	69.472	32.474	
1996	данные отловов	20	6928.31	3226.43	69.472	32.474	
1996	данные отловов	20	6928.31	3226.43	69.472	32.474	
1996	данные отловов	20	6928.31	3226.43	69.472	32.474	
1996	данные отловов	21	6928.83	3226.76	69.477	32.479	
1996	данные отловов	22	6928.37	3230.48	69.473	32.508	
1996	данные отловов	23	6928.28	3229.69	69.471	32.495	
1996	данные отловов	24	6928.59	3231.55	69.483	32.526	



Norwegian Radiation Protection Authority
Норвежское агентство по радиационной безопасности



Murmansk Marine Biological Institute
Мурманский морской биологический институт



Akvaplan-niva AS
Компания «Акваплан-нива»



The Norwegian Barents Secretariat
Норвежский Баренц-секретариат



All-Russian non-governmental organization
«Russian Geographical Society»
ООО «Русское географическое общество»

INTERNATIONAL CONFERENCE
«Radioecological research and monitoring
in the Barents Sea and the Andreeva Bay area:
current status, cooperation and further prospects»

PROGRAMME ПРОГРАММА

МЕЖДУНАРОДНАЯ НАУЧНАЯ КОНФЕРЕНЦИЯ
«Радиоэкологические исследования и мониторинг
Баренцева моря и губы Андреева:
современное состояние, сотрудничество
и дальнейшие перспективы»

October 25, 2016
Murmansk, MMBI



25 октября 2016 г.
г. Мурманск, ММБИ



The Effect of Radioactive Waste Storage in Andreev Bay on Contamination of the Barents Sea Ecosystem

Academician G. G. Matishov^a, G. V. Ilyin^a, I. S. Usyagina^{a,*}, D. V. Moiseev^a, Salve Dahle^b, N. E. Kasatkina^a, and D. A. Valuyskaya^a

Received April 25, 2016

Abstract—The effect of temporary radioactive waste storage on the ecological status of the sea and biota in the littoral of Andreev and Malaya Andreev bays and near the shore of Motovskii Gulf (including the mouth part of the Zapadnaya Litsa Bay) was analyzed. The littoral sediments contaminated by the ¹³⁷Cs, ⁹⁰Sr, ²³⁸Pu, and ^{239,240}Pu isotopes are located in the zones of constant groundwater discharge on the shores of Andreev and Malaya Andreev bays. The littoral slopes and bottom depressions of the bays accumulate finely dispersed terrigenous material and ¹³⁷Cs. The investigations have shown that the storage does not exert a significant adverse effect on the radioactive conditions and the status of the sea ecosystems beyond Andreev Bay.

DOI: 10.1134/S1028334X17020155

Andreev Bay is one of the most well-known potentially dangerous sites of radioactive contamination in the shore zone of the Barents Sea. The temporary radioactive waste storage (TRS) located on the shore of the bay is the largest storage site of radioactive wastes (RAW) in Northern Europe and is a source of artificial radionuclides. The potential hazard of the TRS effect exceeds the regional risks and is spread over the Barents Sea, an international fishery basin.

The TRS of RAW in Andreev Bay has been used for a 40-year period. Its areas were sometimes contaminated as a result of the loss of containment of the storage of wastes of the fuel assembly in 1982 and the spread and leakage of radioactive materials from the open storage of solid RAW. The volume of radioactive loss is about 37 terabecquerel [1, 2, 3].

The plot of TRS occupies the cape, which enters Zapadnaya Litsa Bay of Motovskii Gulf and forms small bays (Andreev and Malaya Andreev) (Fig. 1). The moraine deposits on the plot determine quick isotope migration to lower horizons, their spread, and prolonged flow into the surrounding sea with groundwater.

The radioecological conditions in the sanitary-protection zone of the TRS are controlled by the Fed-

eral Center for Nuclear and Radiation Safety, the Northwestern Center for Radioactive Waste Management, the Federal Medical–Biological Agency of Russia, and the Center of Hygiene and Epidemiology no. 120. Nevertheless, their data are insufficient for evaluation of the contaminating effect of the TRS on the water and ecosystems near the seashore in places of the discharge of Zapadnaya Litsa Bay. Investigations of the possible effect of the TRS were performed in the region by the Murmansk Marine Biological Institute in 2013–2014.

Their aim was to analyze the effect of the radiation-hazardous object on the ecological status of the sea and biota near the TRS in Andreev Bay and near the shore of the Kola Peninsula (Motovskii Gulf). These are ecosystems with a permanent source of contamination of technogenic isotopes.

There were two stages of investigation in the littoral areas of Andreev and Malaya Andreev bays around the TRS and near the shore of the Kola Peninsula, including the mouth of Zapadnaya Litsa Bay (Fig. 1).

The samples for the investigations were taken in Motovskii Gulf August 4–9, 2013, during an expedition of the vessel *Viking-2*. The expeditions in Andreev Bay took place October 28–29, 2014.

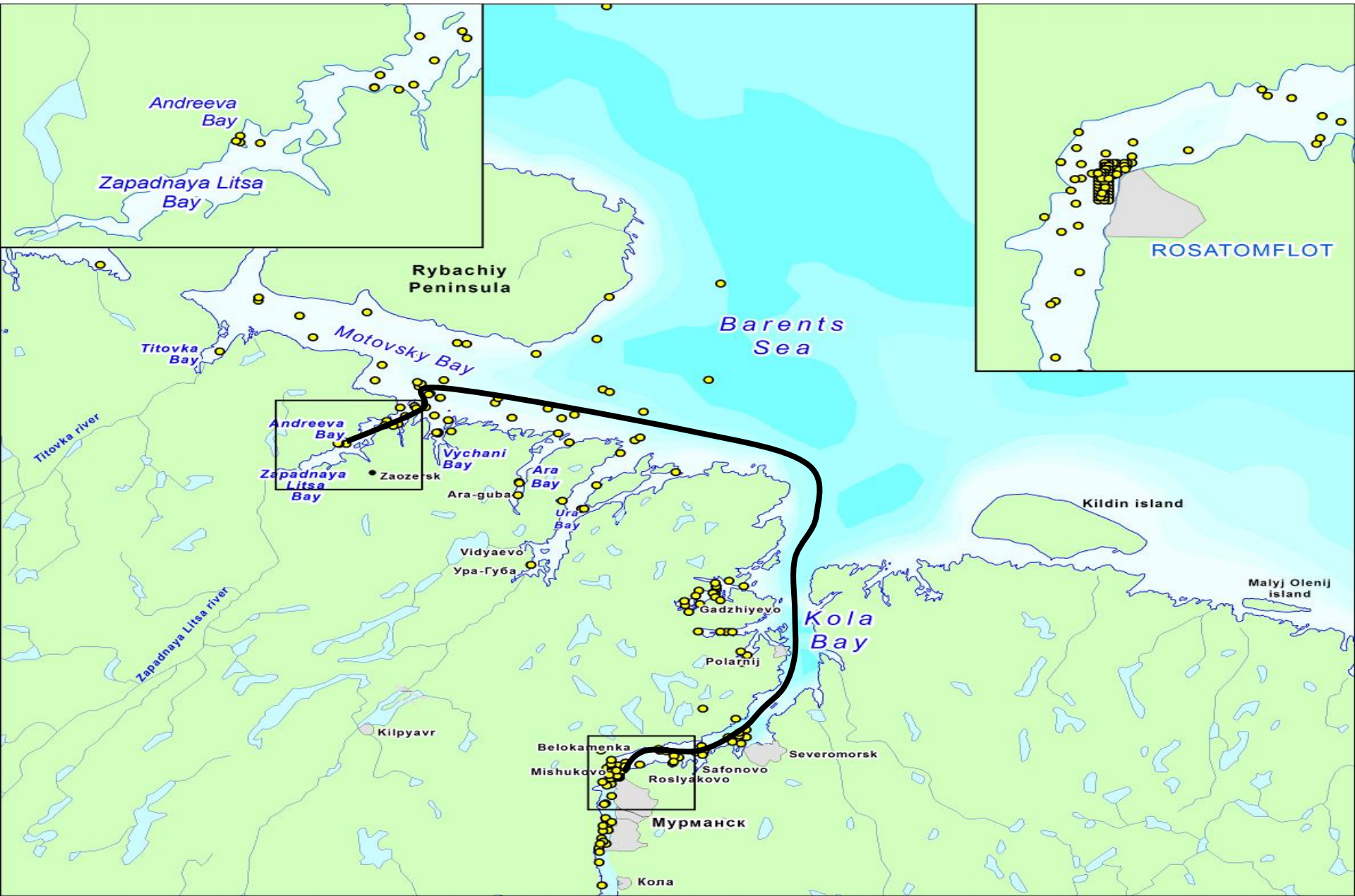
We took 17 samples of seawater from the 0–1 m layer, 17 samples from the top (0–2 cm) layer of bottom sediments, and 12 ground columns 11 to 18 cm long. Ground core samples were cut into 1-cm-thick layers for layer-by-layer study. Bottom sediments were sampled with the use of the Van Veen grab and gravitation tube, and samples from the littorals of bays were taken with the use of a ground sampler and by diving.

^a Murmansk Marine Biological Institute, Kola Research Center, Russian Academy of Sciences, Murmansk, 183010 Russia

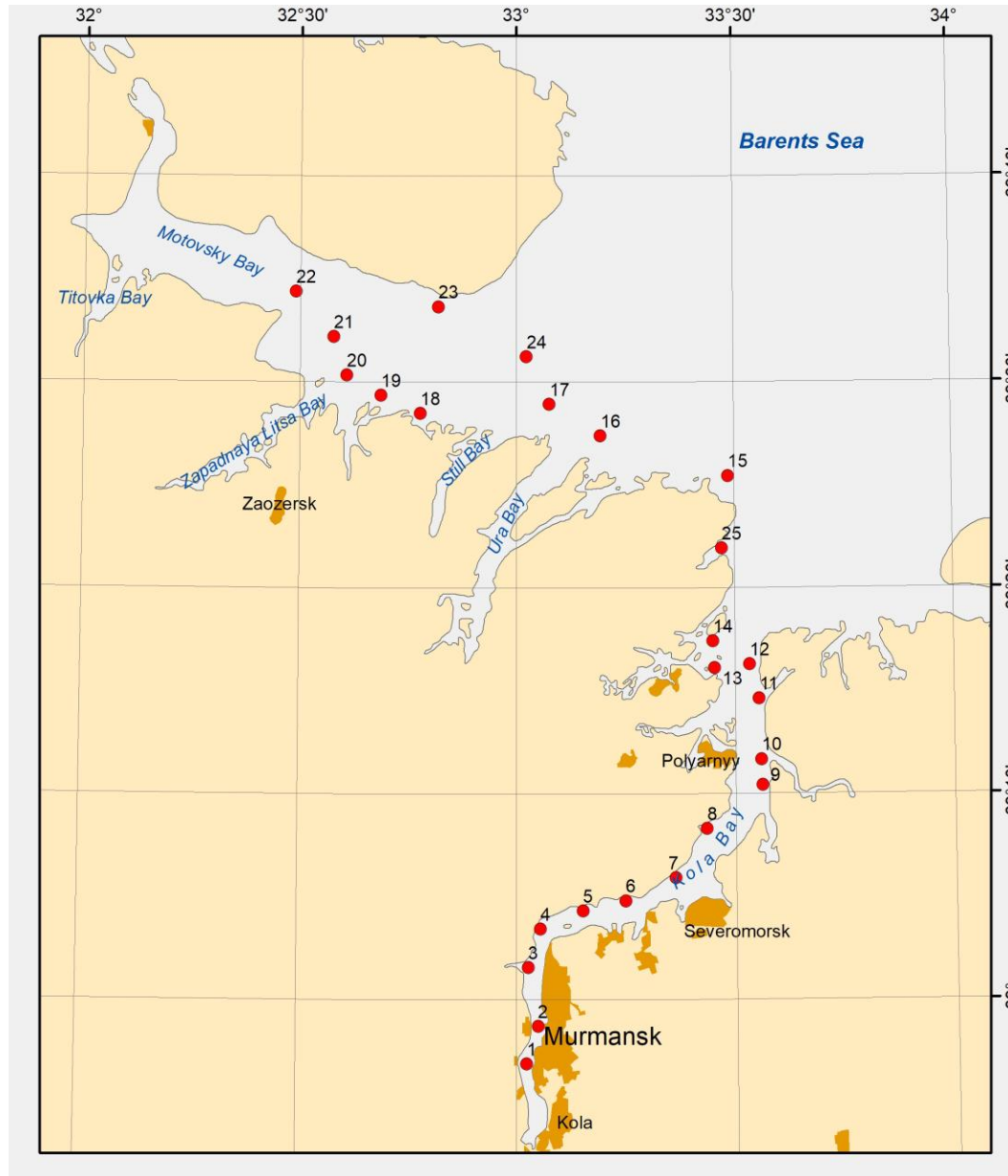
^b Akvaplan-niva AS, Polar Environmental Centre, Tromsø, Norway

*e-mail: usyagina@mmbi.info

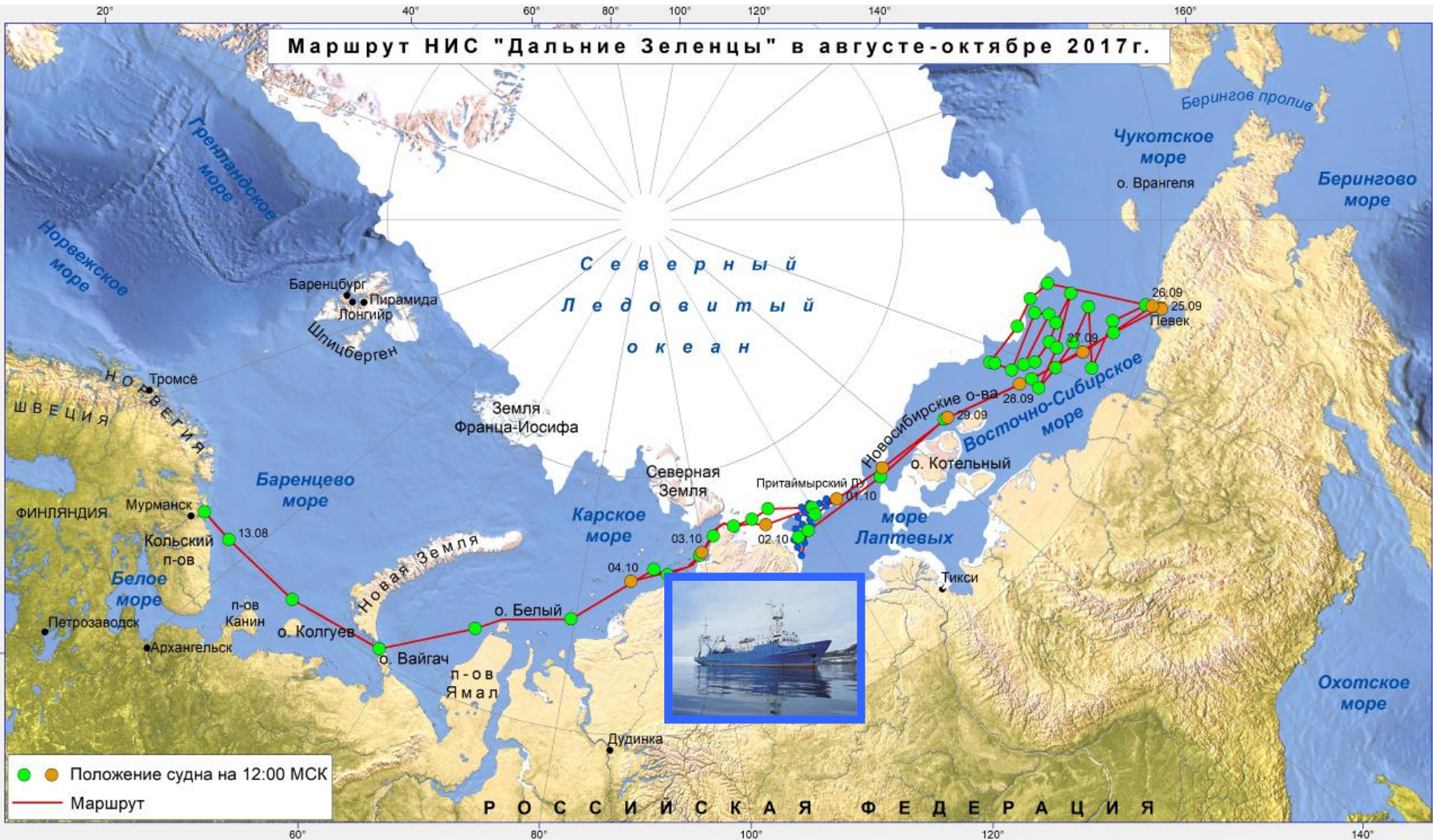
Sample sites, 1990-2017



Planned sample sites, end of October 2017



Route of R/V "Dalnie Zelentsy" in August-October



JOINT MMBI – AKVAPLAN-NIVA PROJECTS WITH RADIECOLOGICAL TASKS

Development of methods for ecosystem-based monitoring of the coastal zone and continental shelf of the Barents Sea and the High Arctic, methods for scenario modeling of emergency situations related to transport of petroleum products and radioactive waste, accompanied with and innovative technologies for marine environment protection under conditions of the marine periglacial (Project identification number RFMEFI61616X0073, Agreement number 14.616.21.0073) MEMO-PRO (2016-2018)

Evaluation of the present radio-ecological situation in Andreeva Bay, adjacent offshore areas and the Kola Bay (2017-2018)



THANKS FOR ATTENTION!