*SSC RAS and MMBI Areas of Researches*




*SSC RAS and MMBI Areas of Researches*

# «Variability in Ecological Conditions of the Russian Arctic LMEs; Conference on the Russian LMEs»

**Gennady G. Matishov**

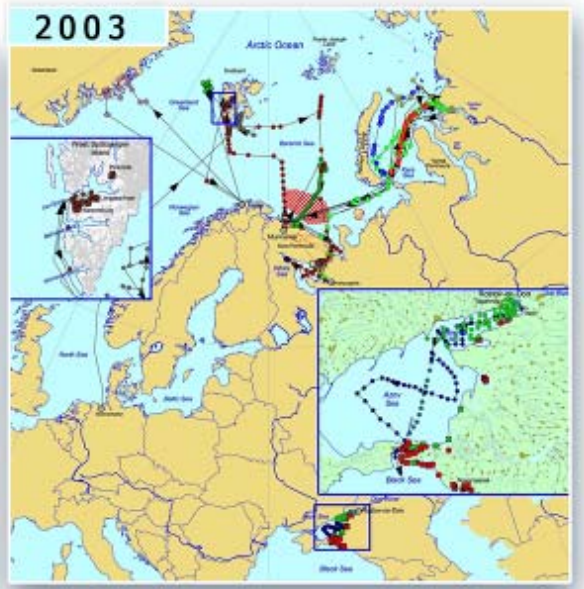
SSC RAS/MMBI KSC RAS

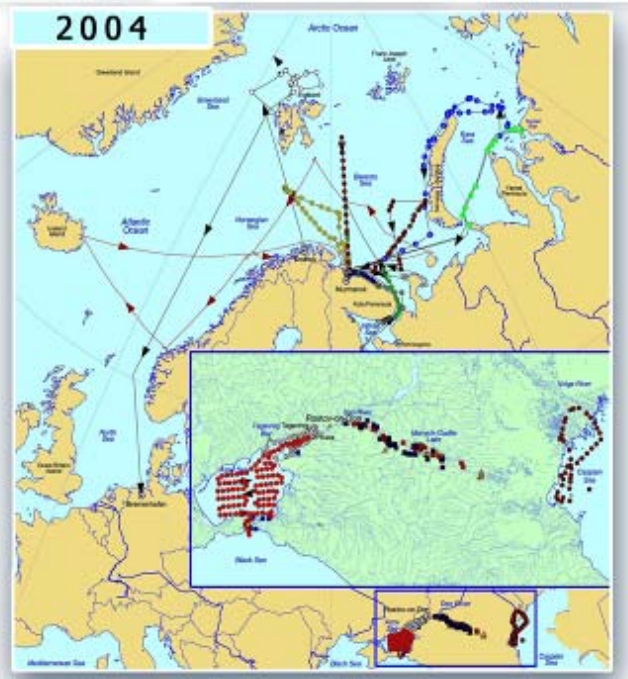
**Paris, France**

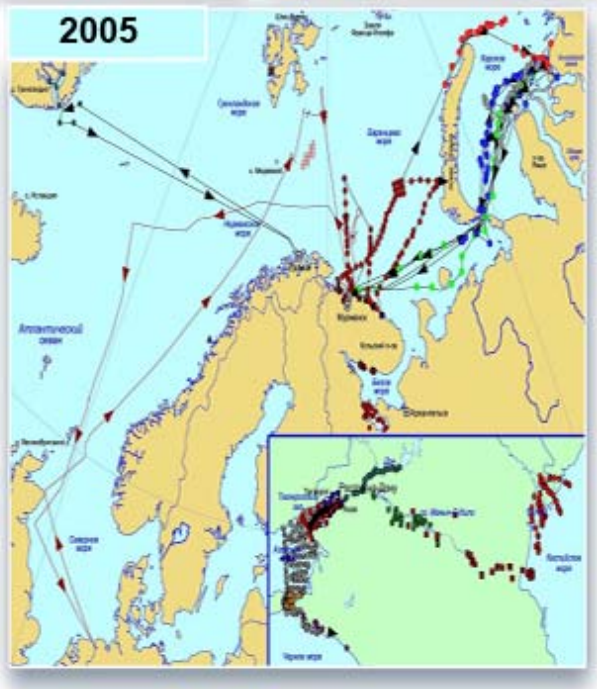
10-11 July 2007

# MMBI KSC RAS and SSC RAS Expeditions, 2000 - 2006



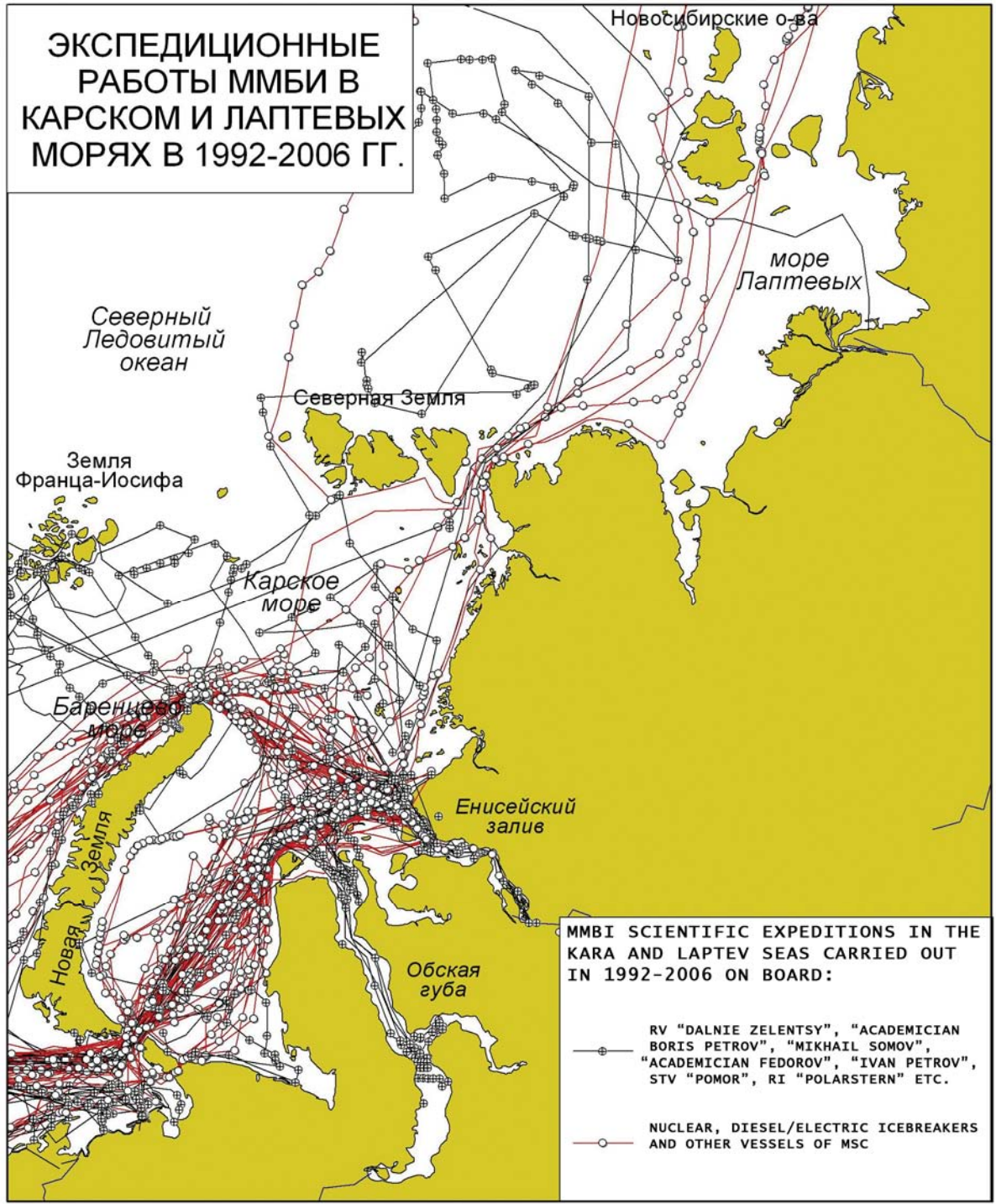

# A YEAR-ROUND ECOSYSTEM MONITORING ON BOARD THE ATOMIC ICEBREAKERS IN DIFFICULT TO ACCESS

Arctic Ocean
Chukchi Sea
East Siberian Sea
Laptev Sea
Kara Sea
Barents Sea
White Sea
Franz Joseph Land
Svalbard
Severnaya Zemlya
New Siberian Islands
Yamal Peninsula
Ob Bay
Yenisei Bay

TIME PERIOD: 1996-2005
NUMBER OF EXPEDITIONS: 27
NUMBER OF STATIONS: 1,101

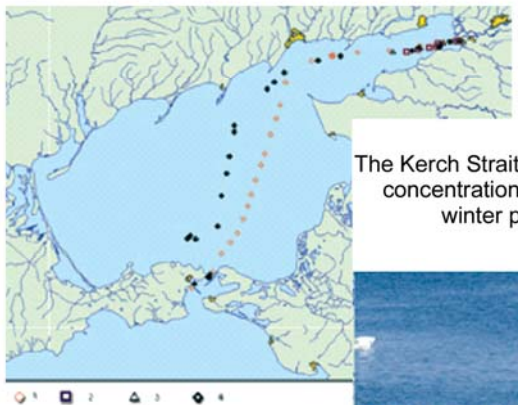
NUCLEAR ICEBREAKERS:
1. ARCTIC
2. NORTHERN SEA ROUTE
3. RUSSIA
4. SOVIET UNION
5. TAYMIR
6. VAYGACH
7. YAMAL

# MMBI EXPEDITION ACTIVITIES IN THE KARA AND LAPTEV SEAS IN 1992-2006



# SSC RAS EXPEDITIONS (2003 - 2006)

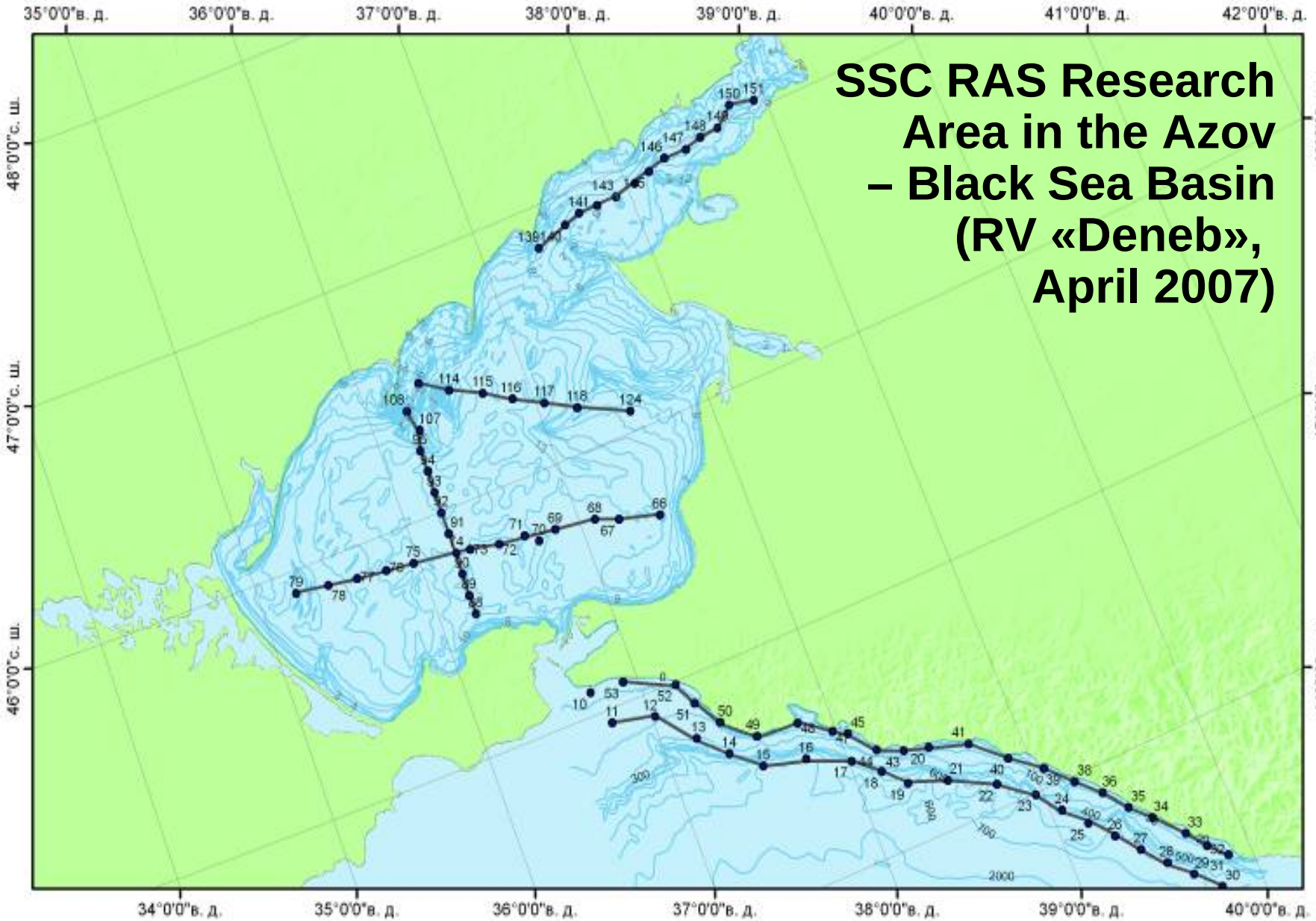

Regular Winter Expeditions in the Sea of Azov on board the icebreakers

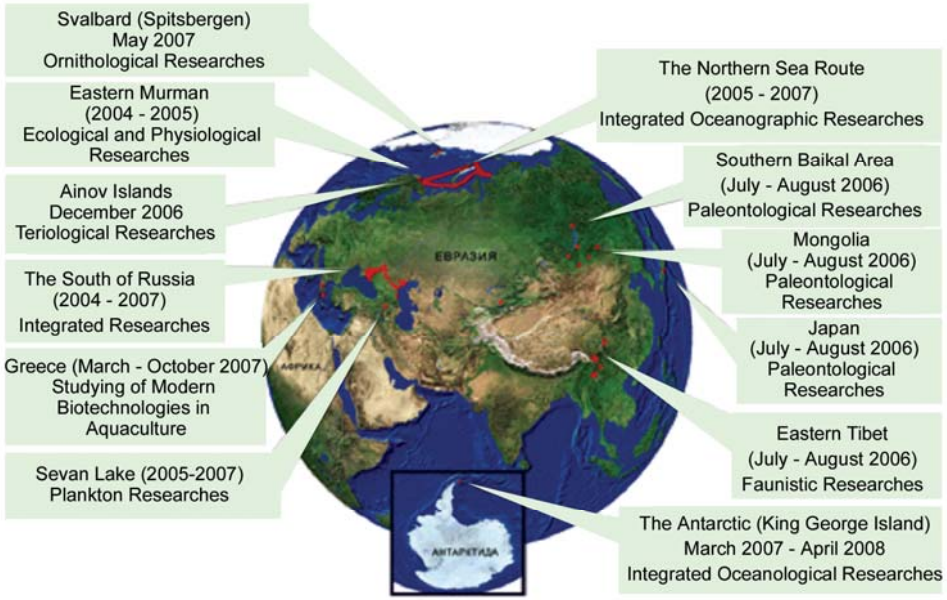


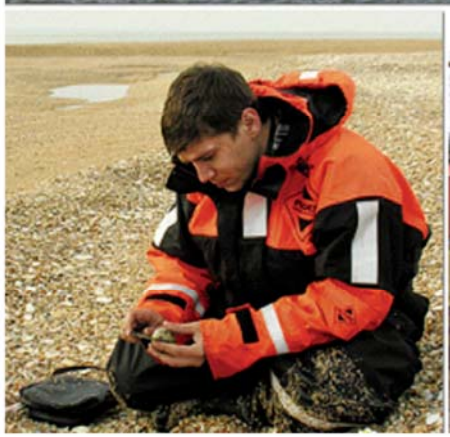
Map-scheme of sampling sites and ornithological observations in the winter period on board the Captain Demidov Icebreaker and the Professor Panov Research Vessel
Legend:
1 – 25.02-5.03.2003
2 – 21-22.01.2004
3 – 28.02-3.03.2005
4 – 24.01-19.02.2006

The Kerch Strait – waterfowls concentration site in the winter period

Black Sea
January 2007


SSC RAS Research Area in the Azov – Black Sea Basin (RV «Deneb», April 2007)
35°0'0"в. д.
36°0'0"в. д.
37°0'0"в. д.
38°0'0"в. д.
39°0'0"в. д.
40°0'0"в. д.
41°0'0"в. д.
42°0'0"в. д.
48°0'0"с. ш.
47°0'0"с. ш.
46°0'0"с. ш.
45°0'0"с. ш.
44°0'0"с. ш.
34°0'0"в. д.
35°0'0"в. д.
36°0'0"в. д.
37°0'0"в. д.
38°0'0"в. д.
39°0'0"в. д.
40°0'0"в. д.


Svalbard (Spitsbergen)
May 2007
Ornithological Researches
Eastern Murman
(2004 - 2005)
Ecological and Physiological
Researches
Ainov Islands
December 2006
Teriological Researches
The South of Russia
(2004 - 2007)
Integrated Researches
Greece (March - October 2007)
Studying of Modern
Biotechnologies in
Aquaculture
Sevan Lake (2005-2007)
Plankton Researches
The Northern Sea Route
(2005 - 2007)
Integrated Oceanographic Researches
Southern Baikal Area
(July - August 2006)
Paleontological Researches
Mongolia
(July - August 2006)
Paleontological
Researches
Japan
(July - August 2006)
Paleontological
Researches
Eastern Tibet
(July - August 2006)
Faunistic Researches
The Antarctic (King George Island)
March 2007 - April 2008
Integrated Oceanological Researches
ЕВРАЗИЯ
АФРИКА
АНТАРКТИДА



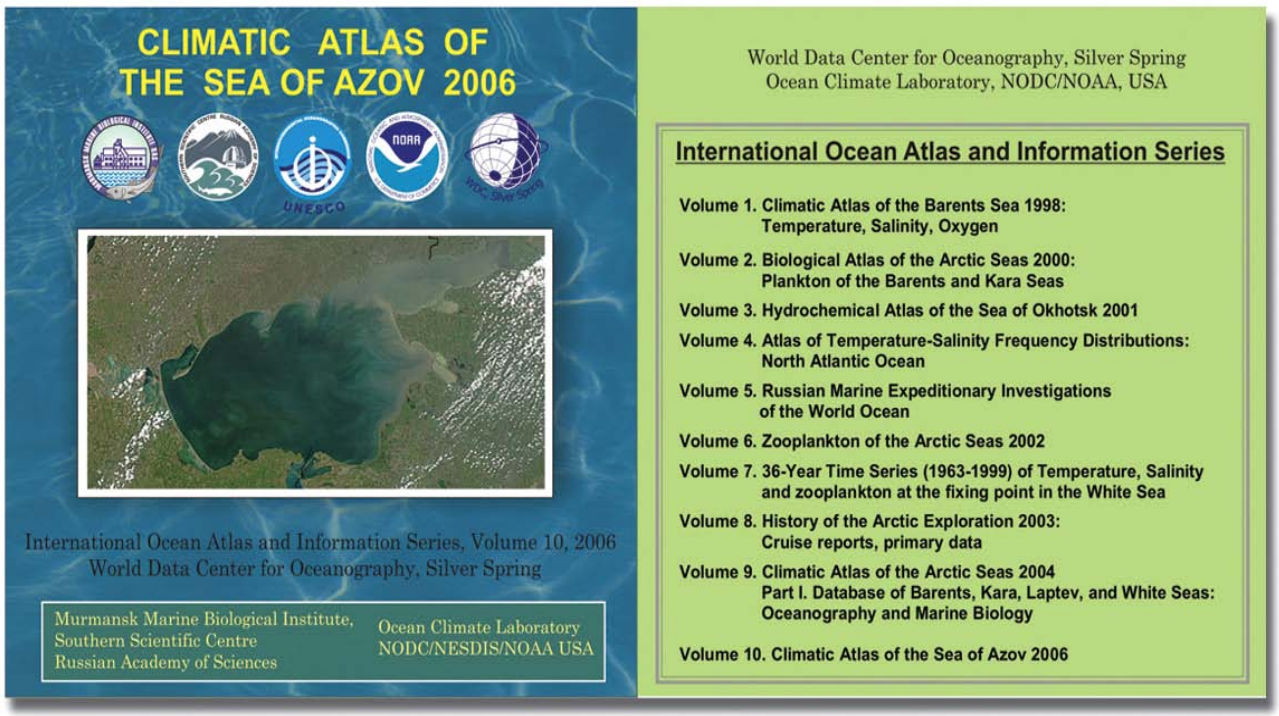
# CLIMATE – THE KEY IMPACT FACTOR ON THE ECOSYSTEMS

# Climate Issues and Atlases

*International Ocean Atlas and Information Series, Volume 10*

Climatic Atlas of the Sea of Azov 2006


Southern Scientific Centre Russian Academy of Sciences, RUSSIA;
Murmansk Marine Biological Institute, RUSSIA;
Ocean Climate Laboratory, NODC/NOAA, USA




World Data Center for Oceanography, Silver Spring
Ocean Climate Laboratory, NODC/NOAA, USA

**International Ocean Atlas and Information Series**

**Volume 1. Climatic Atlas of the Barents Sea 1998: Temperature, Salinity, Oxygen**

**Volume 2. Biological Atlas of the Arctic Seas 2000: Plankton of the Barents and Kara Seas**

**Volume 3. Hydrochemical Atlas of the Sea of Okhotsk 2001**

**Volume 4. Atlas of Temperature-Salinity Frequency Distributions: North Atlantic Ocean**

**Volume 5. Russian Marine Expeditionary Investigations of the World Ocean**

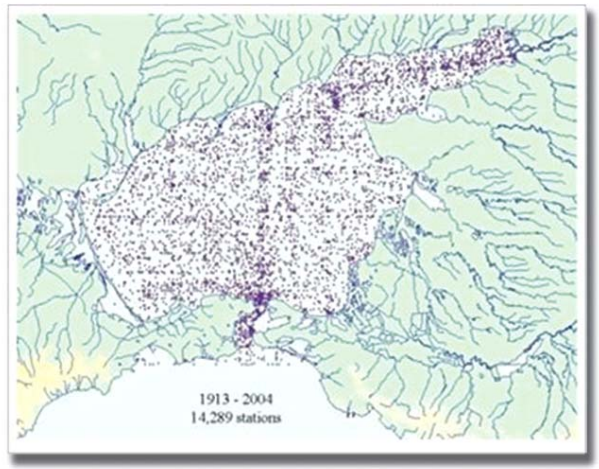
**Volume 6. Zooplankton of the Arctic Seas 2002**

**Volume 7. 36-Year Time Series (1963-1999) of Temperature, Salinity and zooplankton at the fixing point in the White Sea**

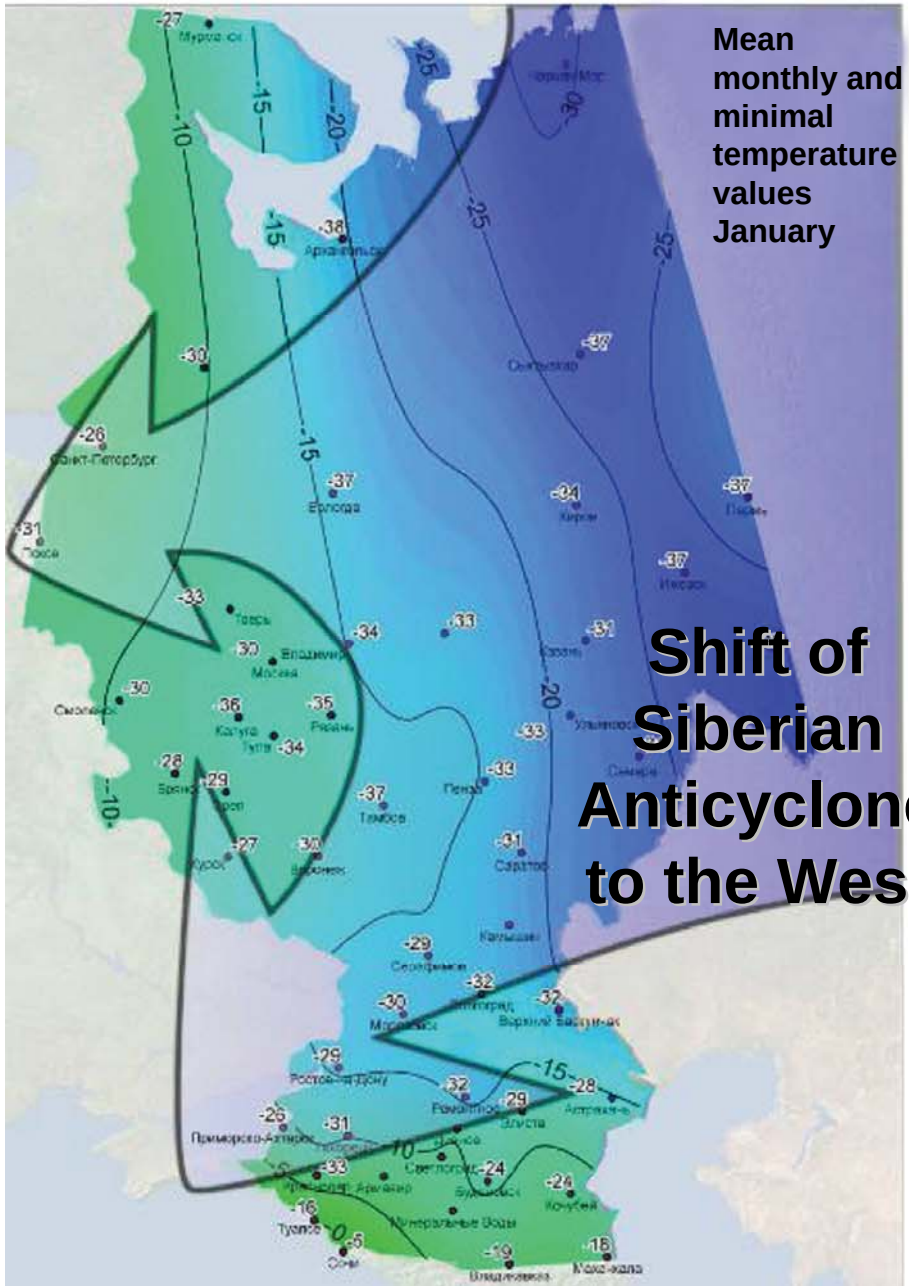
**Volume 8. History of the Arctic Exploration 2003: Cruise reports, primary data**

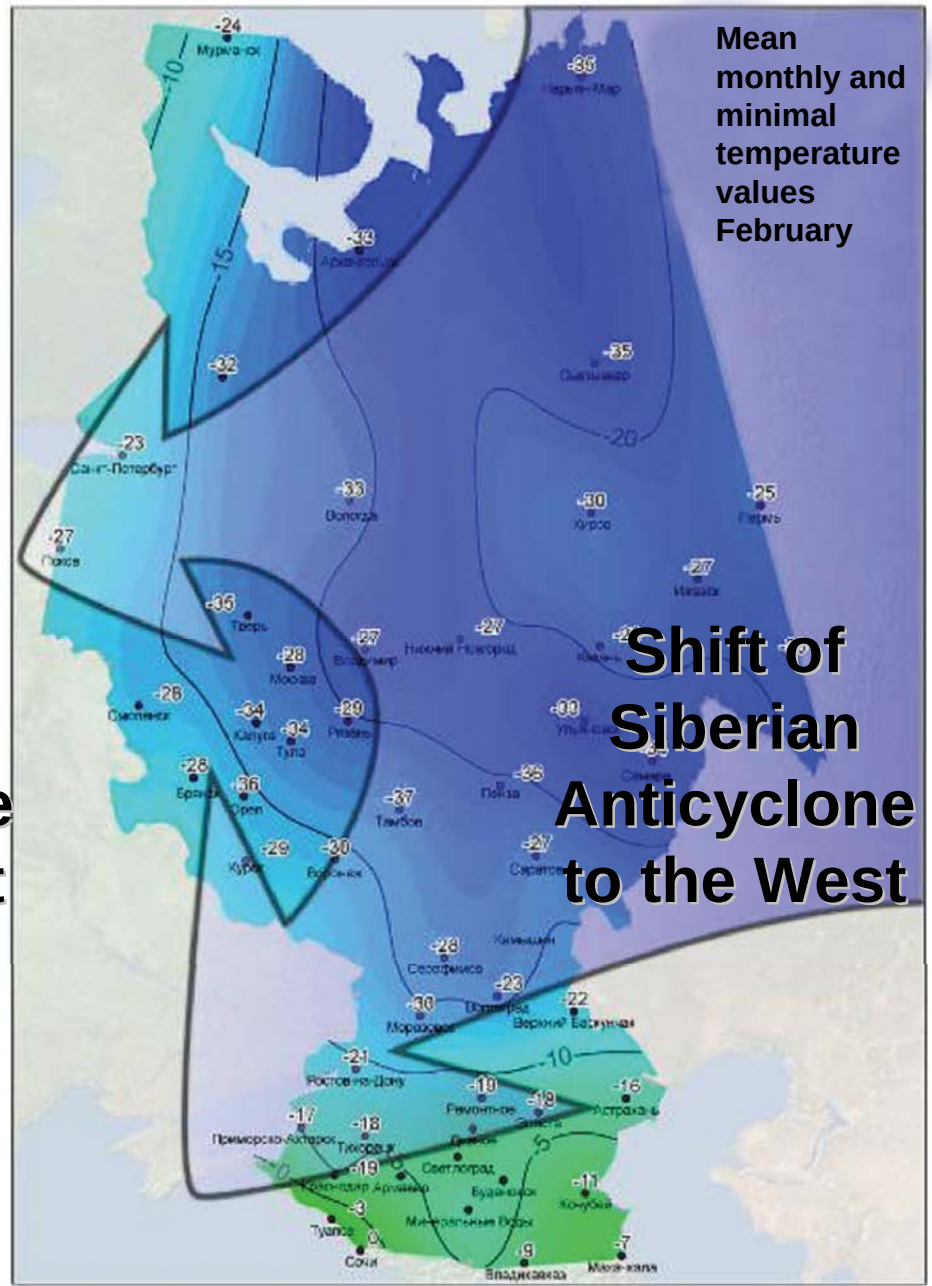
**Volume 9. Climatic Atlas of the Arctic Seas 2004 Part I. Database of Barents, Kara, Laptev, and White Seas: Oceanography and Marine Biology**

**Volume 10. Climatic Atlas of the Sea of Azov 2006**

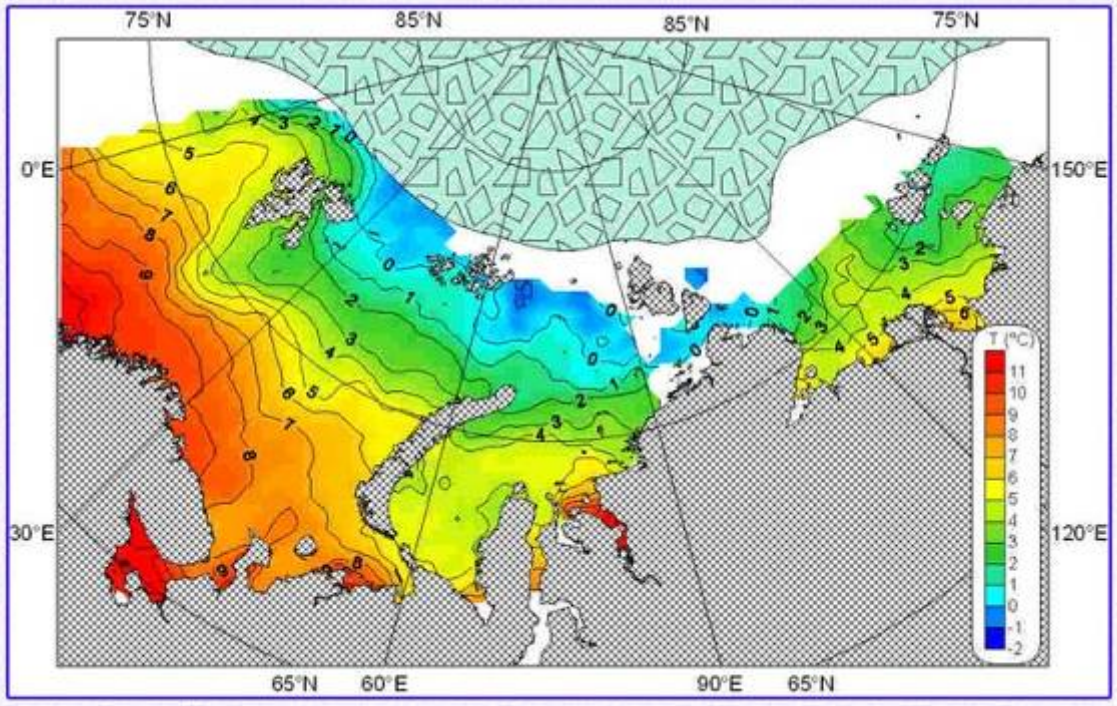


# Extremely Severe and Lasting (More than 30 days) Frosts in Eastern Europe in 2006



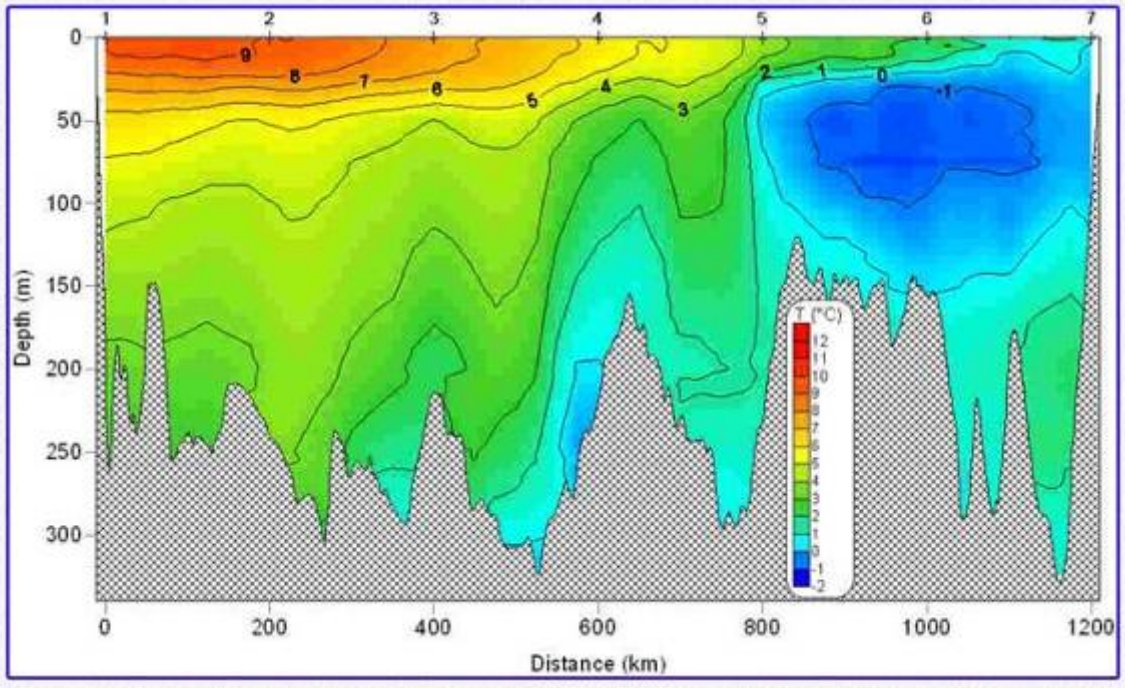



# Extreme Winter of the years 2005-2006 in the Sea of Azov



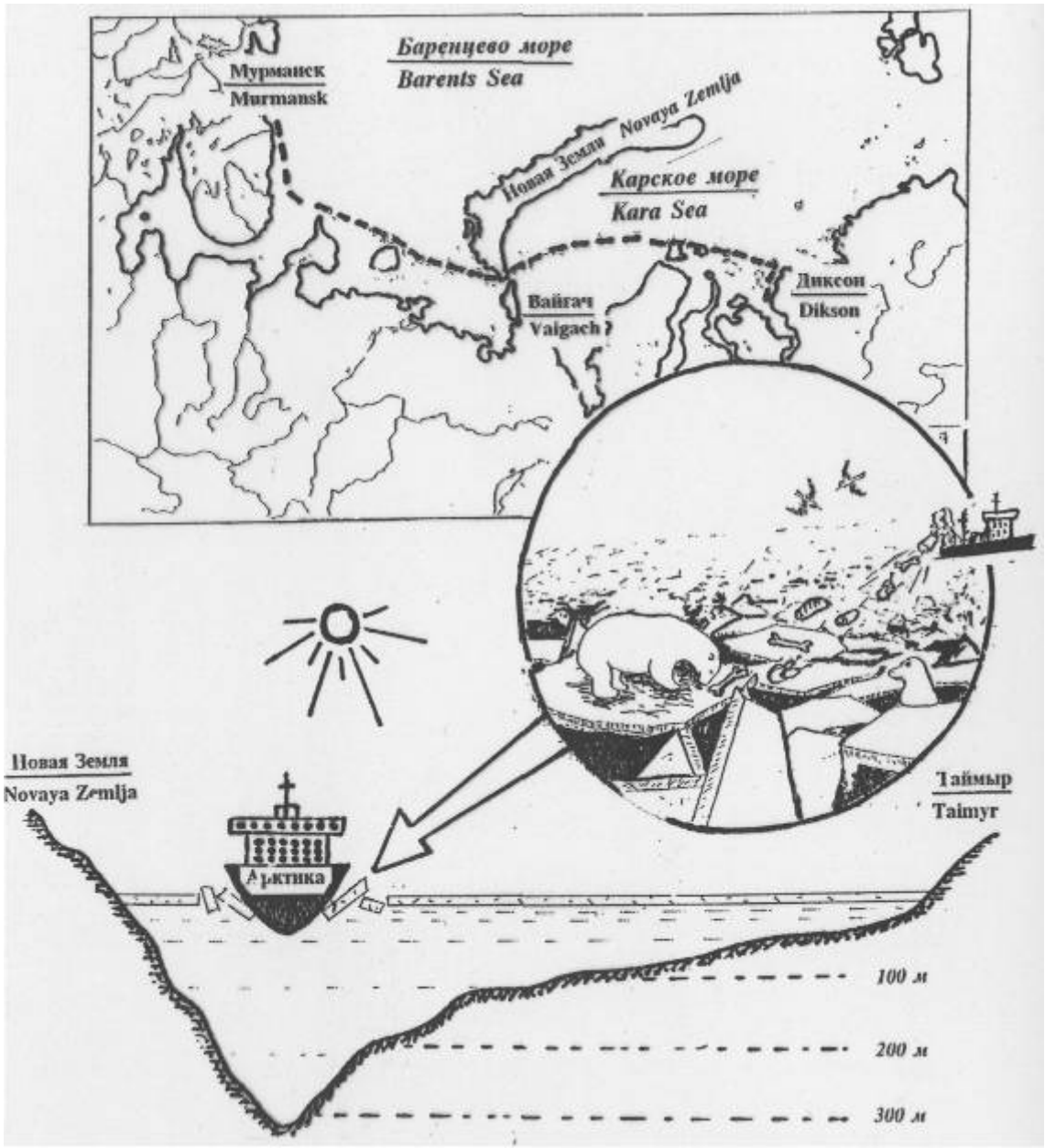

August, surface

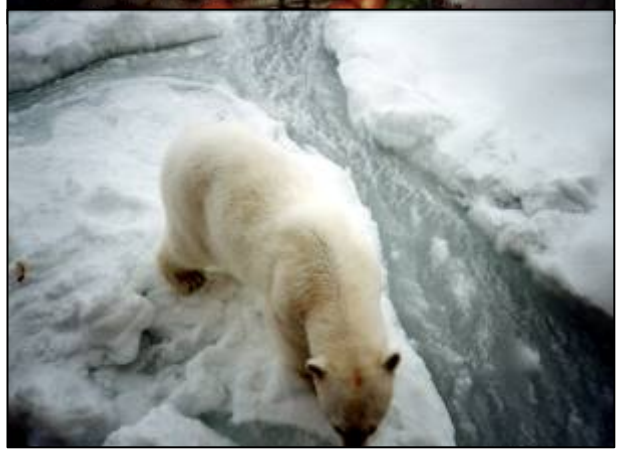
# Waters' Thermic Structure of the Russian Western Arctic



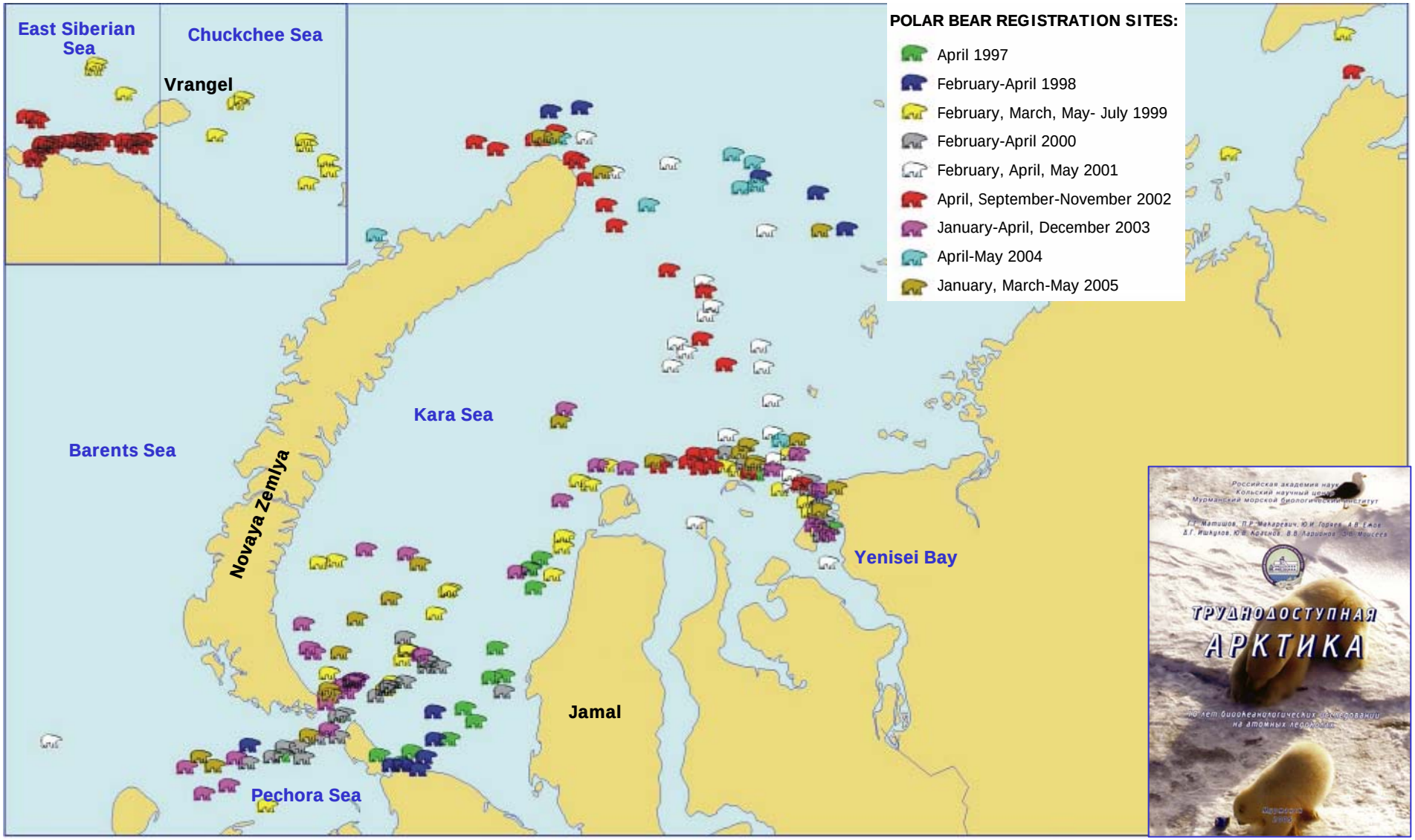

«Kola Transect»

# POLAR BEAR ANTHROPOGENIC FOOD LINKS WITH NORTHERN SEA ROUTE



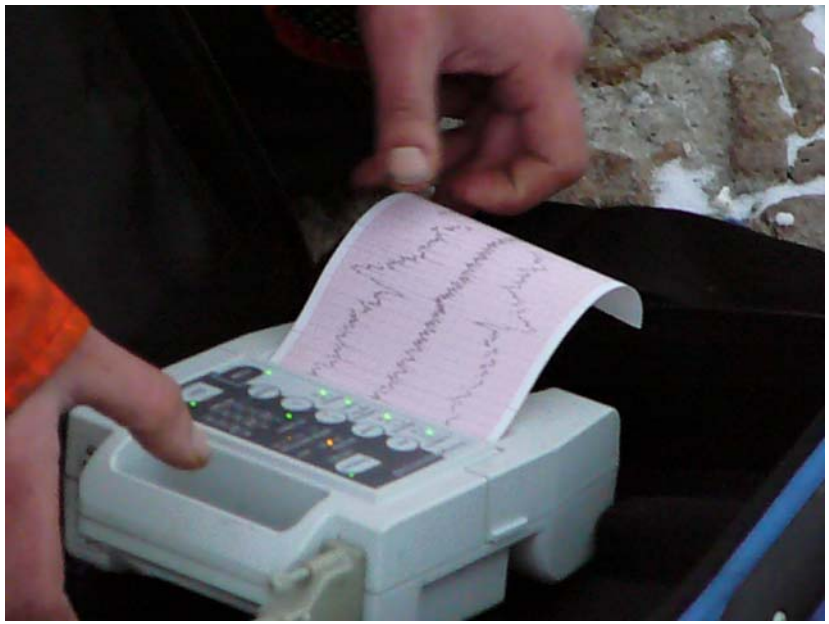



# Polar bear registration sites in the Barents and Kara Seas during the period of 1997-2005



# RARE AND PROTECTED MARINE BIOTA SPECIES

## STUDYING OF GRAY SEAL ON THE AINOV ISLES (NOVEMBER-DECEMBER 2006)

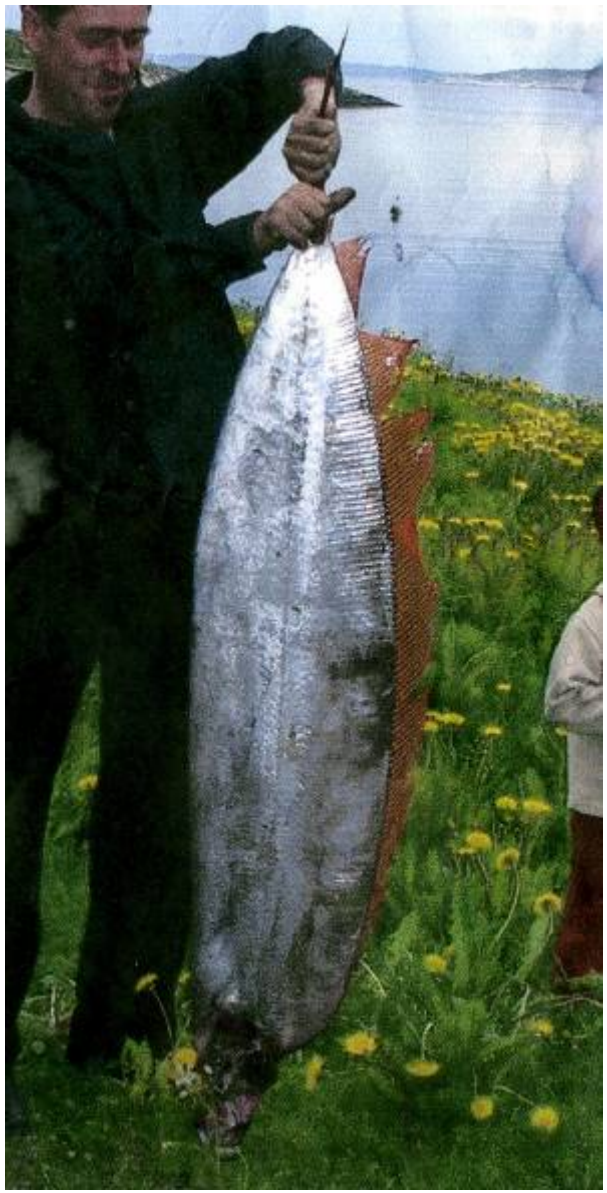


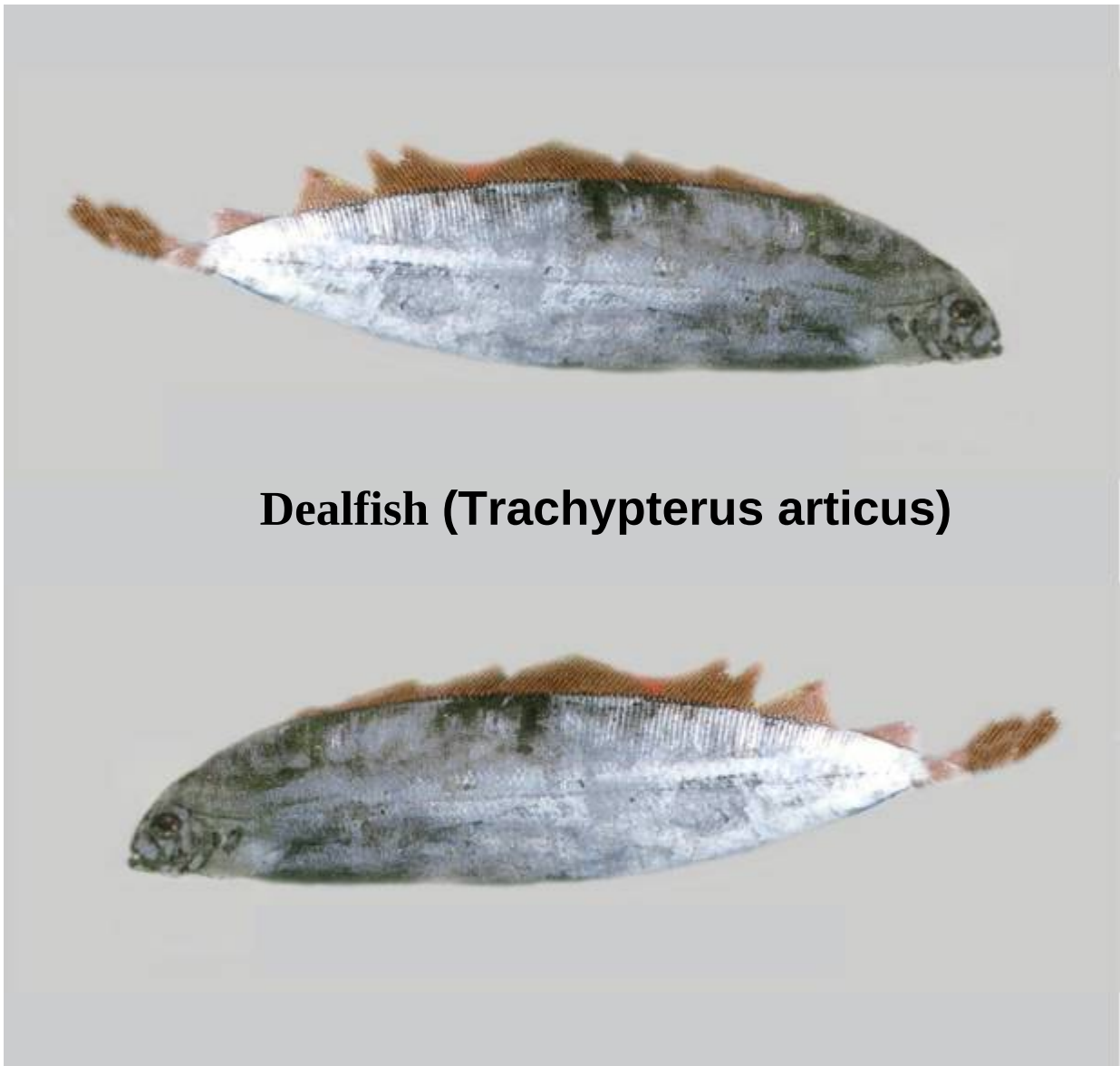


# *Inventory of present species composition of the Lower Don basin ichthyofauna has been performed (71 species)*

**Considerable changes in the species composition and relative abundance of indigenous ichthyofauna, as well as new alien species have been registered.**

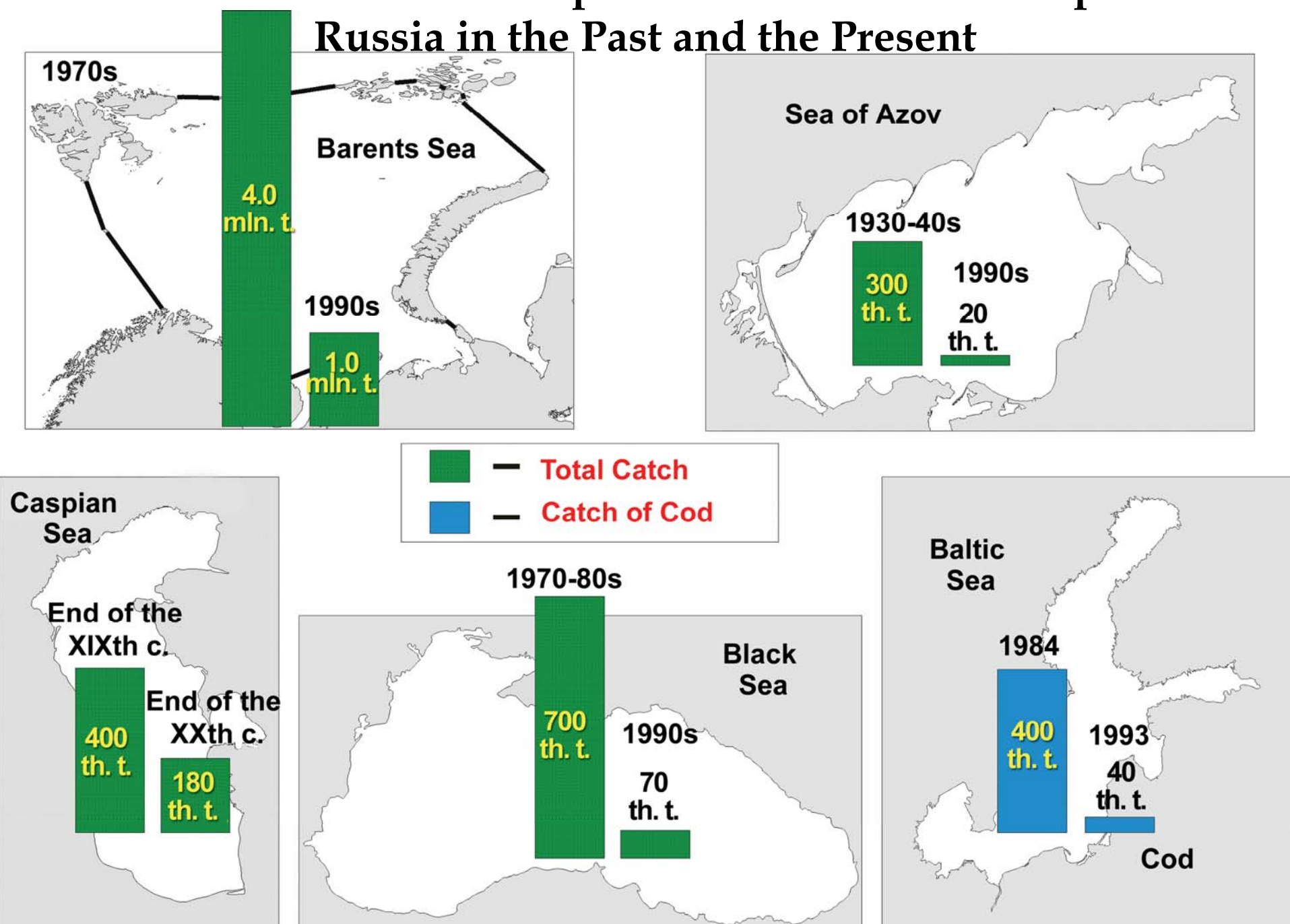
# Monitoring of Rare and Exotic Ichthyofauna Species (June 2006, Coastal Waters of Murman)





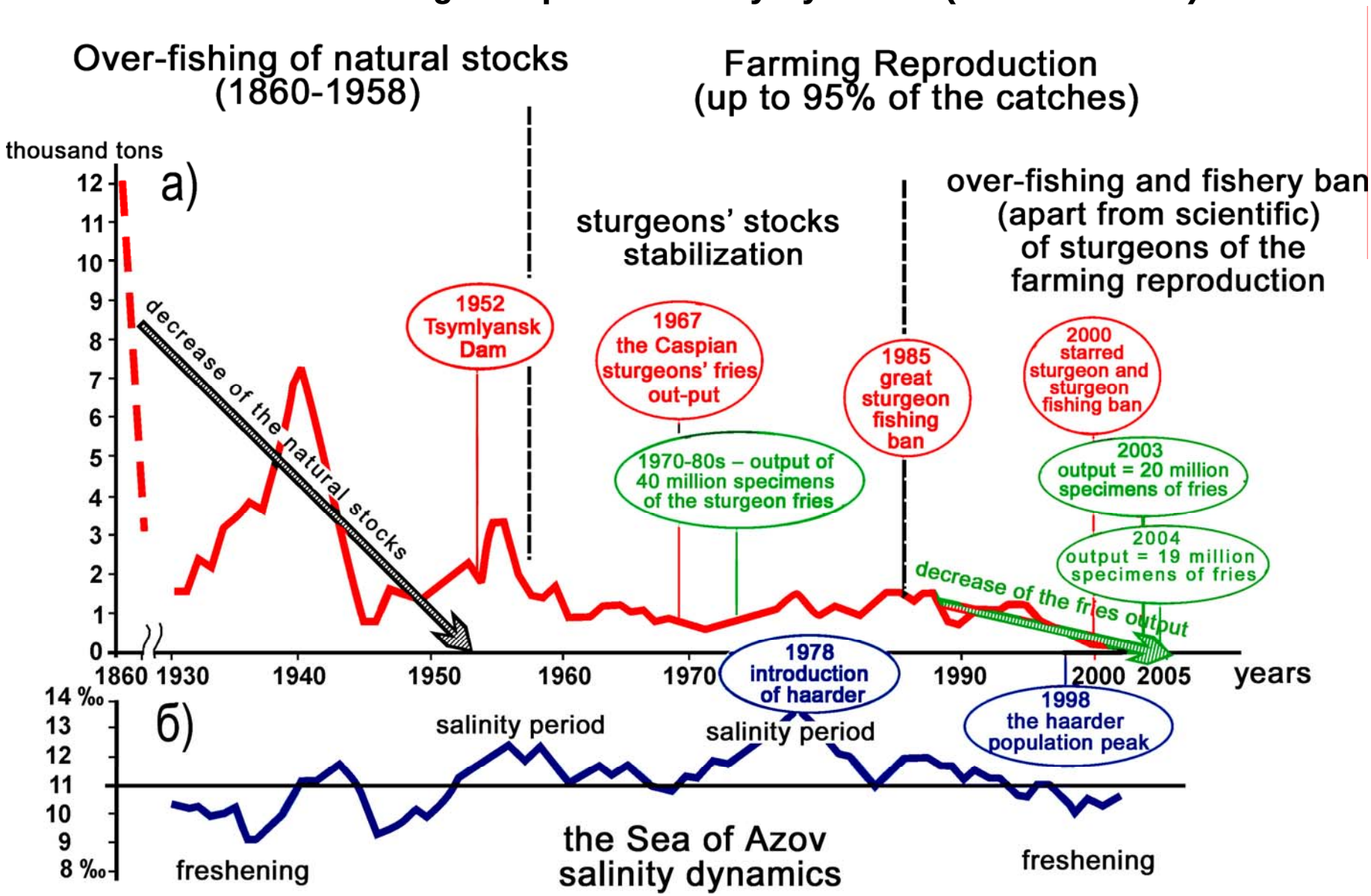
Dealfish (Trachypterus articus)

# Total Catches of Fish Species in the Seas of European Russia in the Past and the Present

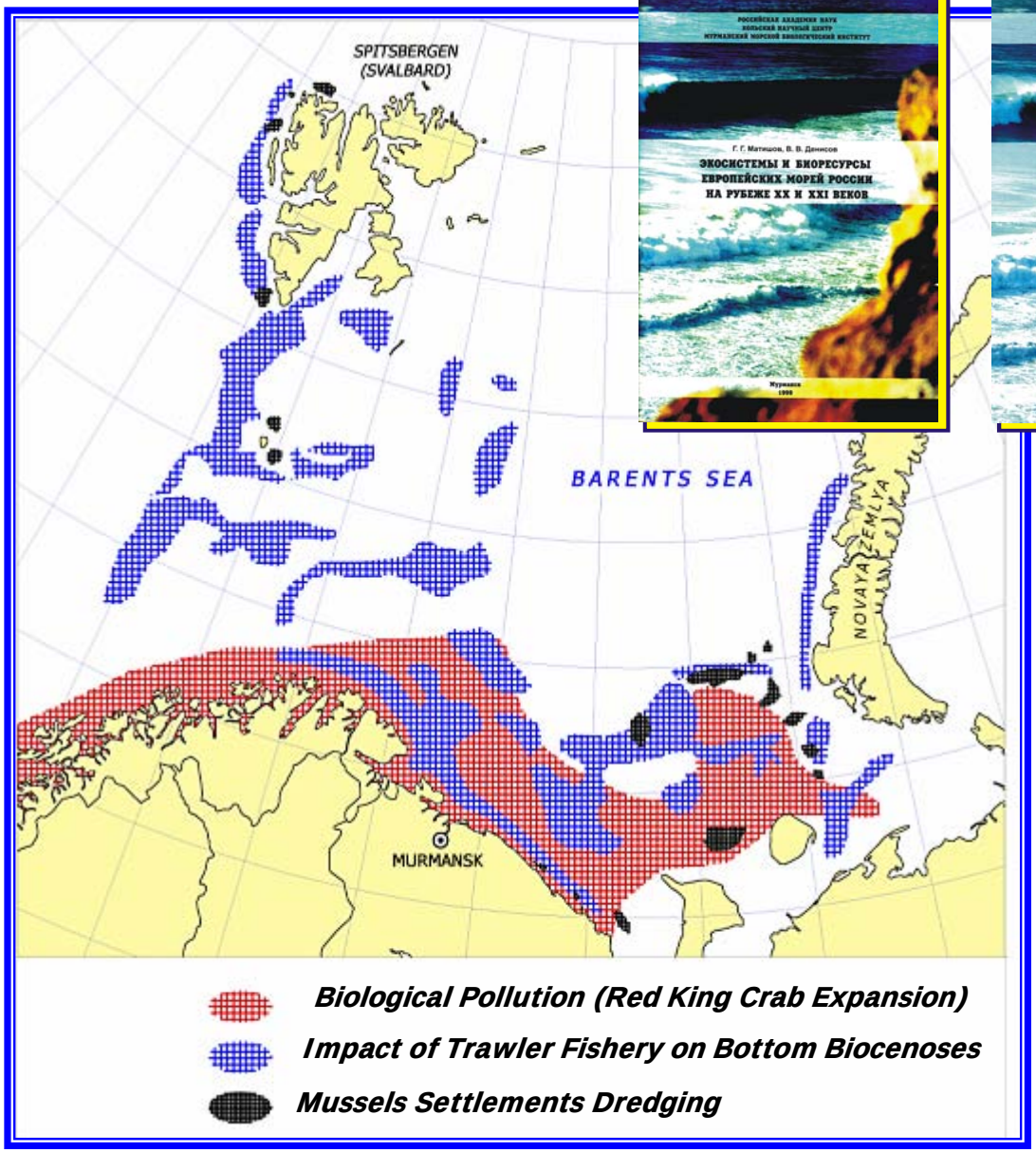


# Reproduction of Sturgeon Species is the Key Problem

**The Azov Sturgeon Species Fishery Dynamics (thousand tons)**

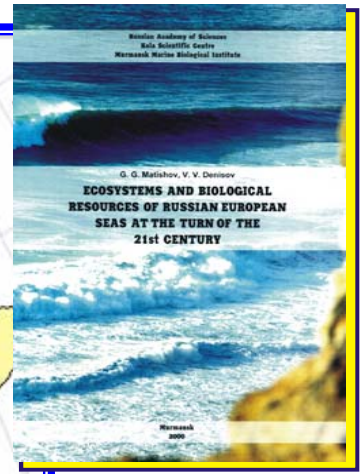


# THE TRAWLS' IMPACT ON THE BARENTS SEA ECOSYSTEM









# Types of Alien Species Fauna

## Biological Pollution in Marine Ecosystems

1) **Natural (climatic) migrants**
2) **Alien biota of the tankers' ballast waters**
3) **Species introduced – planned acclimatization**
4) **Genetically modified species, including the aquaculture hybrids**

THE NATION'S NEWSPAPER
USA TODAY
Fri/Sat/Sun, May 11–13, 2007

# nvasive cargo spawns calls for regulations

/ Dennis Cauchon
SA TODAY

The discovery of a deadly fish rus in the Great Lakes has re-ewed calls for stringent reg-lations to prevent foreign ips from bringing invasive ecies into U.S. waters.

The invasive critters are owaways in the tons of water at ships pump in and out of eir hulls for stability and ma-neuverability.

Every year, billions of gallons this ballast water are dis-arged into U.S. waterways, leasing everything from fish microorganisms.

"It's a huge problem that is visible to most people," says m Eichenberg, a lawyer at the ean Conservancy, an envi-nmental group. "The ballast dumped underwater, so you n't see it happen, and the mage is below the surface."

The shipping industry agrees at untreated ballast is a prob-m. "It's well-established that ltwater ships coming from ound the world have brought vasive species to our waters," ys Stuart Theis, a veteran ipping executive who heads e U.S. Great Lakes Shipping sociation. "The question is hat to do about it."

Some mayors and state legis-tors have started to say it's me to consider what once was thinkable: banning all for-gn ships — "salties," they're lled — from the Great Lakes.

"At a certain point you have say, 'When is it time to get e salties out of the lake?' " ys Gary Becker, mayor of Rac-e, Wis., and a director of the reat Lakes Cities Initiative, a oup of mayors.

Racine depends on Lake lichigan for recreation and urism, an industry that has ined political clout in the re-on as the area's industrial conomy has shrunk.

### loving tons of cargo

In 2006, salties accounted for 365 trips into and out of the reat Lakes, according to the St. awrence Seaway Develop-ent Commission. The ships rry grain, steel, coal and oth-cargo. A typical salty ship, ith a crew of 25, might deliver reign steel and leave with ain from U.S. farmers. Salties count for less than one-third the deliveries on the Great es. "Lakers" — ships that de-r only within the lakes — ac-nt for the rest.

e problem of invasive species is most severe in the Great Lakes, a self-contained fresh-water system under attack from foreign intruders brought in by ocean ships passing through the St. Lawrence Sea-way. The region has more than 100 invasive species, including the notorious zebra mussel, a fingernail-size creature from Asia that clogs industrial pipes and litters beaches with sharp shells that make it painful for people to go barefoot.

The urgency of cleaning bal-last accelerated when one of the world's most feared fish diseases — viral hemorrhagic septicemia, or VHS — caused a large fish kill in the Great Lakes in 2006. VHS is a saltwater-fish virus that is deadly to a wide range of freshwater sport fish that lack genetic resistance.

Coastal waters have suffered, too. The Asian clam has taken over much of the floor of San Francisco Bay, replacing native clams and oysters.

In the absence of federal reg-ulations, states have started to impose strict standards on bal-last. On Jan. 1, Michigan started requiring permits for ships to release ballast. To get a permit, the ship must show it has tech-nology onboard to treat ballast to kill invasive species. Last year, California imposed rules that ballast have no detectable level of organisms by 2020.

"The states are understand-ably impatient that we don't have federal regulations, but the shipping industry can't deal with different standards in ev-ery state," Theis says.

The Coast Guard has author-ity to regulate ballast under the National Invasive Species Act of 1996. It hopes to release an en-vironmental analysis this sum-mer. Proposed regulations could arrive in 2008.

"It's a ... complex issue," says Bivan Patnaik, regulatory coordinator for environmental standards at the Coast Guard.

Congress has considered sev-eral proposals for standards over the last few years, but the bills have died because of dis-agreements over details, such as whether federal law should overrule state laws.

Cargo companies won't buy treatment systems, which cost $500,000 to $1 million per ship, until they know the reg-ulations, says Joel Mandelman, vice president of Nutech 03 Inc., an Arlington, Va., company that sells a system to treat ballast.

### 'A Catch-22'

Regulators won't set stan-dards until they know what technology works. And venture capitalists won't invest in devel-oping a technology without knowing the regulation and marketplace.

"It's crazy. This is a Catch-22 that's been going on for a dec-ade," Mandelman says.

In the late 1980s and early 1990s, the shipping industry began trying to reduce the re-lease of invasive species. The in-dustry encouraged ships to cer-tify they had "no ballast on board."

Those with ballast were ex-pected to exchange the water in deep ocean, where high salt content would kill most ina-sive species.

The strategy hasn't worked. "We haven't seen a reduction in invasive species since these practices went into effect," says University of Michigan scientist Thomas Johengen.

Johengen's research found that ships can't dump all their ballast. A layer of murky water and sediment remains in the cavelike structure of a ship's hull. Even ships labeled as hav-ing "no ballast on board" are carrying invasive species.

When a ship unloads foreign cargo in the USA, the vessel takes on ballast. The Great Lakes water mixes with the for-eign residue to become an aquarium for invasive species. Later, when the ship takes on U.S. cargo before it leaves, the freighter dumps perhaps 60,000 tons of ballast mixture into the Great Lakes.

Johengen says ballast must be treated inside the ship to kill invasive species.

It's not clear how best to do that. Several approaches — us-ing chemical, heat, ozone or ul-tra-violet rays — are being ex-plored. Research has been slow because it's unclear what the regulations will require.

## Foreign species in ships' ballast find homes in U.S. waters

By Justin L. Mallett, AP

**Tiny invaders:** Zebra mussels are one of more than 100 species invading the Great Lakes.

By Kenneth Newcombe, Duluth (Minn.) Shipping News

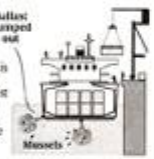
**Into port:** A carrier from Cyprus arrives in Duluth, Minn., on Lake Superior. Foreign ships on the Great Lakes are known as "salties."

### Moving water and more

Ships using water as ballast carry fish, plants and bacteria from their native regions to other parts of the world. One such trip:

1. A ship takes in thousands of gallons of water from the Black Sea as ballast for a trip across the Atlantic Ocean and to the Great Lakes. In the water are zebra mussels.


2. As new cargo is loaded in the USA, the ballast water is pumped out, along with the mussels.





The zebra mussels reproduce rapidly in their new habitat. They clog water lines and threaten native fish and shellfish populations.

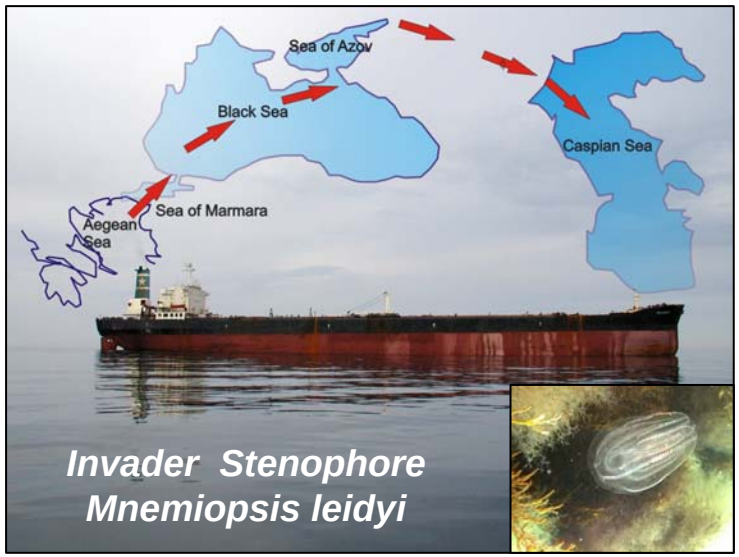

### Other ballast imports


| Common name | Mitten crab | Round goby | Asian kelp | Green crab |
|---|---|---|---|---|
| Origin | Northern Asia | Black and Caspian seas | Northern Asia | European Atlantic Coast |
| Invading | U.S. West Coast | North America | U.S. West Coast | USA |
| Damage done | Burrows into riverbanks and dikes, causing erosion | Preys on the eggs of other species | Grows swiftly, displacing native algae and altering habitat | Competes with native crabs and becomes dominant species |

Sources: United Nations International Maritime Organization, U.S. Geological Survey

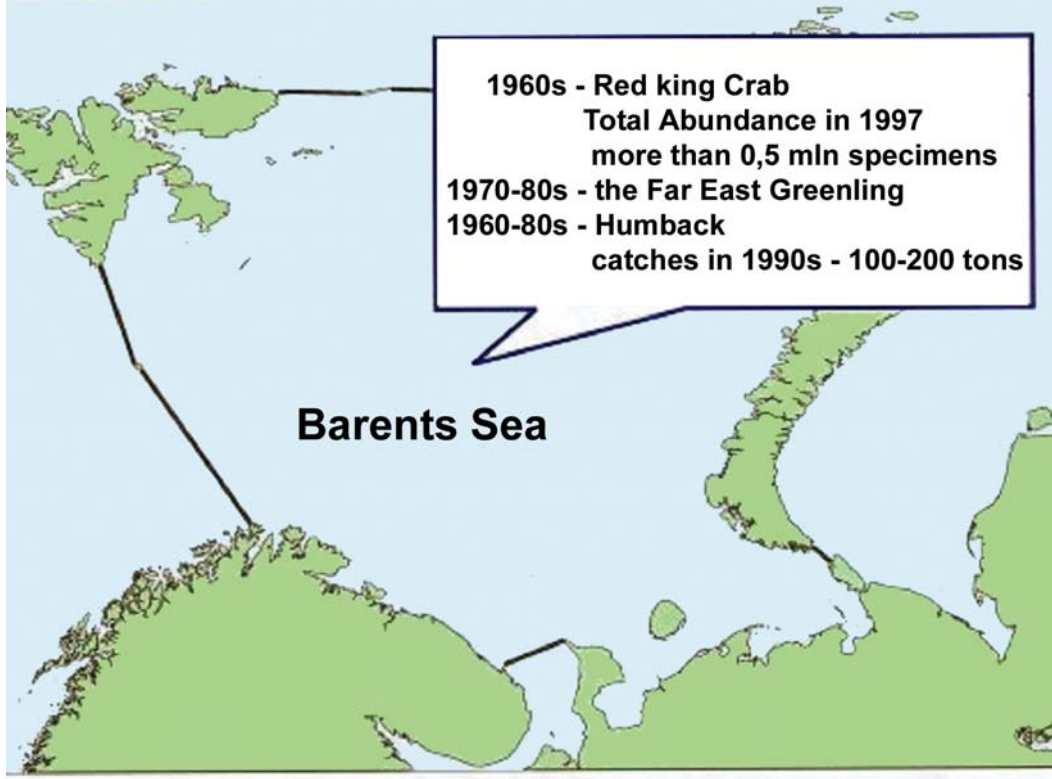
By Dave Merrill and Chris Hendricks, USA TODAY

# Alien fauna introduction with ballast waters while goods transportation




Ballast waters control system in all large ports of the southern seas, jointly with the Ministry of Transport of the RF, is required

# Introduction of Various Fauna Species




# Haarder – the Far East acclimatized species, dominating in the Sea o Azov

Taganrog

Don River

Azov

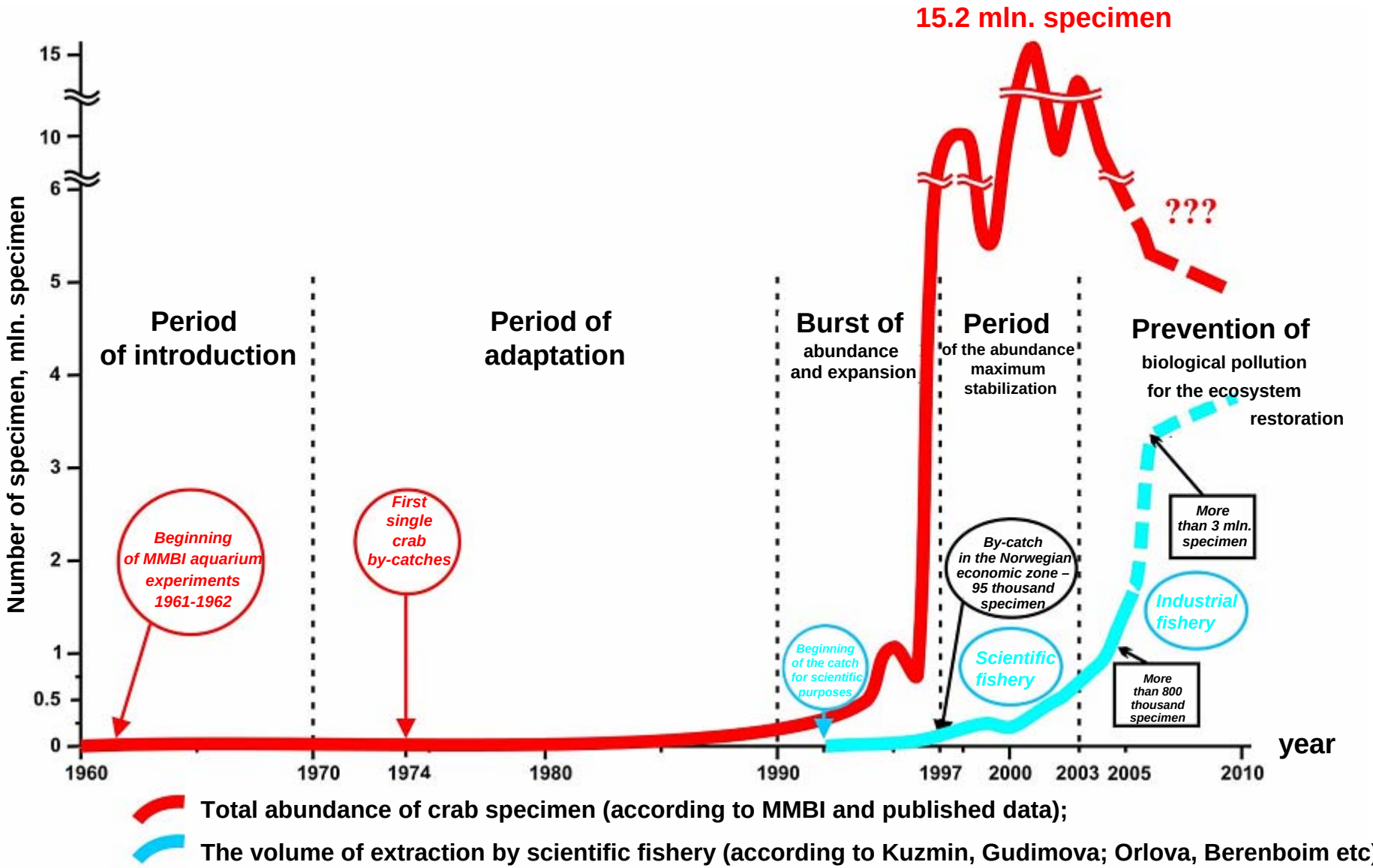
Taganrog Bay
(Sea of Azov)

¾ of control catches in the Taganrog Bay are composed of alien species

# Biological Pollution

## Red King Crab Measuring

# RED KING CRAB ACCLIMATIZATION STAGES (BIOLOGICAL INVASION) IN THE BARENTS SEA (1960-2005)



# The Far East Humpback Salmon – alien species introduced into the seas of Europe

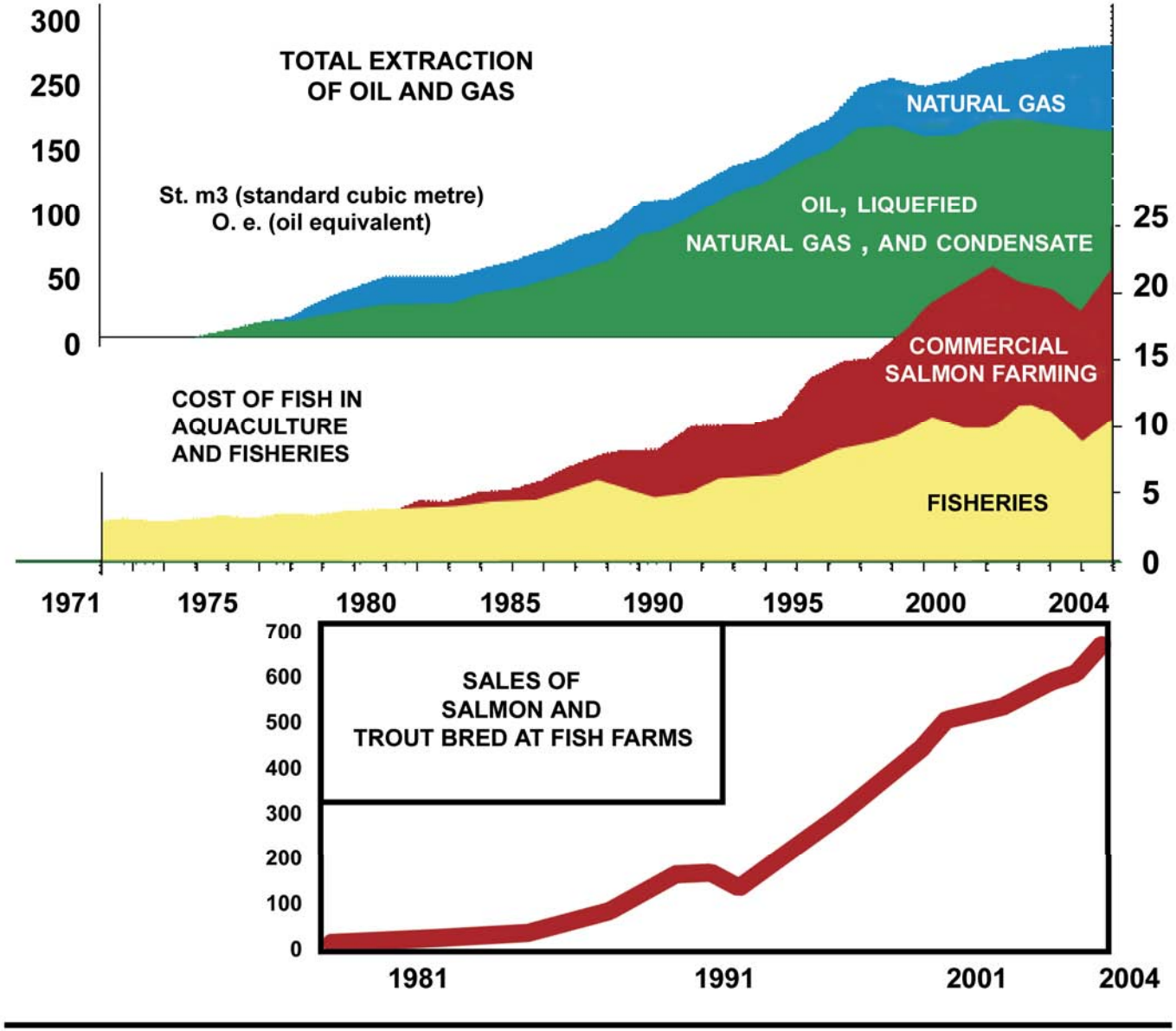
**Humpback Salmon caught in the waters of the Faeroe Islands**
**5 August 2000**

Natural (1), Introduced (2), and of Uknown Origin (3) Habitat of Humpback in Eurasia

- 1 - 2 - 3

# Alien Species entering the Taganrog Bay from the fish farms (escapes)

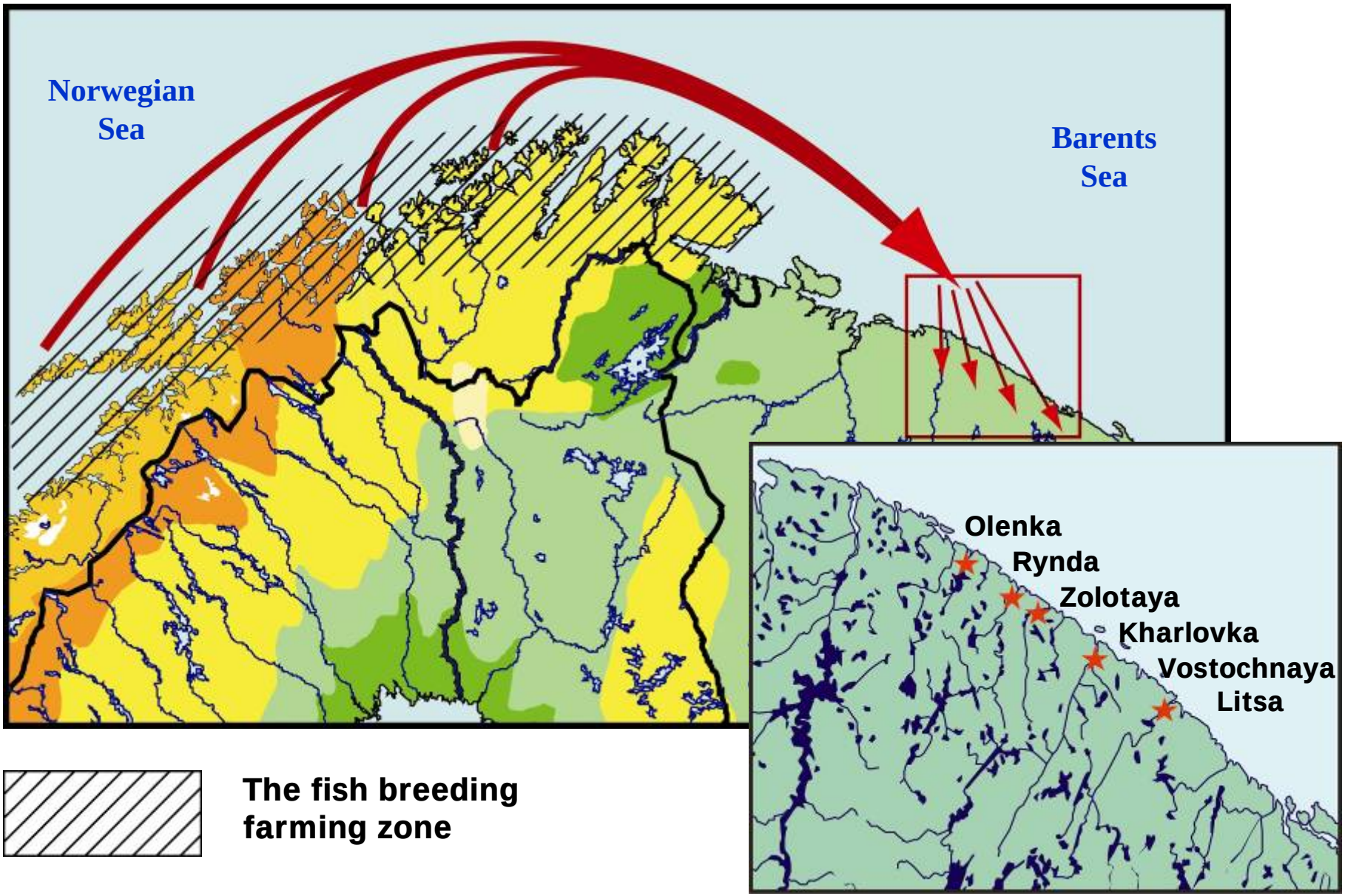
# Rapid Development of Salmon Farming on the Basis of Investments coming from the Oil and Gas Industry of Norway



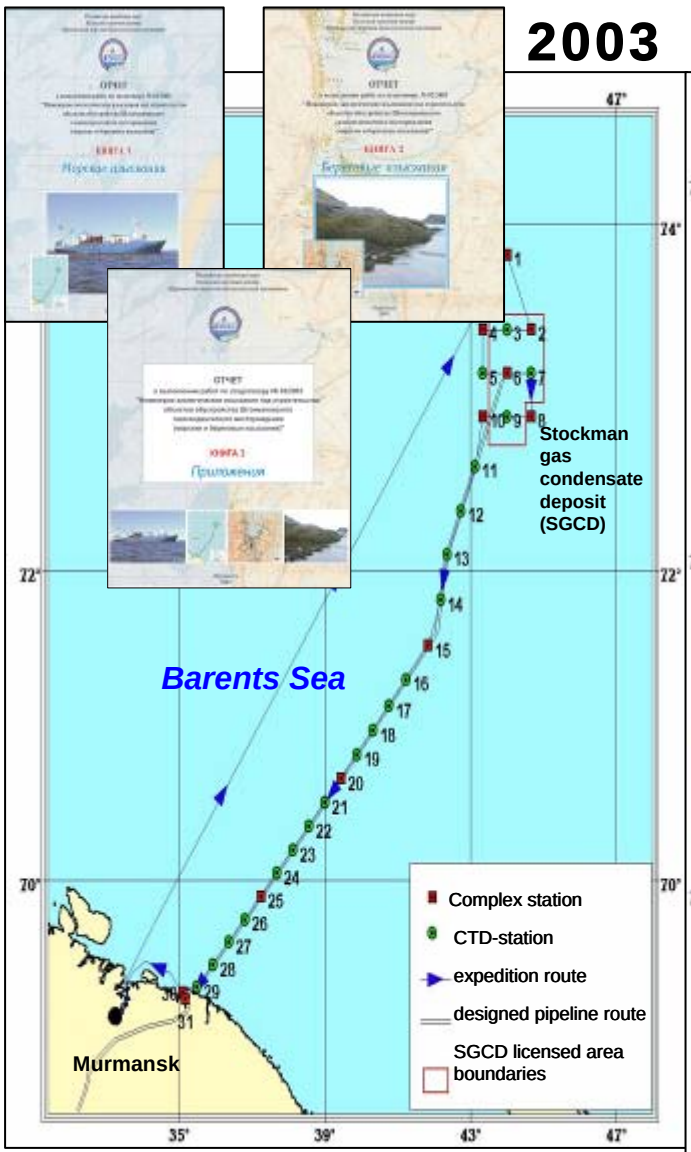

DATA OF CENTRAL STATISTICS BUREAU AND OIL DIRECTORATE OF NORWAY, 2005

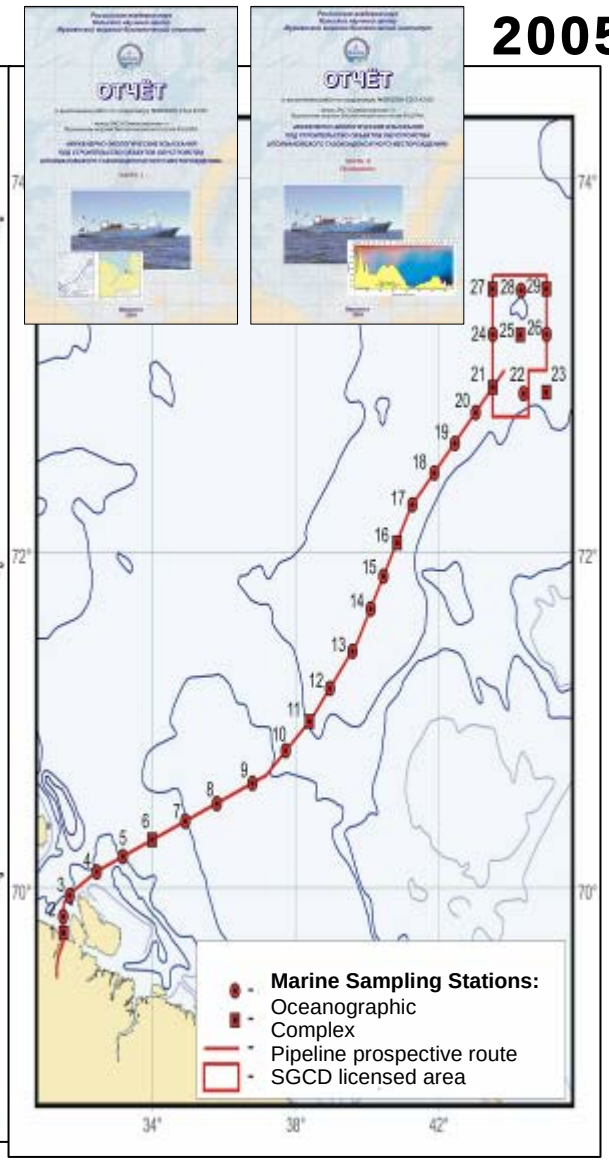
# The impact of industrial fish breeding of Norway on the ecology of rivers of the Kola Peninsula

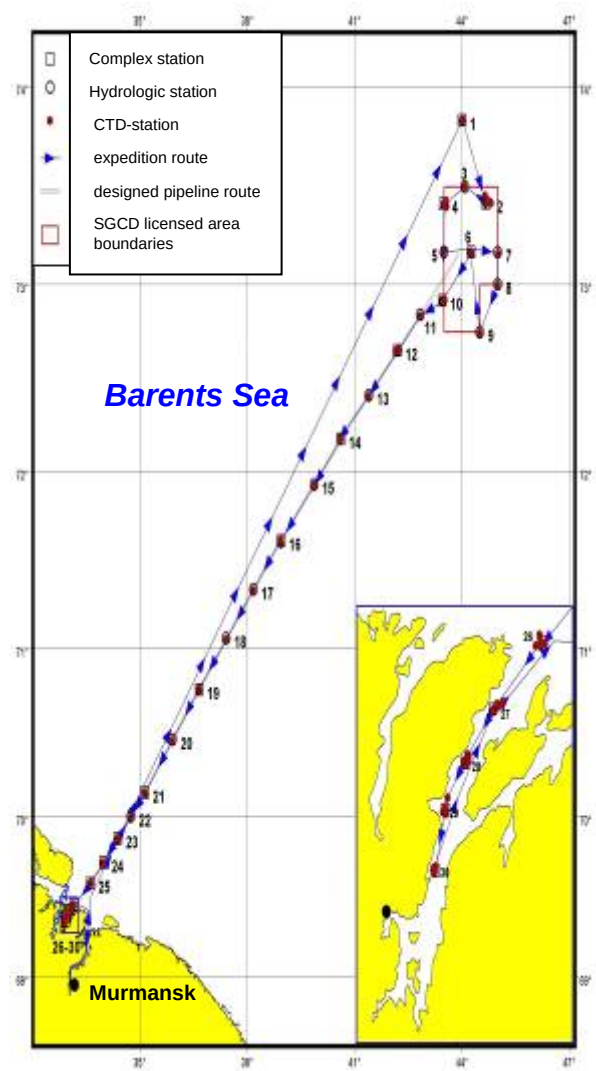
## (invasion of the Atlantic salmon, trout and other fish species)



# «ENGINEERING-ECOLOGICAL SURVEYS UNDER CONSTRUCTION OF THE STOCKMAN GAS CONDENSATE DEPOSIT PROVISION OBJECTS (MARINE AND COASTAL SURVEYS)»



# NORWEGIAN OIL AND GAS COMPLEX “SNOW-WHITE” (SNØHVIT). POSSIBLE TRANSFER ROUTES OF OIL AND GAS POLLUTANTS TO THE RUSSIAN BARENTS SEA

## «Статойл» и «Гидро» объединяются

HYDRO STATOIL

Советы директоров норвежских компаний «Статойл» и «Гидро» рекомендовали своим акционерам объединиться. Процесс слияния официально объявлен и будет завершен к сентябрю 2007 года. Предполагается, что акционеры «Статойла» войдут в новую компанию с 67,3% акций, «Гидро» будет представлен 32, 7%.

62% акций будут принадлежать норвежскому государству.

– Это событие ознаменует начало новой эпохи. Мы создаем мирового лидера в энергетике и укрепляем нефтегазовую промышленность в Норвегии, – сказал премьер-министр страны Йенс Столтенберг.

Новая компания, название которой пока не определено, станет крупнейшим в мире оператором по добыче нефти и газа на шельфе. Планируемая добыча нефти и газа составит 1,9 миллиона баррелей в день.

В течение многих лет «Гидро» и «Статойл» конкурировали друг с другом. Целью обеих компаний является использование ресурсов Баренцева моря для поставок энергии в Европу. Они назывались как возможные партнеры «Газпрома» в освоении Штокмановского месторождения.

*По материалам норвежских информационных агентств.*


Barents Sea

W. № 4
W. № 3
W. № 2
WELL № 1
W. № 8
W. № 9
W. № 10
Snohvit Area

Shtockman Area

Prirazlomnoye Area

Murmansk

Kola Peninsula

Kolguyev Island

# Typical Environmental Situation in the Fjords and on the Coast (Bergen, Norway)

**Pollution of the Golubaya Bay Water Area (Black Sea) with Communal Wastes (August 2006)**



Golubaya Bay, Southern Department of the Institute of Oceanology RAS

RUSSIAN ACADEMY OF SCIENCES
MINISTRY OF EDUCATION AND SCIENCE
OF THE RUSSIAN FEDERATION
SOUTHERN SCIENTIFIC CENTRE RAS
MURMANSK MARINE BIOLOGICAL
INSTITUTE KSC RAS

International Conference

# LARGE MARINE ECOSYSTEMS OF RUSSIA IN THE EPOCH OF GLOBAL CHANGES (CLIMATE, RESOURCES, MANAGEMENT)

First Announcement/First Information Call

10 – 13 October 2007
Rostov-on-Don
Russia

# REGISTRATION FORM

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Large Marine Ecosystems
of Russia in the Epoch
of Global Changes
(Climate, Resources, Management)
Rostov-on-Don
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