

# Navigation in ice conditions. Experience of Russian sailors

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PetroArctic project. UNIS

# PetroArctic Project



Address <http://www.ntnu.no/petroarctic>

Nettstedskart Tilgjengelighet

NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET



Intranett Bibliotek English

 NTNUs nettsider 

- Startside
- Studier
- Student i Trondheim
- Etter- og videreutdanning
- Forskning
- Næringsliv og nyskaping
- Om NTNU
- Aktuelt

Om NTNU > Fakulteter og institutter > Fakultet for ingeniørvitenskap og teknologi > Institutt for bygg, anlegg og transport > Forskning > Forskningsprosjekt > PetroArctic

- ▢ PetroArctic Project Overview
- ▢ News
- ▢ Board of executives
- ▢ People
- ▢ Publications
- ▢ Presentations
- ▢ Laboratories
- ▢ Financing / Sponsors
- ▢ Available positions

## PetroArctic Project

### Offshore and coastal technology for petroleum production and transport from arctic water.

The objective of the project is to increase the knowledge of Arctic/cold climate technology for safe and sound petroleum production and transport from the Arctic region. The project aims in particular towards sustainable development and exploitation of petroleum resources in Arctic waters. The project will enhance the competitiveness of Norwegian oil industry active in Arctic waters.

The project comprises 9 different topics – all relevant for the oil industry and especially applicable for the offshore petroleum production and transport in the ice-infested part of the Barents and Pechora Seas. However, the research is also relevant for the petroleum development in the Kara Sea, the Caspian Sea and off Sakhalin. The research project comprises the following tasks:

- Task 1: Ice ridges
- Task 2: Dynamic ice actions on structures
- Task 3: Marine units in ice
- Task 4: Ice gouging and protection of sub-sea installations
- Task 5: Berm breakwaters and ice barriers in cold waters
- Task 6: Ice actions on jack-ups
- Task 7: Thermal stresses in ice and inhomogeneity
- **Task 8: Collection of ice pilot experiences from sealers**
- Task 9: Miscellaneous (work shops, printing of books)

### Petroarctic News

- Defence PhD-thesis Ms. Svetlana Shafrova on 12.10.2007 at UNIS - Svalbard. Title thesis: "First-year Sea Ice Features: Investigation of Ice Field Strength Heterogeneity and Modelling of Ice Rubble Behaviour". To read more click [here](#).

Last updated: 13/11-07

### Useful links

- [About NTNU](#)
- [About UNIS](#)



**Task 8: Collection of ice pilot experiences from sealers/sailors**

NOR SHIPPING  
OSLO JUNE 12-15 | 2007

Main sponsor:   
MANAGING RISK 

# JOIN THE LEADERS



THE LEADING MARITIME EVENT WEEK

THE LEADING MARITIME EVENT WEEK

Leading Voices Conference

june 13 - WEDNESDAY

Leading Voices Conference

june 13 - WEDNESDAY

www.nor-shipping.com

Lloyd's List Events:



Lloyd's List

1st International Ship Management Conference!

## Risk Management for Ice Operations



Lloyd's List pulls some of the biggest names and the most respected speakers on Ice operations to its event on Wednesday, June 13.

This event should appeal to anyone in ice shipping scenarios, including shipowners, brokers, insurers, maritime lawyers, port authorities, class societies and charterers.

Ice is a very slippery variable in the risk equation marine underwriters need to set up. There's one way to get better: Experience, says Ole Wikborg of Norwegian Hull Club.

THE LEADING MARITIME EVENT WEEK

Nor-Shipping Opening Conference

By 2030 30% of SHIPS ICE CLASSED!

The Arctic borders a half-dozen countries, involves public, commercial and political interests and lies wide open to development. Who will decide over it and how will it affect shipping?

For Nor-Shipping's Leading Voices conference, the Nordic think-tank ECCO has developed three scenarios that describe a realistic near-future for shipping in the Arctic. These practical tools describe the technical, commercial, political and environmental challenges faced up north.

Leading Voices will present these three scenarios, which form the commentary from industry, environmental and political leaders.

Get more expertise to back up your analyses of Arctic shipping developments.

-  Dag Berge Andersen, Minister of Fish and Aquaculture
-  Håvard Nordvik, Chairman ECOM
-  Jan Erik Røysund, CEO Kongsberg
-  Torgeir Helle, President Norwegian Shipowners' Association
-  Tore Torstund, Secretary Norwegian Shipowners' Association
-  Ingvald Skarstad, President ECOM
-  Lia Monica Skjott, Minister of Transport
-  Kathrine Steen Bakke, Senior Advisor ECOM

### But is there ice?

Ice is a very slippery variable in the risk equation marine underwriters need to set up. There's one way to get better: Experience, says Ole Wikborg of Norwegian Hull Club.

Imagine a chemical tanker loses main engine power in a blizzard in the Baltic Sea. In low visibility and amidst the congestion created by a slim lane in the ice, the tanker strikes a crude carrier on its way to the Russian Primorsk refinery. Both crews evacuate into icy seas without appropriate winter survival suits.

At this point, the marine underwriter responsible for assessing the risks for the chemical carrier wakes up with a cold sweat. In a recent article called "Additional premium for trading in icy waters: Is there any logic?", the Norwegian Hull Club's Ole Wikborg addresses risk assessments in underwriting vessels trading in icy water.

**Assessing the weather?**  
More than 400 ships alone call at the Primorsk oil refinery annually. These pass through an inner part of the Baltic Sea covered with ice three to six months every year. "Experts claim that in order for a deck officer to gain proper experience from

navigating the Baltic during the winter months, 8 to 10 years of service in the area is a minimum requirement," says Wikborg. "The challenges of ice coupled with extreme low temperatures and a crew that is often not properly dressed and equipped, are risk factors that the underwriter must bring into his risk assessment when evaluating the risk associated with any Gulf of Finland transit."

The kind of sea areas where shipowners are asked to alert underwriters when transiting are increasingly areas where oil and gas resources are produced or shipped. Owners want to know ahead of time how much extra premium they will face, in order to budget and plan appropriately.

Winter conditions change quickly, though. How can an underwriter provide an accurate and appropriate risk assessment before a realistic weather and sea condition assessment is available? The answer: They can't.

"This is unfair to the assured. To assist him, the underwriter may obtain useful information from databases that adequately report ice and weather conditions. These databases are continuously updated," says Wikborg.

**Scandinavian advantage**  
The more weather you've seen, the more you're prepared to see. This factor works to the advantage of companies like the Norwegian Hull Club.

"We...impose changes in the insurance conditions and additional premium that reflect the actual risk at the time the vessel enters such an [conditional] area. Located in Scandinavia, and with experience with harsh winter conditions, we have some good qualifications," concludes Wikborg.



NORWEGIAN HULL CLUB

Start 0930 Coffeebreak 1100 Lunch 1300

OPENING SPEECH | SCENARIOS | COMMERCIAL IMPLICATION

# Scope of Work

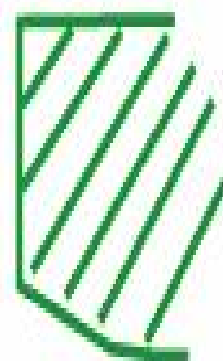
Collect information about:

- Experience of seafarers, which have operated off and close to the ice edge experiencing e.g. icing
- All activities in the Arctic
- Waters for sealers hunting
- Shipwrecks

# THE REGION OF INVESTIGATION FOR PetroArctic project Task 8: Collection of ice pilot experiences from sealers



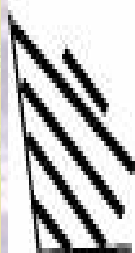
High-priority region



Johanes  
Alme



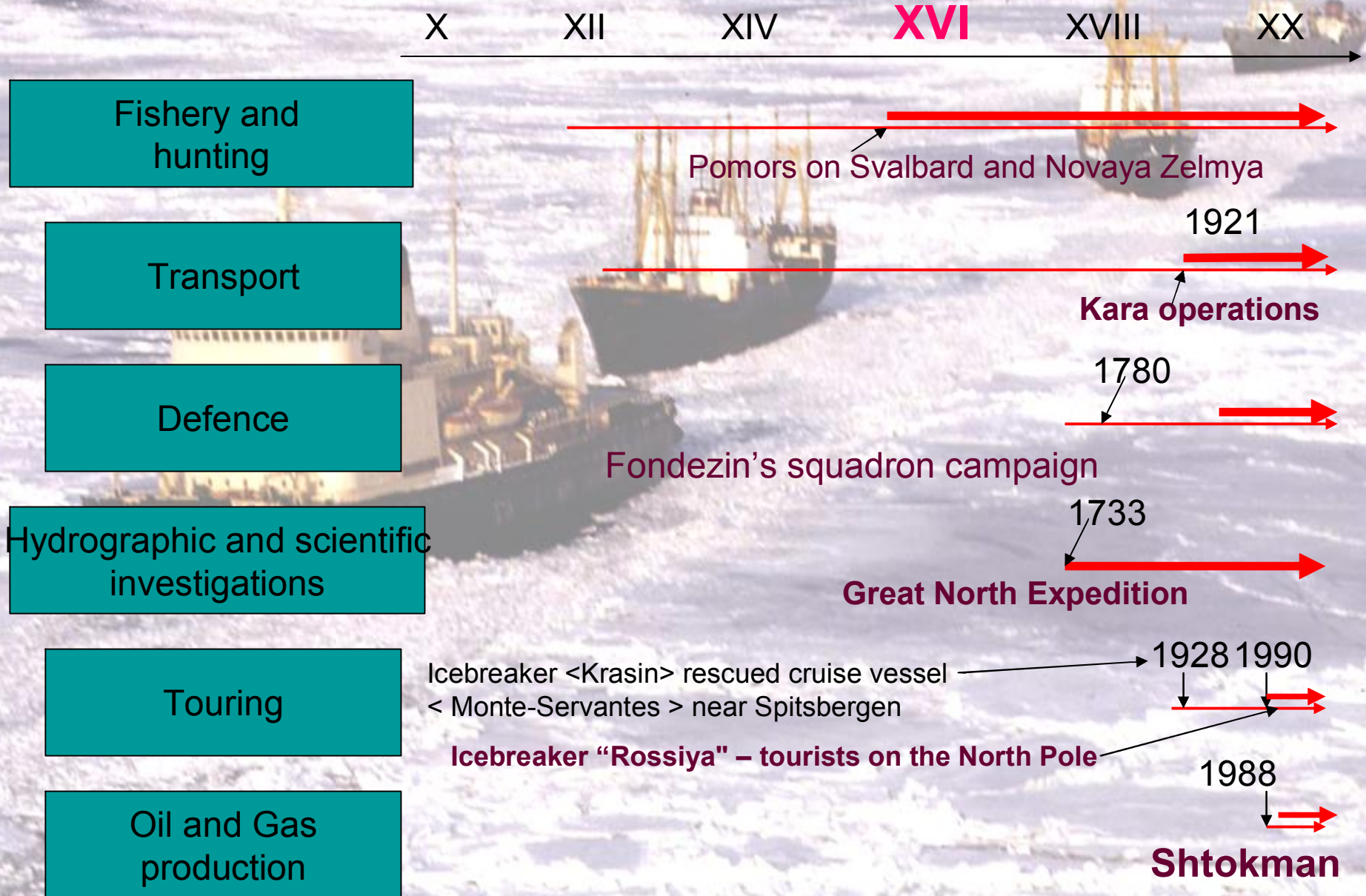
Nataly  
Marchenko



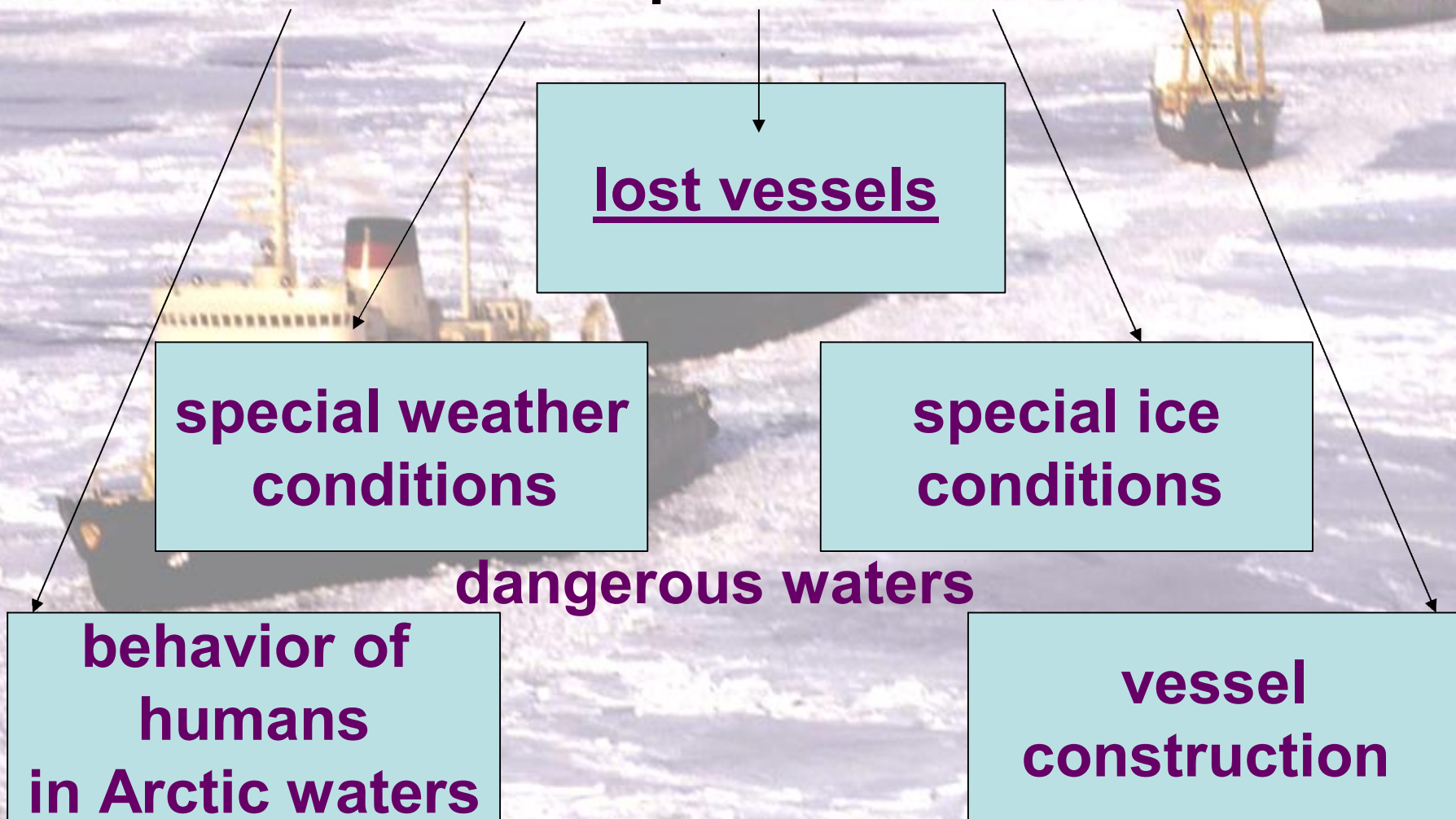
- The area, which can be also  
considered



# Russian activity in Arctic



# Items of special interest



**ice pilot experiences**

# WHY ARE WE ESPECIALLY INTERESTING IN VESSEL LOSSES AND SHIPWRECKS ??

BECAUSE the safety is most important

BECAUSE we want to prevent the future losses

BECAUSE we have to know what we will do in emergency situation

BECAUSE in extreme situations, it is more evident how men act



# RUSSIAN MARITIME ARCTIC

## INSROP International Northern Sea Route Programme



Central Marine  
Research & Design  
Institute, Russia



The Fridtjof  
Nansen Institute,  
Norway

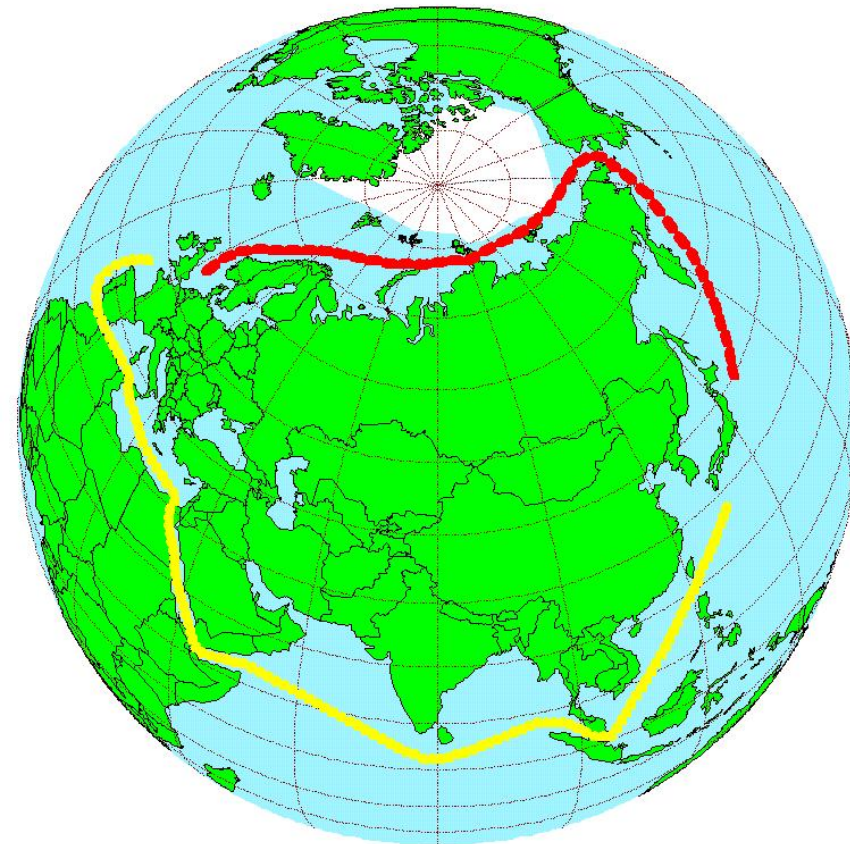


Ship and Ocean  
Foundation,  
Japan

June 1993 – March 1999

**5 CENTURIES  
HISTORY**

**160 DEGREES  
10 000 KM  
11 TIME ZONE**



ARCTIC PORTAL

Arctic Council Working Groups Associate

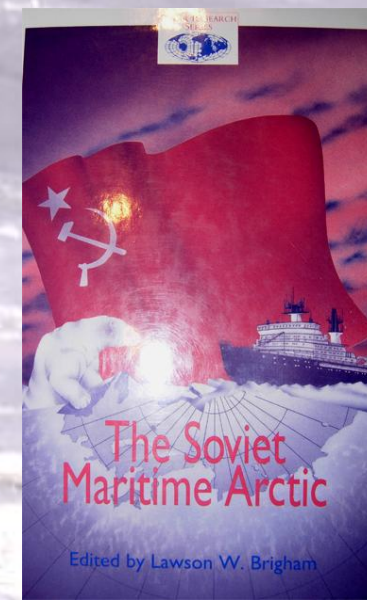
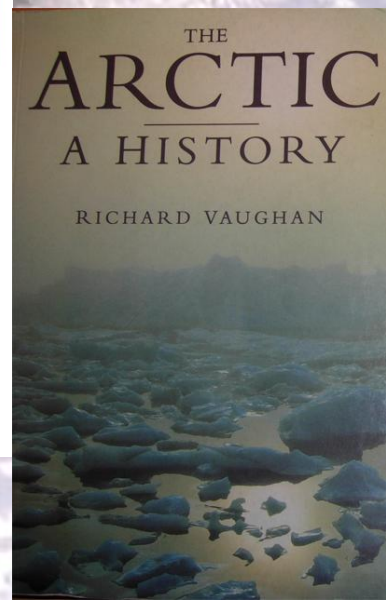
Home / Arctic Council

ARCTIC COUNCIL

THE ARCTIC

ARCTIC COUNCIL  
NORWEGIAN CHAIRMANSHIP  
2006-2008

<http://arcticportal.org/en/arctic-council2>



# SOURCES OF INFORMATION

written documentation

involved persons

MUSEUMS

LIBRARIES

**RUSSIAN  
GEOGRAPHICAL  
SOCIETY** Department of  
polar region geography

**CENTRAL NAVY MUSEUM**  
Saint-Petersburg, since 1709 y.

The greatest collection of boat models  
and plots (20 000 specimens)

INTERNET

**ASSOCIATION** of polar  
researchers and Polar  
workers

**Real Vessels**



**The Russia State Museum of Arctic and  
Antarctic**, Saint-Petersburg, since 1930 y.

Caspar David Friedrich, Arctic Shipwreck, 1824

# «Data Base» in my laptop

Address **D:\PETROARCTIC\BOOKS** Go Links

Folders

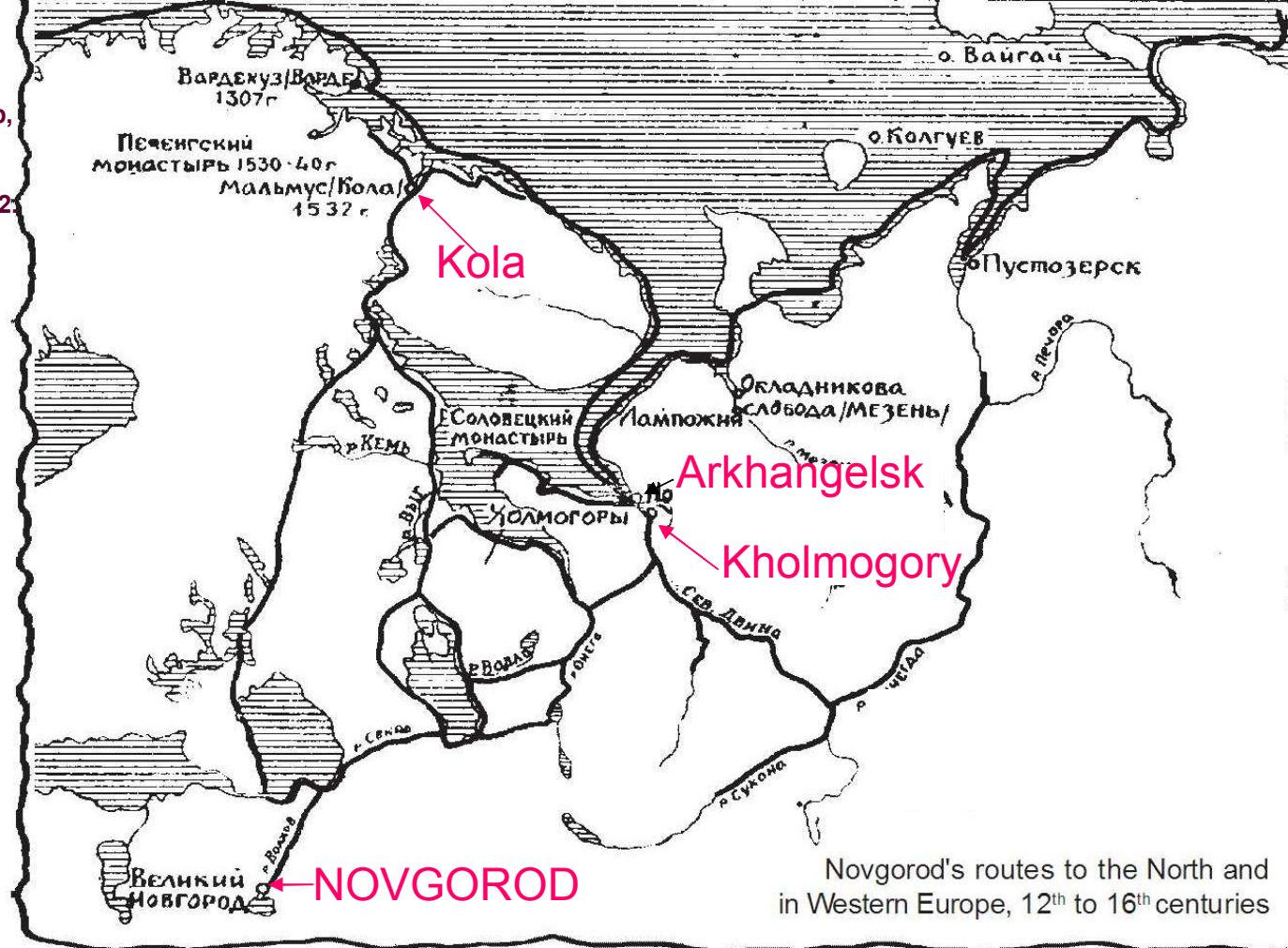
- OZI
- PETROARCTIC
  - 2007 events
  - BARENTS SEA
  - BOOKS**
  - Cont-Annotation
  - DISKS
    - AARI
    - ICE EDGE-NPI
    - Map-Lozet
  - HISTORY OF ARCTIC
  - ICE
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  - ORGANIZATIONS
  - PAPIR
  - PEOPLE
  - [PetroArctic-july 2007](#)
  - PITER-MOSCOW - foto
  - Presentations
  - Shtokman
  - SOUND TR
  - VESSELS
    - Icebreakers
    - Lost Vessles
    - Sewn Kola shnjaka reconstruction\_files
    - ДИКАЯ ПРАВДА - Рассказы еще не старор


# XII-XV c.

The earliest voyage by a Novgorodian, Uleb, to the "Iron Gateway" and his passing into the Kara Sea through the Yugorskiy Shar Strait were recorded in 1032



Ушкүйникки на Беломъ море



Novgorod's routes to the North and in Western Europe, 12<sup>th</sup> to 16<sup>th</sup> centuries

Samoyeds



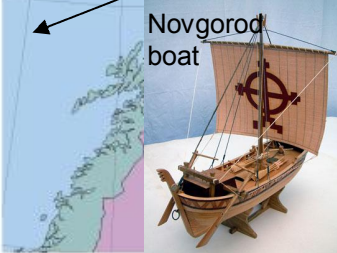
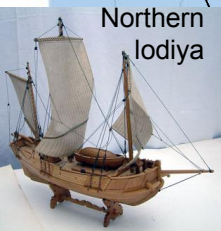
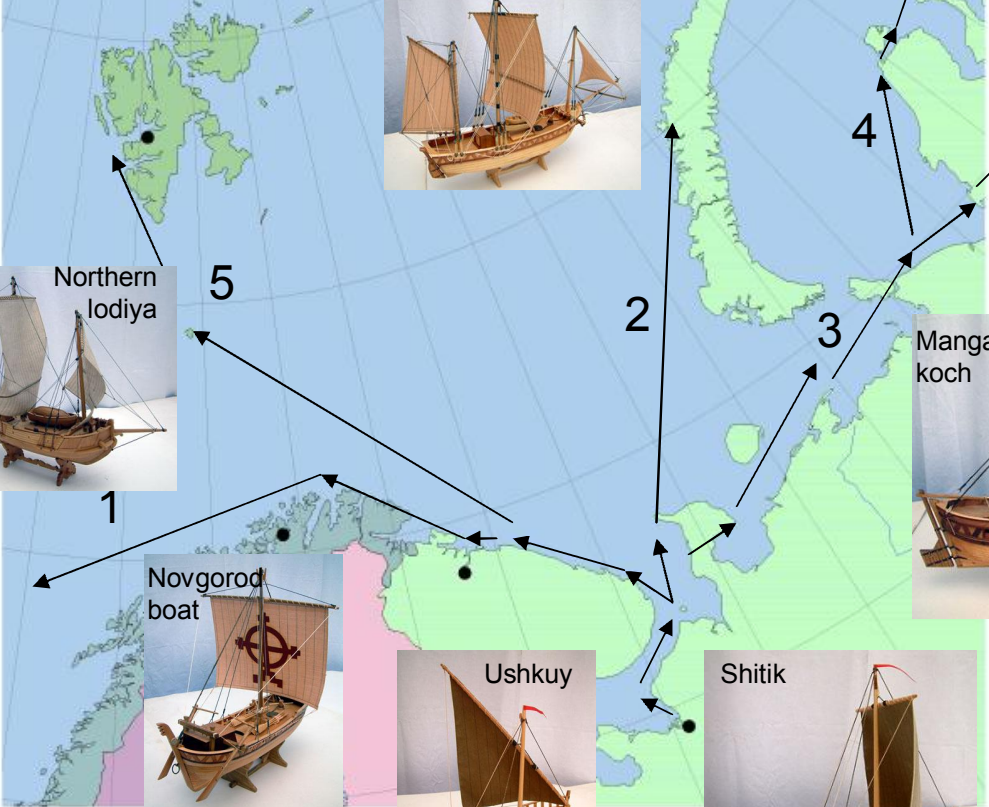
As early as the 12th century, explorers from Novgorod entered the White Sea through the Northern Dvina and Onega estuaries and founded settlements along the sea coasts of Bjarmaland. Their chief town used to be Kholmogory, until the rise of Arkhangelsk and Kola.

## 5 main sea routes

- 1 – Along the shore of Kola peninsula and Norway to Europe,
- 2 – To Northern island of Novaya Zemlya (New Land) archipelago
- 3 – Mangazeya sea path - 6 weeks
- 4 - Yenisey river route
- 5 - Grumant route - 6-8 days



7,400 small ships in a single year



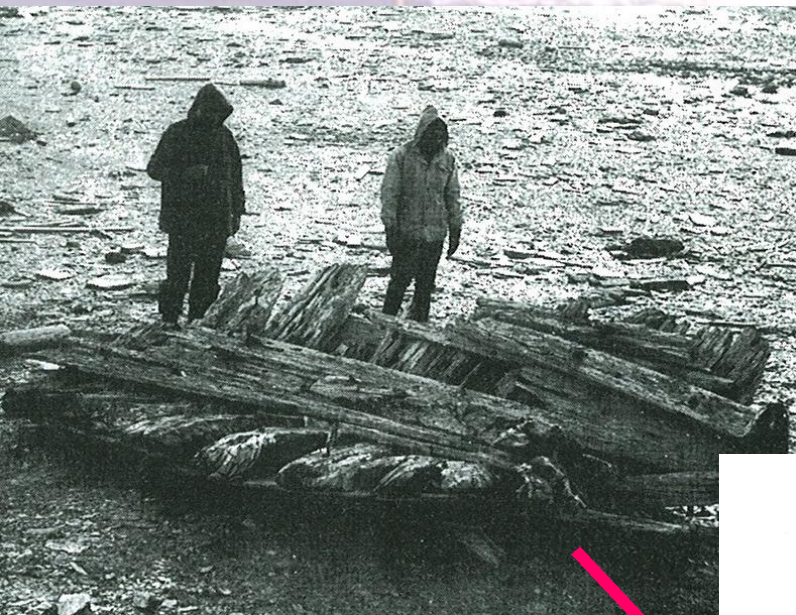
Models by Vladimir Zorin  
Scale 1:50

XVI-XVII c.

# POMORS on SVALBARD

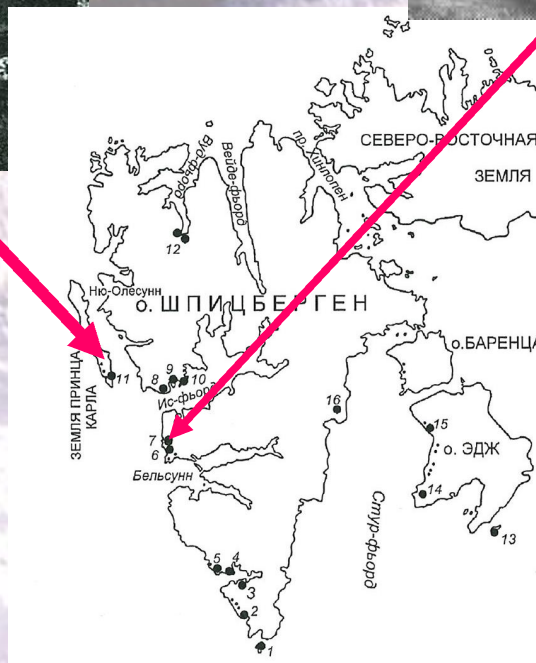
## GRUMANT and GRUMLANDERS

Archeological finds. Vadim Starkov's expeditions  
(4 houses XVI c. and remains of koches)



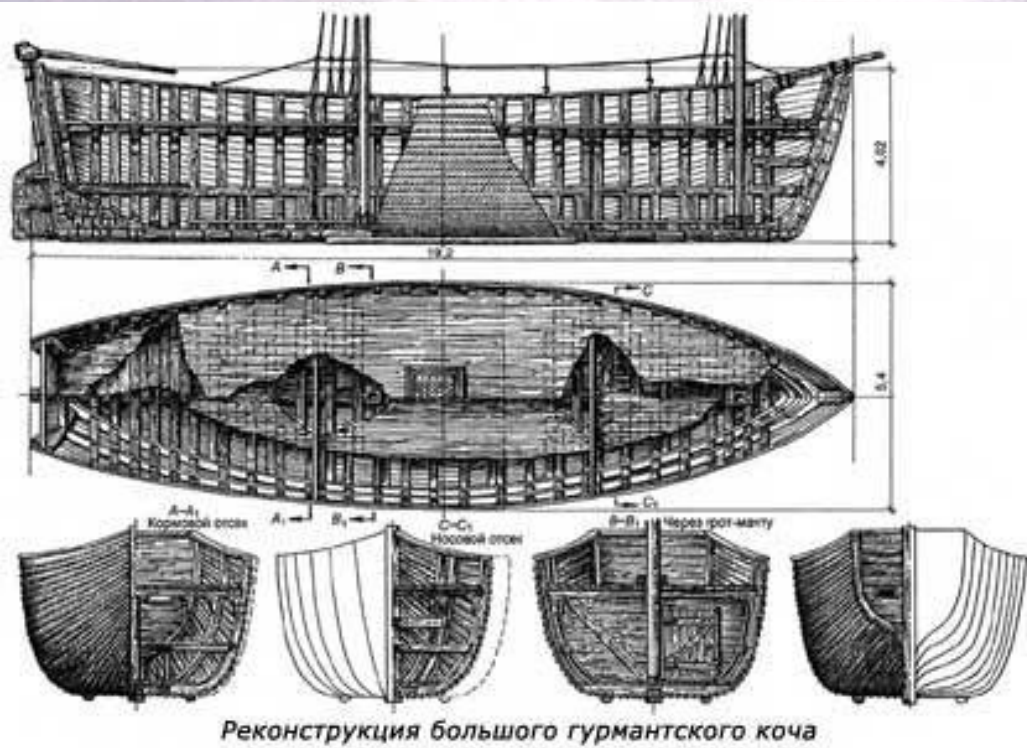
House remnant 1578. Laguna Gravshen

Fragment of koch. Prince Karl Earth  
(Starkov, 2001)



# XVI-XVII B.

This wooden made boats were like a walnut-shell in a shape. When huge floats aspired to catch and nip these boats and overwhelm them, they jumped out to the surface. Pomors built since XIII c. especially for seafaring In ice seas. They named these boats as koches.

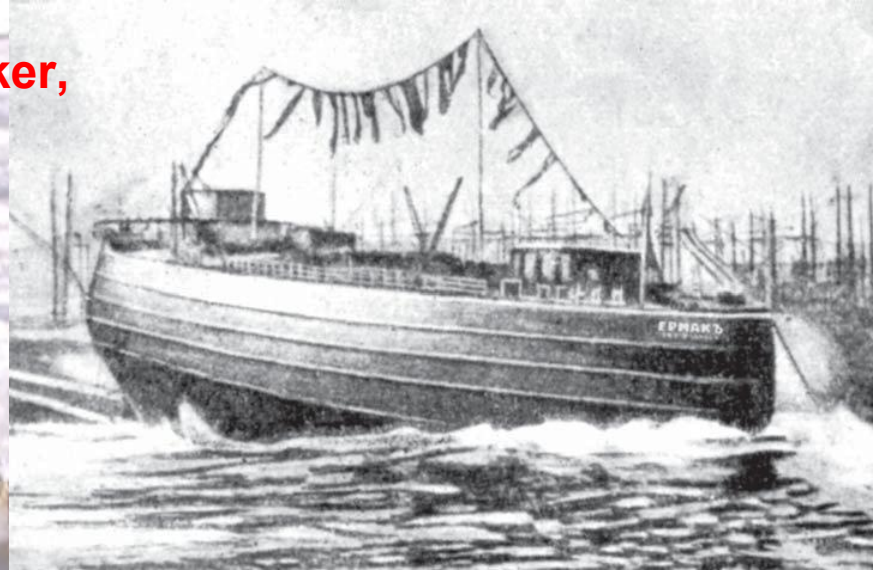


Large Grumant koch

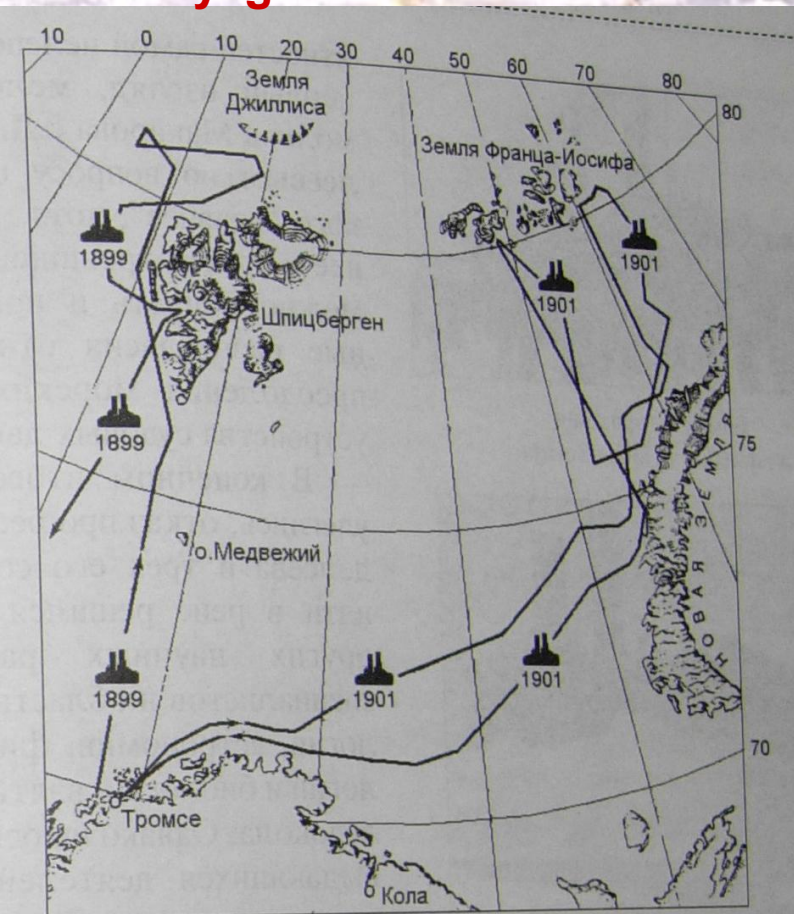
## Northern large Grumant koch – Pomor's boat XVI-XVII cc.

- keel length - 10-25 meters. - flat deck.
- one square sail on each of its two masts, and, usually, two triangular sails on the bowsprit
- big square rudder with extra-slim design of the upper part.
- 2 main anchors (32 kg) and, very often, light anchors for mooring kochs to the ice fields.
- an additional belt of ice-floe resistant flush skin-planking
- cargo capacity of 1.5 to 2.0 metric tons. - Crew 10-25 , Passengers – 50

**XX C.** *Yermak* - world's first true icebreaker, with a strengthened hull shaped to ride over and crush pack ice (up to 2 m thickness).



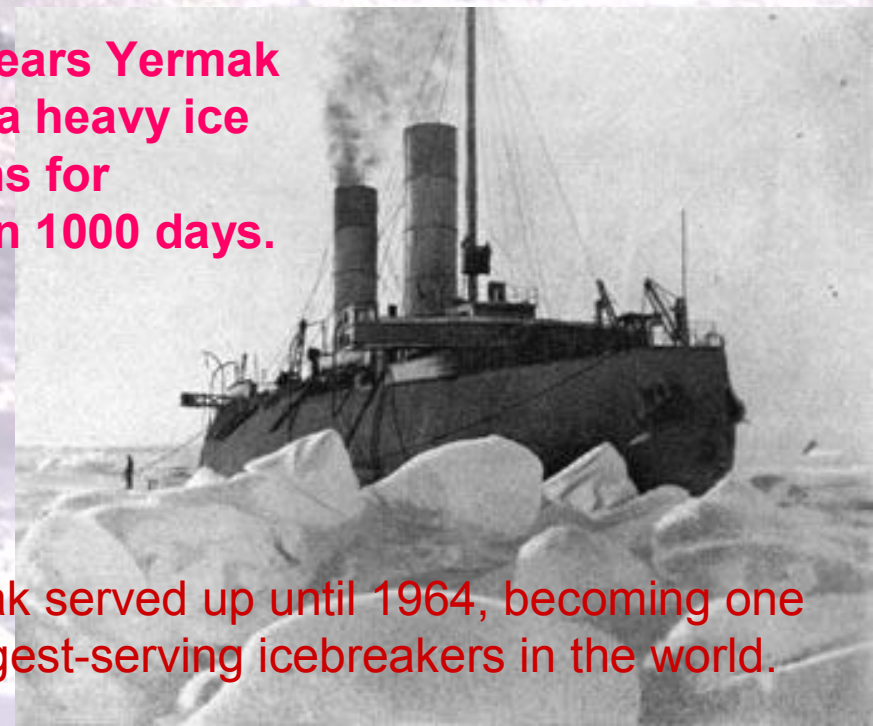
**First voyage to 81°21'N north in 1899.**



Маршруты "Ермака" в 1899 и 1901 гг.

**October 29, 1898**  
**launching of icebreaker Yermak**

**12 next years Yermak sailed in a heavy ice conditions for more than 1000 days.**



**Yermak served up until 1964, becoming one of longest-serving icebreakers in the world.**



## XX c.

1921 – The first Russian trade Kara expedition (1932 – 12-th)

1932 - All the way through voyage on this route (from the White sea) was firstly conducted only in 1932 by an expedition led by O.Y.Smidt on the icebreaking steamer "Sibiryakov" (master V.I.Voronin).

1935- First transport operation on NSR.



1978 - Beginning of whole year operation on route Murmansk –Dudinka for transport enriched nickel and copper from Norilsk to Murmansk by sea then to the Monchegorsk enrichment plant

1987- Turnover on NSR reached 6.85 ml.t. There were 16 icebreakers (8 nuclear, 8 diesel) and 380 transport vesels

1989 – 18 icebreakers, Arctic Lichter «Sevmorput», 20 судов класса УЛА, 108 судов УЛ.

# IS IT DANGEROUSE ?

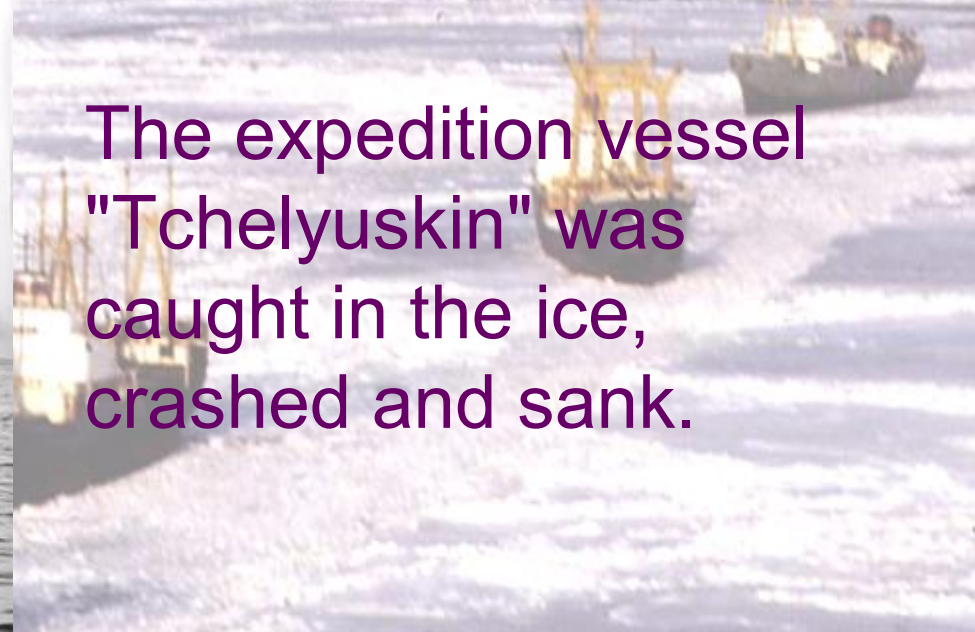
## 10 Shipwrecks during all history of NSR exploitation



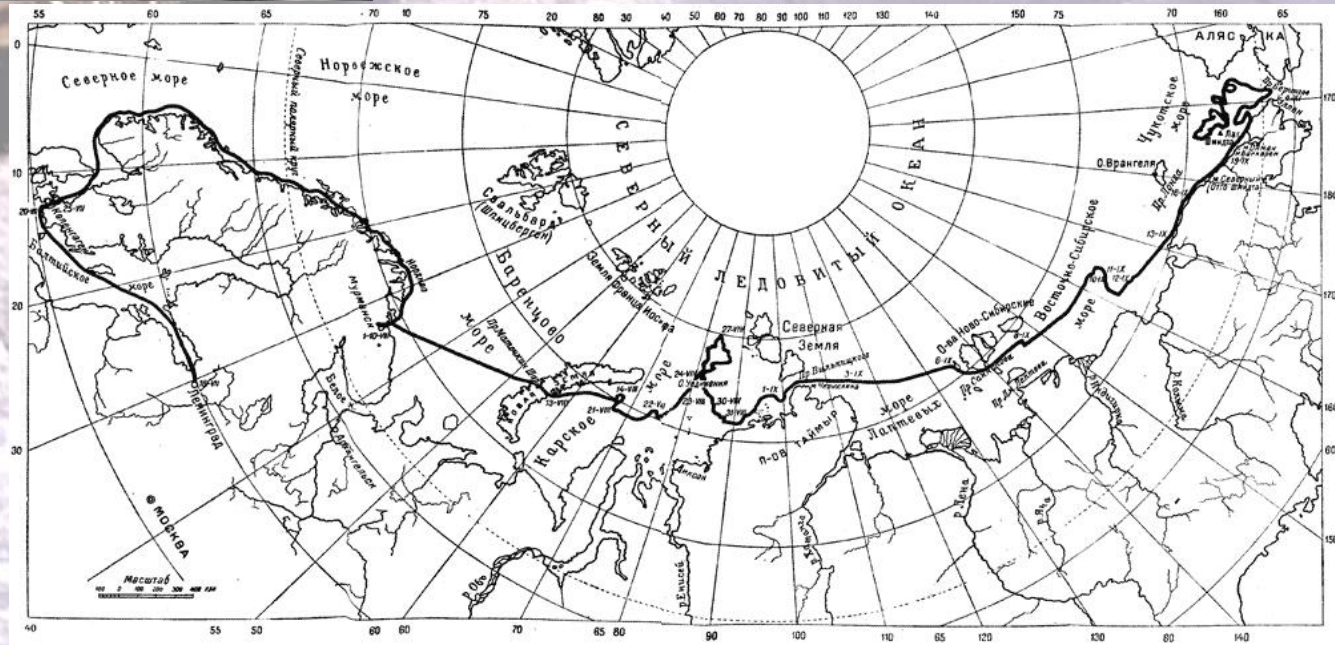
**Probability of ship losses on NSR = 0,04%**  
(4 wrecks , 40 years of intensive exploitation, 250 ships)

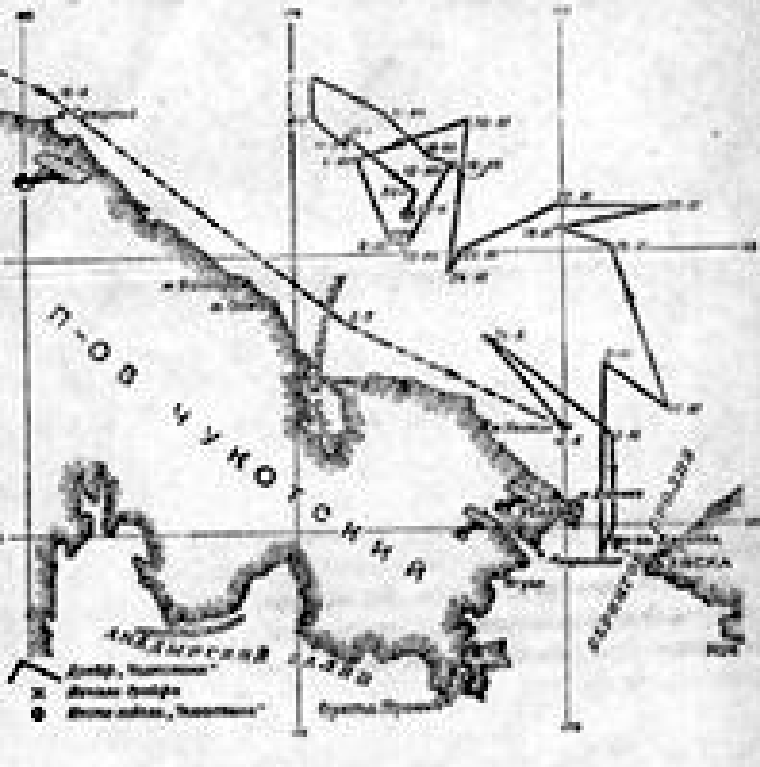
**Probability of ship losses in the World Ocean  
(Lloyd's Register) = 0,15-0,39%**  
(every 1-2 days ship loss, 75 000 vessels)

# Shipwrecks. EXAMPLES



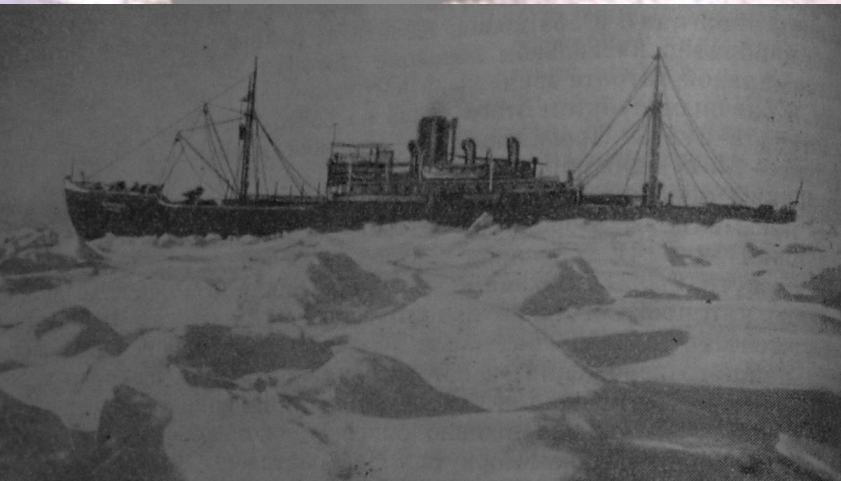
13 February  
1934  
CHUKCHI  
SEA





The ship's crew and expedition team had to survive on drifting ice for 60 days during polar night and had to endure the most severe of weather conditions.

They were finally rescued by the polar aircraft. The courageous pilots were the first to be honoured by the highest Soviet Russia Award – the title of the Heroes of the Soviet Union and Golden Star Medal.



# 7 archeological expedition to place of Cheluskin's grave

Submarine foto.

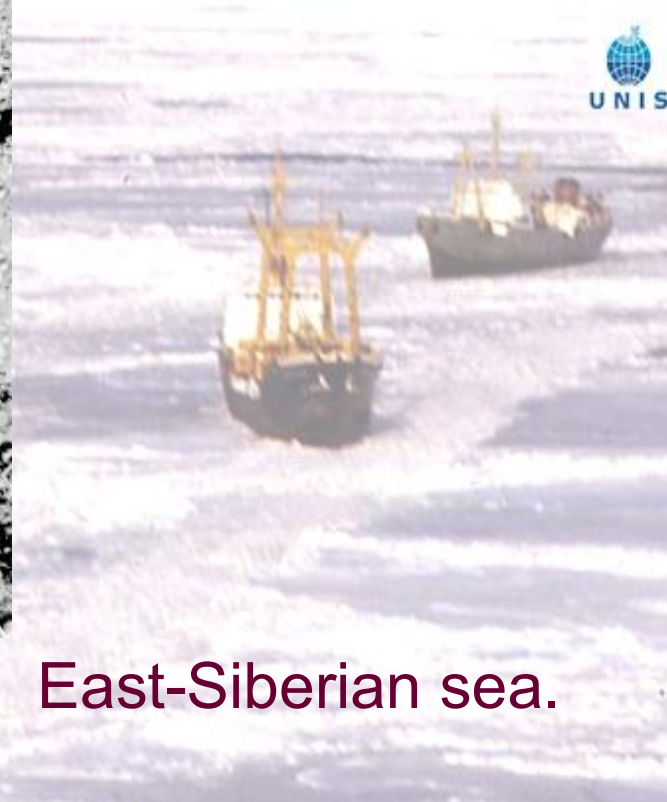
In summer 2006  
the boat has been found





**Transport vessels “VitimLes” 1965 in East-Siberian sea.  
She got shell hole by hit of heave ice-float  
and sank after 12 hours.**





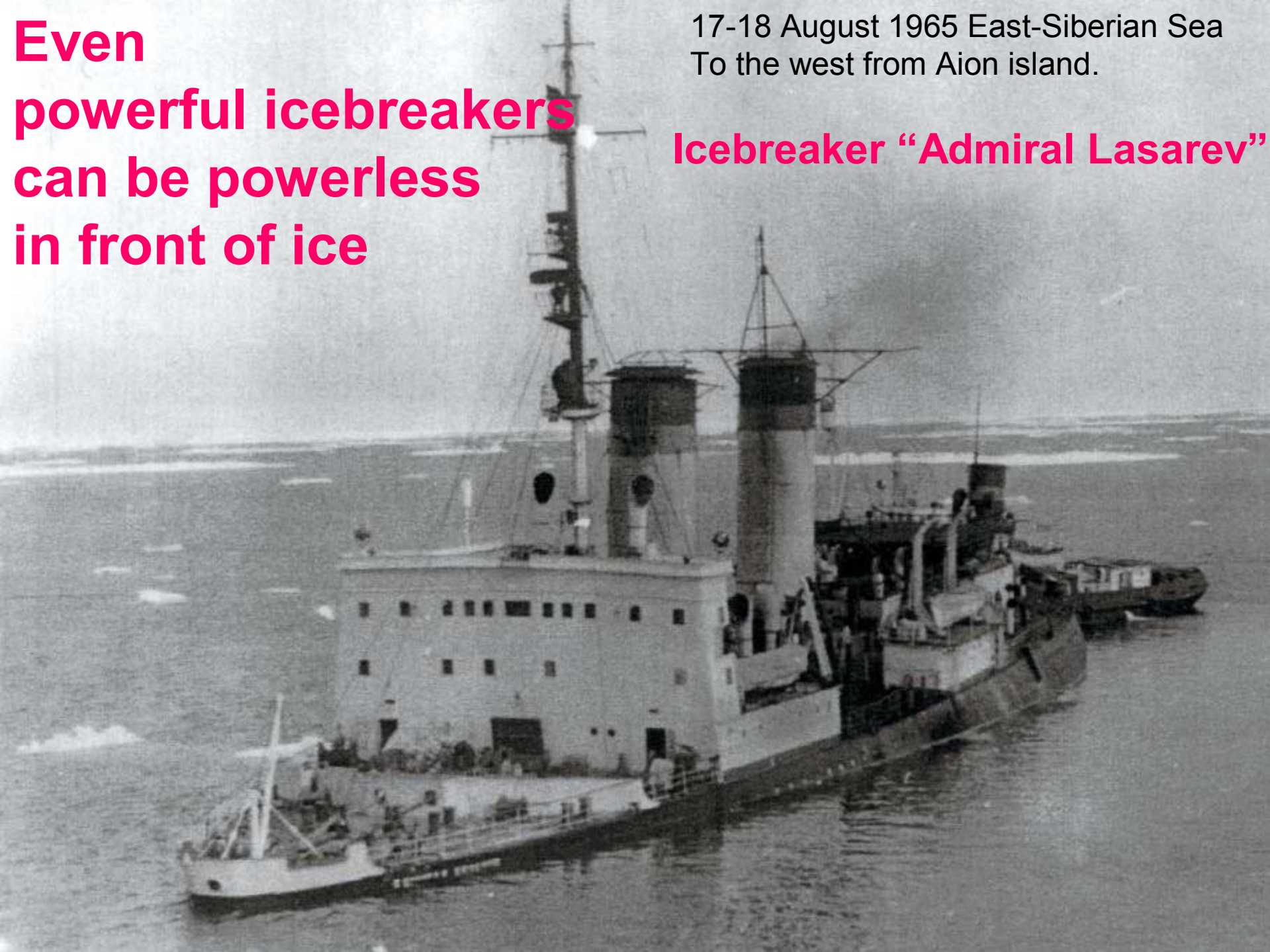
Transport vessels “Nina Sagaidak” 1983 East-Siberian sea.  
Crushed by nipping and sank.



**Even  
powerful icebreakers  
can be powerless  
in front of ice**

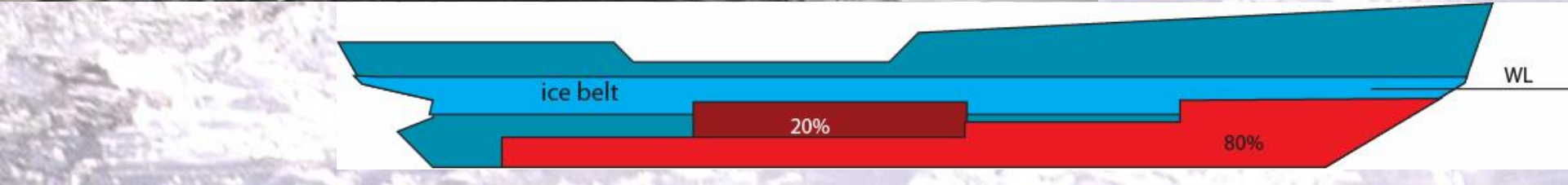
17-18 August 1965 East-Siberian Sea  
To the west from Aion island.

**Icebreaker "Admiral Lasarev"**





# Ice damage



# Ideal Requirements for a Arctic ship

**Strong hull, to minimize damage from floating ice,**  
to avoid being crushed by sea ice and to be able to push its way through the ice.

**Rounded hull to allow the ship to ride upwards**  
if pushed from the sides by wind-blown pack ice

**Re-inforced bows to withstand hitting against floating pack ice.**  
Ideally re-inforced by massive structural strength and then clad in iron.

**Retractable propeller and rudder** to avoid ice damage.

**Skewed bows** so that when hitting pack ice the ship would ride up and over the ice breaking it with its own weight.

**Powerful engines** economical with fuel for working in heavy ice.

**Well insulated on the inside**

to retain heat and not allow moisture to drip inwards from frozen ice and snow on the outside.

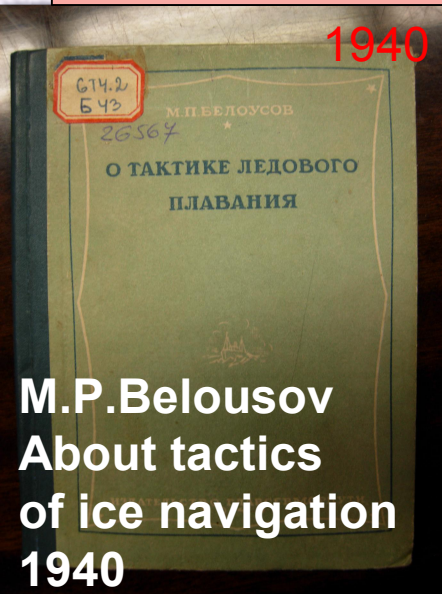
**Plenty of stowage space**

for scientific cargo and provisions for at least a year longer than the intended voyage - in case the ship was iced in.

**A good supply of ice anchors, long (14ft) ice saws and maybe dynamite**  
to break a passage through winter ice to open water in the spring.

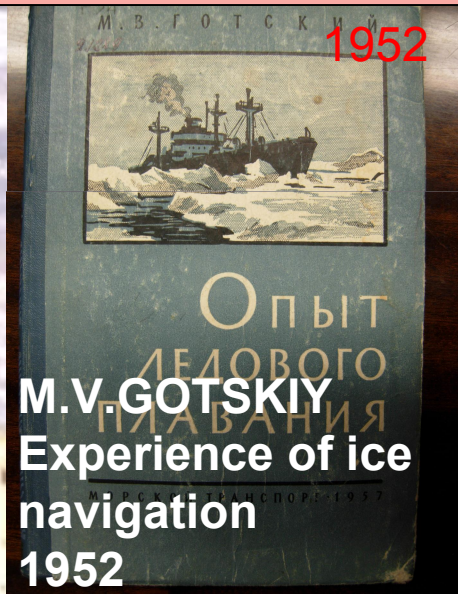
**Entertainments** on board to pass the long dark winter months.

# The books on ice pilot experiences



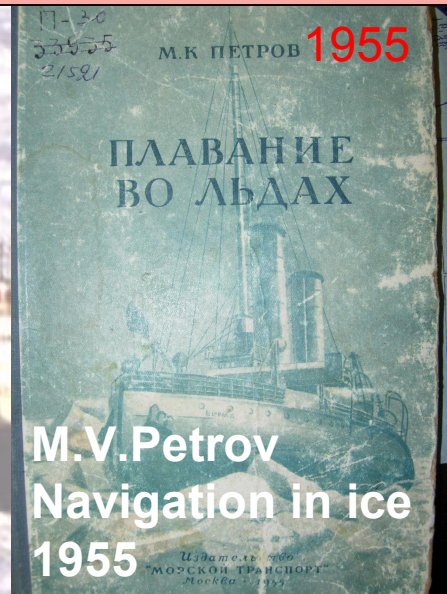
1940

M.P. Belousov  
About tactics  
of ice navigation  
1940



1952

M.V. Gotskiy  
Experience of ice  
navigation  
1952



1955

M.V. Petrov  
Navigation in ice  
1955



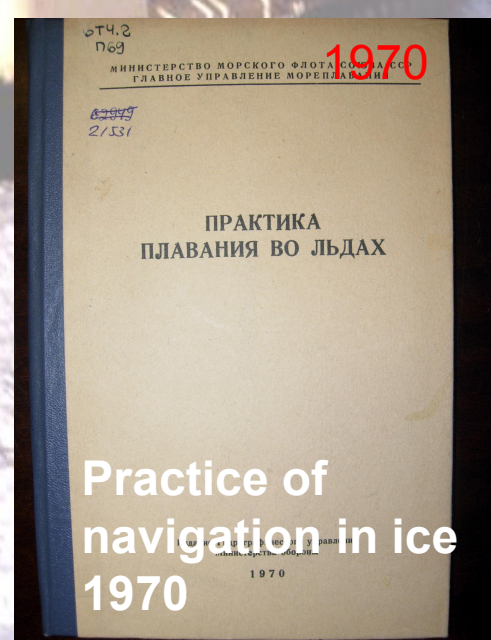
1956

F.I. Voronin  
Navigation in  
Hard conditions  
1956



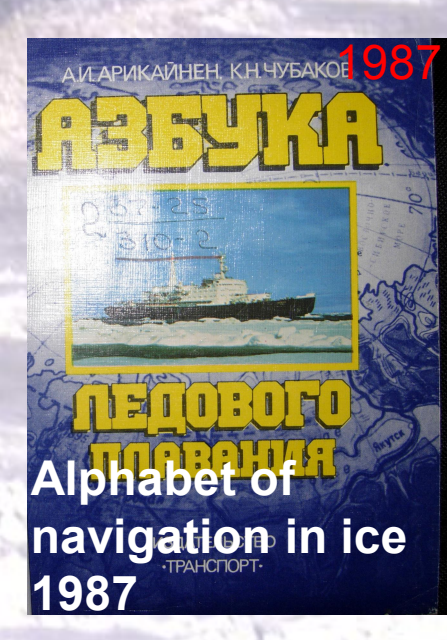
1956

L.E. Polin  
Sea transport ship  
navigation in ice  
1956



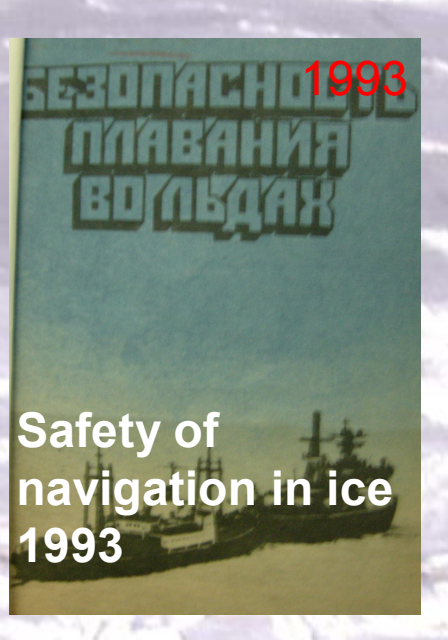
1970

Practice of  
navigation in ice  
1970



1987

Alphabet of  
navigation in ice  
1987



1993

Safety of  
navigation in ice  
1993

# Summarizing of ice navigation experience

Now the special instruction, which renewed each several years, lays on pilot-bridge on each ships.

In general the rules describe 4 main points

- 1/ Estimation of ice condition,
- 2/ Choice of safety speed
- 3/ Choice of safety distance
- 4/ Cutting of ice for icebreakers

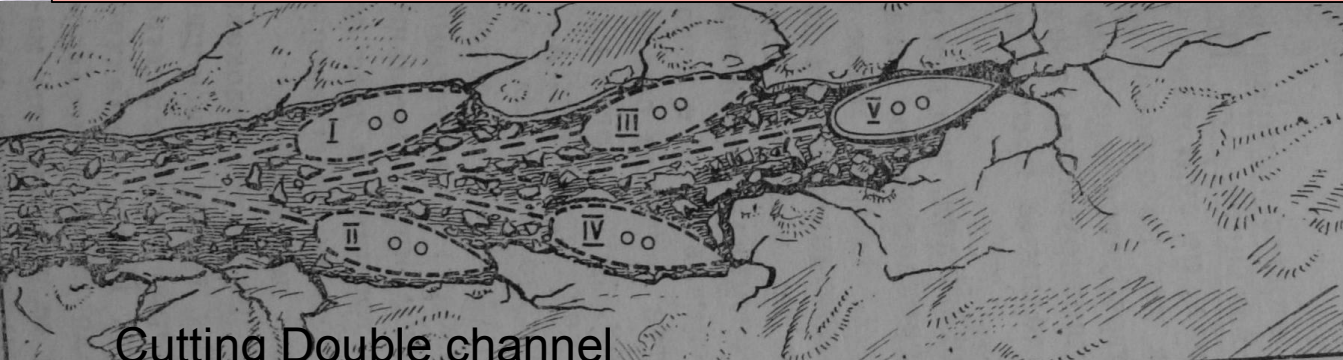
Diesel-electric ship "Kapitan Gotskiy",  
vessel of ice class



**M.V.GOTSKIY**  
Experience of ice  
navigation  
1952



# Ice technique



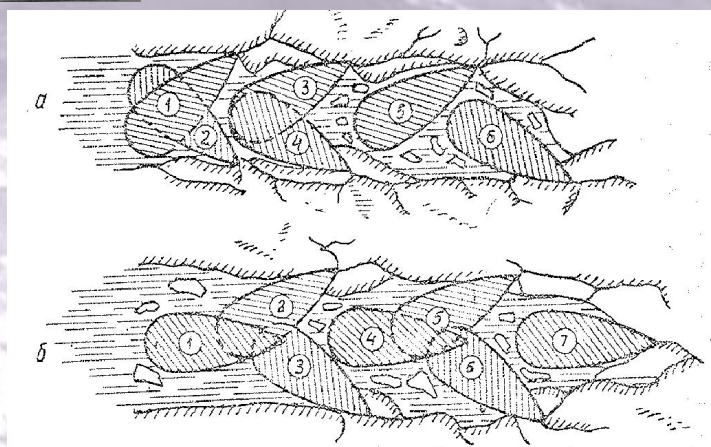
Cutting Double channel

“Spruce tree” - herringbone - fishbone

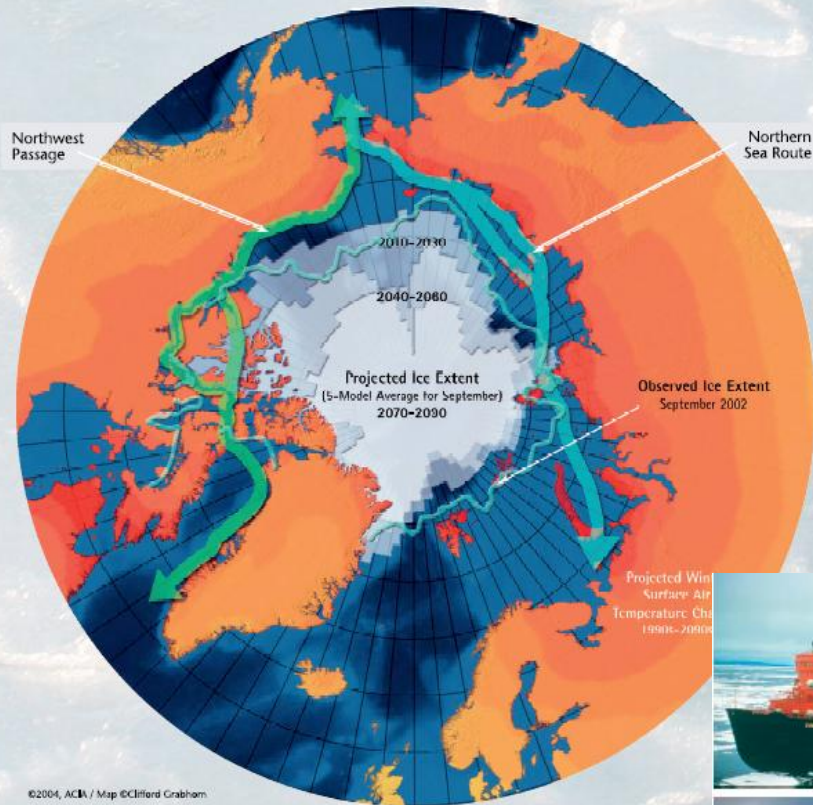


Cutting Triple channel “compound spruce tree”

- herringbone - fishbone



# Arctic Marine Strategic Plan



## 2 causes for quick NSR reactivation.

- oil and gas production and transport
- global warming and numerous forecasts about free ice Arctic.



# Nuclear Icebreaker 50 Years Since Victory or 50 Years Anniversary of Victory



The icebreaker is an upgrade of the Arktika-class, the largest icebreakers in the world.

The 159-meter (522-foot) long and 30-meter (100-foot) wide vessel, with a deadweight of 25,000 metric tons, is designed to break through ice up to 2.8 meters thick (9.2 feet). It has a 138-man crew.

Thank you for your attention

