



INSROP WORKING PAPER NO. 128 – 1999

**The NSR Simulation Study Work Package 7:
Legal and Environmental Evaluation of
the Routes Selected for the INSROP
Simulation Study**

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INSROP International Northern Sea Route Programme



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Box B: The Simulation Study of NSR Commercial Shipping

Work Package 7: Legal and Environmental Evaluation of the Selected Routes

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FOREWORD - INSROP WORKING PAPER

INSROP is a five-year multidisciplinary and multilateral research programme, the main phase of which commenced in June 1993. The three principal cooperating partners are Central Marine Research & Design Institute (CNIIMF), St. Petersburg, Russia; Ship and Ocean Foundation (SOF), Tokyo, Japan; and Fridtjof Nansen Institute (FNI), Lysaker, Norway. The INSROP Secretariat is shared between CNIIMF and FNI and is located at FNI.

INSROP is split into four main projects: 1) Natural Conditions and Ice Navigation; 2) Environmental Factors; 3) Trade and Commercial Shipping Aspects of the NSR; and 4) Political, Legal and Strategic Factors. The aim of INSROP is to build up a knowledge base adequate to provide a foundation for long-term planning and decision-making by state agencies as well as private companies etc., for purposes of promoting rational decisionmaking concerning the use of the Northern Sea Route for transit and regional development.

INSROP is a direct result of the normalization of the international situation and the Murmansk initiatives of the former Soviet Union in 1987, when the readiness of the USSR to open the NSR for international shipping was officially declared. The Murmansk Initiatives enabled the continuation, expansion and intensification of traditional collaboration between the states in the Arctic, including safety and efficiency of shipping. Russia, being the successor state to the USSR, supports the Murmansk Initiatives. The initiatives stimulated contact and cooperation between CNIIMF and FNI in 1988 and resulted in a pilot study of the NSR in 1991. In 1992 SOF entered INSROP as a third partner on an equal basis with CNIIMF and FNI.

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SUMMARY

The first part of the present paper is concerned with the legal evaluation of the selected routes.

The legal evaluation of the Northern (high - latitudinal) and the Southern (coastal) transit routes has been made in full detail. The evaluations of the Western and Eastern regional routes have been made with regard to foreign vessels calling at the Arctic ports only, on condition that these ports are open for this purpose.

The provisions of Article 234 of the 1982 UN Convention of the Law of the Sea, dealing with "ice covered regions" within the limits of the exclusive economic zone, serve as a basis for regulation of shipping. Evaluation of the legal regime for access and order of navigation along the selected routes has been made in accordance with the Russian Regulations for Navigation on the Seaways of the Northern Sea Routes (NSR), 1991, and "Guide to Navigation Through the NSR", 1996.

The results of the legal evaluation of the selected routes:

1. Opening the NSR for international commercial shipping Russia has created a favorable non-discriminatory legal regime for this purpose. Access of the vessels to the NSR seaways is provided on the "notification" principle. Leading of the vessels is regulated by Marine Operations Headquarters under the State supervision of the NSR Administration.
2. The goals of shipping regulation are safety of navigation and prevention of sea and Russian Northern Coast pollution from vessels.
3. The legal regime for foreign vessels calling at Arctic ports is based on the provision that only the port of Igarka on the NSR is open for foreign vessels. However, every year the RF Government issues an Order to permit foreign cargo vessels call at other Arctic ports and stations, numbering up to 70, during the navigation season. State border - guard control and customs inspection of foreign vessels is carried out both on arrival in and before departure from Russia, in the ports open for foreign vessels (such as Murmansk and Provideniya).
4. The report includes cost tables of fees, duties, tariffs, price-lists for the services to be rendered to vessels when led along the selected routes.

The second part of the present paper is concerned with the environmental evaluation of the selected routes.

An obligatory aspect of the simulation study of NSR Commercial shipping is a preliminary environment impact assessment (PEIA). This item is considered in the second part of the project report.

The assessment is carried out with taking into consideration the proposed activity scenario on NSR. According to the scenario it is assumed that 20 container carriers of about 40000 t dwt will be involved to transport cargo from Asia to Europe and back. The ships navigate only in summer and an early autumn season. When carrying out the work, the authors determined some features of shipping harmful factors. The main of them are wastes discharged into sea and emissions to air from ships, such as oily water, sewage, garbage, sulphur and nitrogen oxides. When a ship is normally operated, about 7 m³ of oily water, 3.4 m³ of sewage, 115 kg of domestic and operational garbage, 8.6 t of nitrogen oxides, 9.4 t of sulphur oxides and 391.6 t of carbon oxides are generated per day. Every ship sailing along the NSR is provided with oil filtering equipment, incinerators and sewage treatment plants. The main parts of wastes are utilised on board the ship with the exemption of emissions from diesel engines.

The PEIA has been performed according to the appropriate Russian environment legislation and the INSROP accepted EIA procedure which was adapted for the purpose of the project.

The preliminary impact assessment obtained for NSR area gives ground for conclusion of a minor negative impact from the assessed activities, provided a conventional navigation practice is observed and natural and legal peculiarities of the area are taken into account.

Basic recommendations are as follows:

1. During NSR navigation one should avoid approaching bird or animal colonies if it is not critically needed, especially in the vicinity of protected territories where animals are less vigilant and fearful and therefore more vulnerable.
2. To obtain reliable data on current animal and bird population and to follow the populations' dynamics and variability, provisions should be made for ecological monitoring along NSR, into which the personnel presently available in the reserves and experts from Goskomgidromet should be involved.
3. In the INSROP format, it is desirable to focus on systematisation of Russian legal documents and international agreements with due attention given to a quantitative assessment and compensation for damage to natural environment in NSR standard operating conditions and identification of mechanism for purpose-oriented use of received funds.

Abbreviations:

AARI	- Arctic and Antarctic Research Institute
ASC	- Arctic Shipping Company.
CHEM	- Centre of Hydrometeorology and Environmental Monitoring
CNIIMF	- Central Marine Research and Design Institute
DHEM	- Department of Hydrometeorology and Environmental Monitoring
FAS	- Federal Aviation Service of Russia
FESCO	- Far Eastern Shipping Company
GRT	- Gross Register Tonnage
GUNIO	- Head Department of Navigation and Oceanography of the RF Ministry of Defense
HB	- Hydrographic Base
Inspector	- Head State Inspector of the NSRA or an Authorized Person
Jurinflot	- Juridical Consultants of the "Moscow Juridical Centre"
L1	- Ice class of vessels capable of unassisted sailing in broken sailing ice in the Arctic in summer period
LOSC	- UN Convention on the Law of the Sea, 1982
MOH	- Marine Operations Headquarters
MSC	- Murmansk Shipping Company
MT RF	- The RF Ministry of Transport
NSR	- Northern Sea Route
NSRA	- Northern Sea Route Administration
OJSC	- Open Joint Stock Company.
P&I	- Protection and Indemnity
POOL	- Society of Insurance Companies
RAIS	- Russian Association of Independent Shipowners
Rosgidromet	- Federal Service of Hydrometeorology and Environmental Protection and Monitoring
Rosmorflot	- Merchant Marine Service of the RF Ministry of Transport
UL	- Ice class of vessels capable of unassisted sailing in the Arctic in easy ice conditions in summer/autumn periods of navigation
ULA	- Ice class of vessels capable of unassisted sailing in the Arctic in summer/autumn periods of navigation
URS	- Union of Russian Shipowners

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PART I. LEGAL EVALUATION OF THE SELECTED ROUTES

1. INTRODUCTION

Legal evaluation of the routes selected in WP1 (Route and Operation Infrastructure) has been made in this paper. The legal evaluation of the Northern (high latitudinal) and the Southern (coastal) transit routes has been made in full detail. The evaluations of the Western and Eastern regional routes has been made with regard to foreign vessels calling at the Arctic ports only, on condition that these ports are open for this purpose.

Legal evaluation of the transit routes is based on the international legal standards, Russian legislation, practices adopted by the foreign Arctic states, and also on the result of research conducted in accordance with phase 1 of the Sub-programme IV INS-ROP.

Opening the NSR for international commercial shipping Russia created a favorable legal regime for this purpose. The Regulations for Navigation on the Seaways of the NSR of 1991 [1] establish the same non-discriminatory regime for navigation along the NSR irrespective of vessel's flag and status of waters which the selected routes go through.

As foreign experts consider the regimes of navigation in internal, territorial waters and Russian economic zone and the regime in the Arctic straits of the NSR zone separately, therefore the present paper begins with the regulations for navigation in the corresponding sea areas as it is stipulated in Russian legislation.

Certain practical recommendations have been given to shipowners and shipmasters intending to utilize the NSR, with regard to the legal regime of having access to the selected routes, in addition to the requirements of the Regulations for Navigation [1] and the Guide to Navigation through the NSR [3]. Particular attention has been drawn to the order of submitting notice and applications for leading, payment of ice-breaker fees, and the certificate of the shipowner's civil liability for the damage caused to marine environment by pollution.

The order of vessels navigation along the selected routes and its support considers today's system of the NSR administration and the rules for co-operation: "Foreign vessel - State ice pilot - Ice breaker - MOH - NSRA". The paper emphasizes, once again, that while sailing along the route prescribed by the MOH the foreign vessel is granted, in good time, the right to proceed through all zones of Russian internal and territorial waters which are parts of the selected route. In the closing part of the paper information on navigational and hydrometeorological support, means of radio communication and salvage support has been given.

On the whole, the paper, as far as possible, renders information on the expected expenses (dues, fees, tariffs, costs of required nautical charts and other publications to be paid while sailing along the NSR and of hydrometeorological information) which may be taken into consideration in the project WP8 (Simulation Based on Year - round and Seasonal Operation Scenarios).

2. RUSSIAN LEGISLATION FOR REGULATION OF SHIPPING ALONG THE SELECTED ROUTES

The following are the basic Russian legislative acts used in the paper to make legal evaluation of the selected routes:

- The Law “On State Border of the RF” of 1993 [4];
- The Decree of the Presidium of the Supreme Soviet of the USSR “On Economic Zone of the USSR” of 1984 [5];
- The Decree of the Supreme Soviet of the USSR “On Measures to Improve Ecological Situation in the Regions of Extreme North and Sea Areas Adjoining the Northern Coasts of the USSR” of 1989 [6];
- The Decree of the Council of Ministers of the USSR of 1984 and 1985 promulgating “The List of Geographical Co-ordinates which Determine the Positions of the Basic Lines for the Calculation of the Width of Territorial Waters, Economic Zone and Continental Shelf of the USSR”[7].

The following are the main documents regulating the navigation along the NSR and special requirements to vessels aimed at directing sea ice operations, ensuring safety of navigation and marine environment protection:

- “Regulations for Navigation on the Seaways of the NSR” of 1991 [1];
- “Guide to Navigation Through the NSR” of 1996 [3];
- “Provision on the NSR Administration” of 1971 [8].

The Guide [3] includes the following regulatory documents: “Regulations for Navigation on the Seaways of the NSR”, “Regulations for Ice- breaker Leading of Vessels through the NSR”, “Requirements for the Design, Equipment, and Supply of Vessels Navigating along the NSR”.

2.1. Legal Status of the Selected Routes

The Russian Federation has introduced a common legal status to develop international commercial shipping along the NSR. The basis for regulation of shipping along the NSR are provisions of article 234 of the UN Convention on the Law of the Sea of 1982 dealing with “ice-covered” waters within the limits of the exclusive economic zone. Regulations for Navigation [1] are valid for the whole spatial sphere of the NSR - internal waters, territorial sea and economic zone of the Russia. The main objectives of shipping regulation are: safety of navigation, environment protection from pollution by vessels and selection of most convenient routes. Thus, a common legal status is in operation for the selected routes (Fig.1-3) irrespective of the water areas they may go through (Table 1.).

Table 1.

**Length of internal waters, territorial sea, and
economic zone of the Russia on the selected routes (%)**

Sea areas	Southern route (2680 ml)	Northern route	
		Through Vil'kitskogo strait (2108 ml)	North Severnaya Zemlya islands (2446 ml)
Internal waters	7	5	-
Territorial sea	22	1	1
Economic zone	71	94	99

The data of Table 1 show that approximately 30% of the Southern route lie within sea areas over which Russia exercises absolute sovereignty. The remaining stretch of the Southern route, as well as the whole of the Northern route, are within the limits of the Economic zone where the Russia exercises its jurisdiction on the maintenance and protection of marine environment.

The common legal status facilitates considerably access to any NSR route. A vessel accepted by MOH for leading is also granted the right of passing through all parts of Russian internal and territorial waters on these routes. If a vessel making a transit voyage along the selected routes did not submit application for leading, she will be obliged to request permission to cross any water area under Russian control [10]. If the regime of navigation is not complied with, the NSR Administration (MOH) and other competent Federal bodies will take measures stipulated in the provisions of the Regulations for Navigation on the Seaways of the NSR (Article 10, "Removal vessels off the route") and act in accordance with sovereign rights or Russian jurisdiction over waters where the infringement occurred.

2.2. Shipping Regime in Territorial Waters

In accordance with "On the State Border of the RF" Law of 1993 the territorial waters of the RF include coastal sea waters 12 miles wide counted from the normal and straight basic lines. The outer limit of territorial waters determines the State border of the RF. Foreign vessels are granted the right of "innocent passage" through territorial waters on condition of compliance with international agreements and legislation. The passage is considered innocent unless it infringes peace, good order or safety. "Innocent passage" through territorial waters of the RF is effected with a purpose of them being crossed without entering internal waters, ports (roadstead) of the RF or to leave them when putting to the open sea. While effecting an "innocent passage" a foreign vessel shall follow the sea route or traffic separation scheme if such is prescribed by Russian competent body, or proceed by usual course.

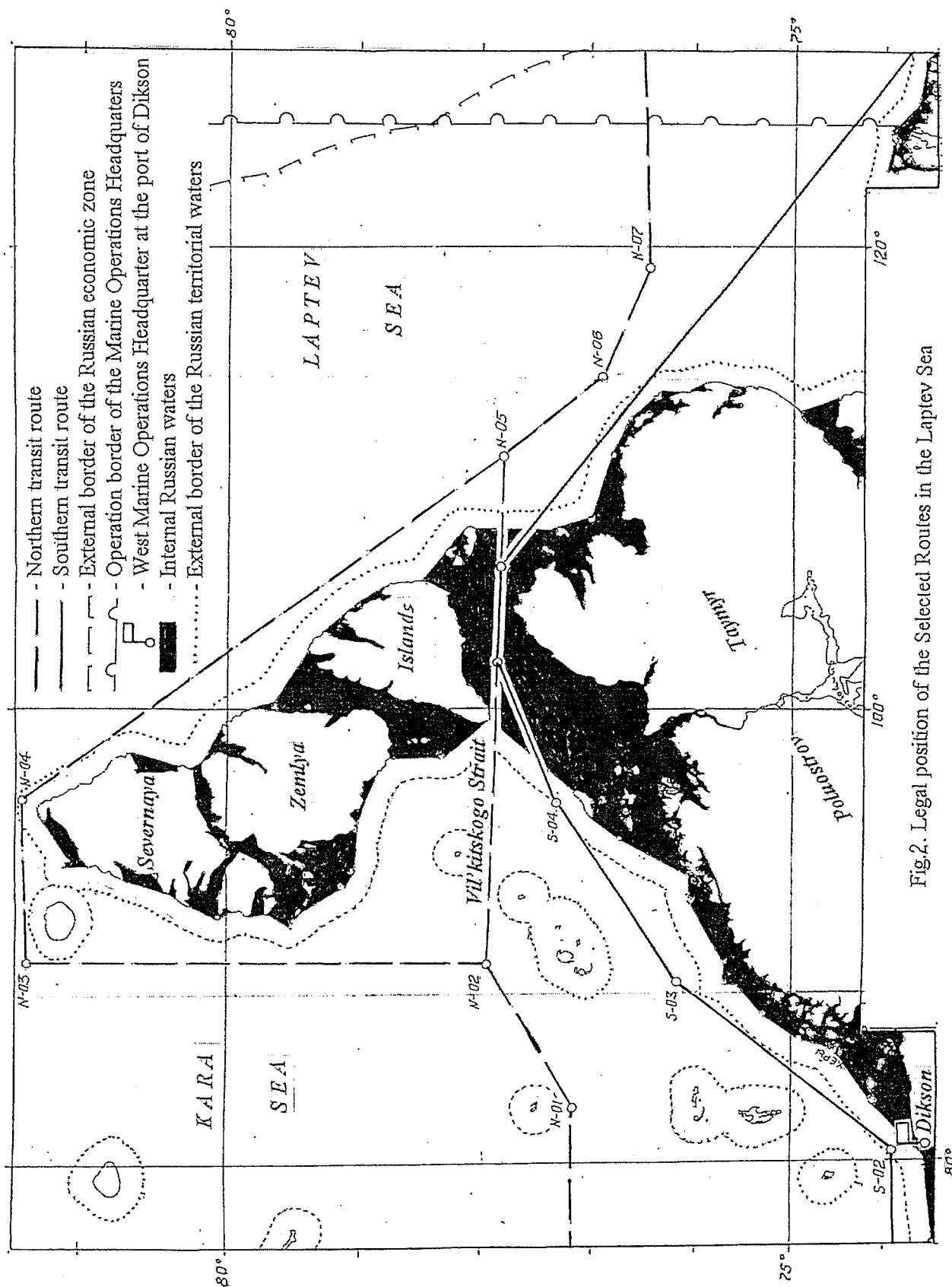


Fig.2. Legal position of the Selected Routes in the Laptev Sea

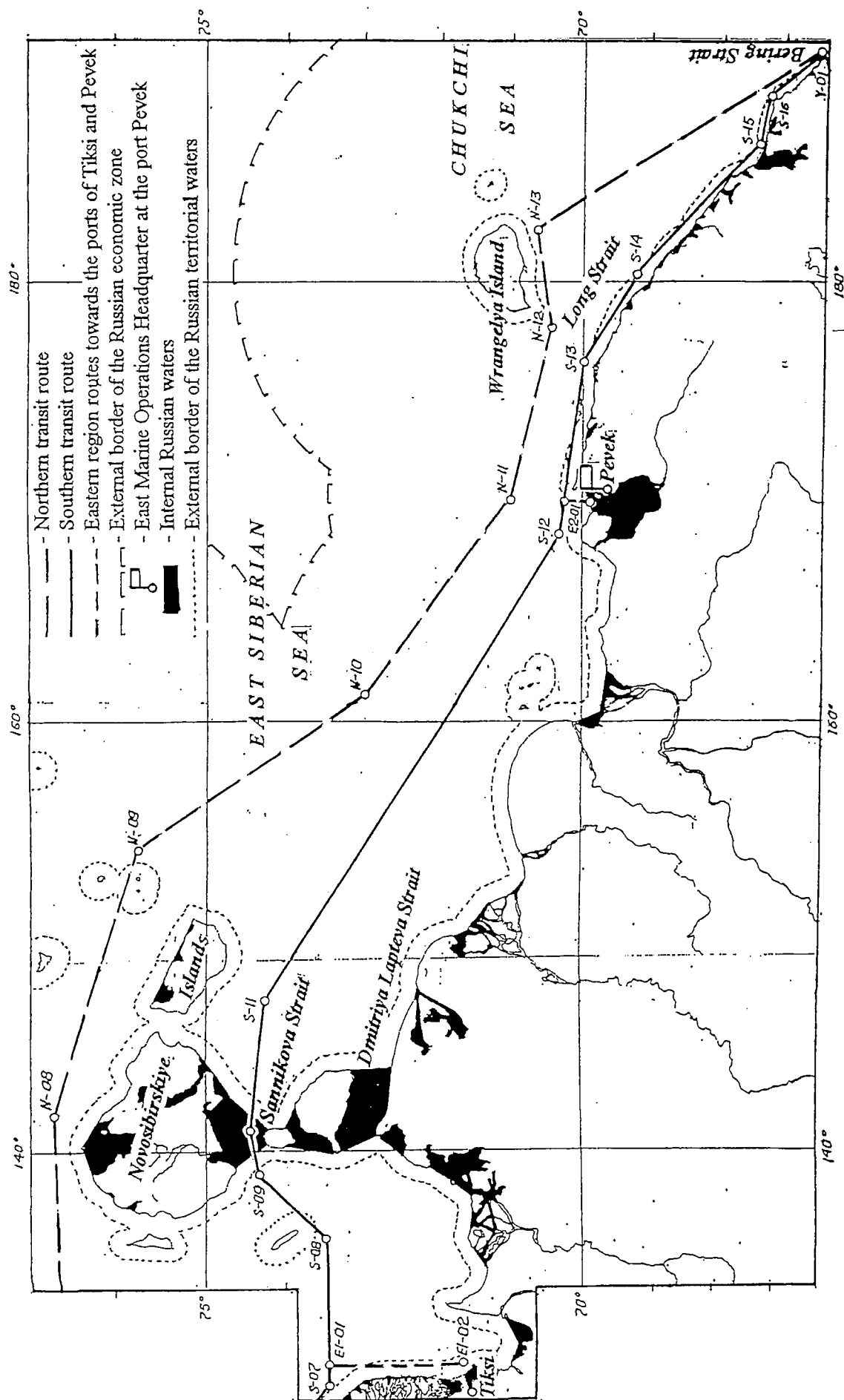


Fig. 3. Legal position of the Selected Routes in the East Siberian and Chukchi Seas

The above regime of navigation is in full compliance with the provisions of the 1982 UN Convention of the Law of the Sea (section 3). Article 18 of the Convention stipulates uninterrupted and fast effecting the “innocent passage”. Good will ensures compliance with this requirement in any area of the World Ocean. However, while navigating along the routes of the NSR, owing to special and geographic and ice conditions, foreign vessel may repeatedly enter territorial and even internal waters (Fig. 1-3).

The total length of the Southern route stretches within the internal and territorial waters is about 30%. A vessel accepted for leading along the NSR shall proceed through these stretches keeping to the routes recommended by MOH. Such order of navigation is stipulated in Article 10 of the Regulations for Navigation on the Seaways of the NSR.

2.3. Shipping Regime in the Arctic Straits

The selected routes pass through the straits of Karskiye Vorota, Vil'kitskogo and Sannikova. Since 1985 the regime of internal waters has been in effect in the above waters. Entrances to the straits are closed by the straight basic lines which go through geographical co-ordinates in accordance with the List [7]. The regime of territorial sovereignty of the USSR has been extended to practically all straits of the Soviet part of Arctic (fig. 1-3). This action of the USSR taken in the period of the “Cold War” had the only goal - to prohibit uncontrolled navigation of foreign vessels through the straits. The protest of the USA in 1986 on the matter was declined by the Ministry for Foreign Affairs of the USSR which declared in the reciprocal note that these straits had never been used as international seaways. Nowadays Russia is working at the problem of the development of international shipping along the NSR. Therefore permission for entering the NSR seaways may be granted on the principle of “notification” which requires an application for leading (Article 3 of the Regulations for Navigation [1]).

The above regime of entering the NSR has practically resolved the disputable matter of the permissible order for foreign vessels to navigate through the NSR seaways and “transit passage” regime for Arctic straits. A vessel which has been accepted for leading along the NSR proceeds freely along its seaways including the straits keeping to the routes recommended by MOH. However, a foreign vessel which has entered the NSR seaways without proper notification of the NSRA and intends to pass through certain straits will be obliged to apply for the permission for this passage.

In the Vil'kitskogo, Shokal'skogo, Lapteva and Sannikova straits, owing to difficult navigational and ice conditions, the Regulations for Navigation [1], require compulsory ice-breaker escorting in order to ensure safety of navigation. In case of difficult ice conditions in Karskiye Vorota straits vessels may take the route through Yugorskiy Shar straits. The guiding through the latter straits is carried out either with a pilot on board or by leading, following a hydrographic vessel.

2.4. Shipping Regime in Economic Zone

The Northern route (if the one leading northward of the Severnaya Zemlya islands has been chosen) and the most part of the Southern route go through the economic zone of Russia. The status of the economic zone with a width of 200 nautical miles is specified by the 1984 Decree "On the Economic Zone of the USSR" [5]. This Decree, in accordance with the LOSC, declares the right for all States to effect free navigation in the Economic Zone of the USSR. The Decree [5] also expands Article 234 of LOSC (Ice-covered Regions) and gives general provisions regarding liability for any infringement of Soviet or International Law in case of marine environment pollution by vessels.

The first USSR legislative act regarding regulation of shipping in the Arctic waters had been the Decree "On the Intensification of Nature Protection in the Regions of the Extreme North and Sea Areas Adjoining the Northern Coasts of the USSR" of 1989 [6]. In compliance with the Sub-legislative Act [11] the Ministry of Merchant Marine worked out and approved "Regulations for Navigation on the Seaways of the NSR" in which attention was drawn to:

- financial security of the shipowners' liability in case of marine environment pollution;
- compulsory insurance
- the NSRA right to carry out control inspections on vessels verifying their compliance with special requirements and prohibiting navigation along the NSR of the above vessels infringing the provisions of the Regulations. The said requirements are given in detail in the Regulations for Navigation [1]. The above-mentioned sub-legislative act [11] explains the right of the competent bodies regarding inspection, detention and arrest of vessels as well as imposition of penalties (fines), if any, to prevent any infringements mentioned in the Decree [6] within the limits of the USSR economic zone.

On the whole the national regime of shipping in the economic zone of Russia is in full compliance with the provisions of the UN Convention on the Law of the Sea of 1982 as well as with legislative practice of foreign states; the Canadian Law on Prevention of Arctic Pollution of 1970 may serve as an example. The above regime firms the indisputable right of Russia to regulate shipping of all vessels in the economic zone to guarantee their safety and prevention of marine environment pollution. Putting into effect this nature-protective regime in the economic zone, Russia thus becomes responsible to the World Community for the control of any kind of activity, shipping included, in these water areas

3. LEGAL REGIME OF VESSELS ACCESS TO THE SELECTED ROUTES

An analysis of the legal regime for vessels intending to navigate along the NSR seaways has been carried out to prove that the existing regime corresponds with the interests of international commercial shipping. The NSR has been granted the preferential principle of "notification" for use of its seaways, on condition that vessels comply with special requirements [18], their guiding is effected by MOHs under the State supervision on the part of the NSRA.

The other part of this paper deals with certain practical recommendations on co-operation of foreign shipowners or masters of vessels with the Russian Administration in the course of sailing along the selected routes. The recommendations include supplements, explanations and methods of co-ordination of certain articles of the Regulations for Navigation [1] and the Guide [3].

3.1. The Order of Submitting Notices and Applications for Leading through the NSR

In accordance with the Regulations for Navigation on the Seaways of the NSR (Article 3.1) both notice and application for leading shall be submitted to NSRA (MOH).

The usual procedure which is stated in the Guide [3], in the section "Regulations for Ice-breaker leading of Vessels along the NSR", requires to submit application for leading to the NSR only and a copy to the MOH depending on the region of entering the NSR. Application shall be submitted on a special form within a stipulated period of time shown in the Regulations [9, Article 2.1.]. Besides, as required by the Order of the RF Ministry of Transport, dated 22 July 1966, N57, the application shall contain information on payment (payment guaranteed) of ice-breaker fees. The NSRA sends the necessary information regarding the leading of foreign vessels to MOHs.

When the purpose of sailing is scientific research or tourism the foreign applicant shall, not later than 6 months in advance, send a relevant request to carry out the above actions via diplomatic channels. The order of granting permission to carry out scientific research or accept tourists is stipulated by the Provisional Regulations [12].

The possibility of transit leading either along the Northern or the Southern route depends on the ice forecast for the period of ice navigation and is determined beforehand when considering the application. From the legal point of view common legal regime for entering the NSR is valid for both routes as well as for any other one. Special features of vessels leading will depend on ice conditions and draught of vessels. Only the Northern route is accessible for vessels drawing over 12,5 m. A vessel drawing 9m may use the Southern route and, if the forecast is favorable, the Northern one as well, the length of the latter being 572 miles shorter. The scientific-commercial voyage of the vessel CA-15 "Kandalaksha" from Yokohama to Kirkenes on August 1-28, 1995 according to the INSROP programme may serve as an example [13].

3.2. Ice-breaker Fee

In accordance with the Regulations to Navigation [1, Article 8.4], when sailing along the NSR payment for the services rendered to vessels is collected according to the tariffs adopted in the established order. This order has been established by the RF Ministry of Transport Decree of 1996 [14]. Managers of Shipping Companies carrying export-import goods along the NSR include ice-breaker fees into the Contract of maritime carriage. Ice-breaker fees are transferred to the MSC or FESCO which operate the ice-breaker fleet. The MSC which is responsible for transportation of the main volume of international transit cargoes along the NSR and those to the port of Igarka, introduced "The Basic Data for the Calculation of Leading Cost for Foreign Vessels and

Russian Vessels Chartered by Foreign Companies Sailing along the NSR Seaways"[15]. An extract from the "Basic data" is given in Table 2.

Table 2.

**Basic data for the calculation of leading cost for foreign vessels and
Russian vessels chartered by foreign companies sailing along the
NSR seaways**

Ice class of vessel	Registered tonnage (GRT)		Cost of leading USD/TN		
	From	TO	Summer		Winter
			Entire NSR	Part of NSR	
Ice-breaker	5001	6000	7.26	4.36	6.53
	10001	11000	6.58	3.95	5.92
	19001	20000	5.49	3.29	4.94
ULA	5001	6000	9.98	6.49	9.73
	10001	11000	9.04	5.88	8.82
	19001	20000	7.54	4.90	7.36
UL	5001	6000	18.15	11.80	17.70
	10001	11000	16.44	10.68	16.03
	19001	20000	13.72	8.92	13.37
L1	5001	6000	22.69	15.88	23.82
	10001	11000	20.55	14.38	21.58
	19001	20000	17.15	12.00	18.00

Notes:

1. Summer period - from July 1st to October 30th; winter period - from November 1st to June 30th; part of the NSR - the stretch up to 90° E when sailing from westward; USD/TN - United States dollars for 1 register ton.
2. To introduce payment in the south-eastern basin of the Barents Sea and as far as 72°N in the Barents Sea - 0.6 USD /TN for the use of navigational, hydrometeorological and ice information including ice-breaker leading, when there exists ice-cover, irrespective of vessel's ice class, which shall satisfy the requirements of safety of navigation in a given season.
3. Vessels exceeding 20,000 GRT the width of which exceeds that of the ice-breaker (26 m), are led for extra fees depending on technical conditions of the vessel, season of the year, region of sailing, actual ice conditions, etc.
4. It has become a rule that a vessel led as far as 90° E, while sailing from westward, may have one State pilot on board. In all other situations the vessel shall have not less than two State ice pilots on board. The cost of one State ice pilot on board the ice-breaker is USD 210 per day. Working hours of the State ice pilot continue 8 hours a day. In case of necessity the working hours of the State ice pilot may be prolonged to 12 hours a day, with the payment increasing to USD 336 per day. All expenses charged for delivery of the State ice pilot from the pilot station on board and back shall be born by the shipowner.

The practice of levying the ice-breaker fees given in Table 2 has shown that their rates were too high. As a result the transit and export-import traffic along the NSR became unprofitable. New “Regulations for Ice-breaker Fees” are currently under development. It is anticipated that a part of the fees will be reimbursed by the Federal budget. As the traffic volume along the NSR increase the amount of the fees will reduce. Operation of the ice-breakers on the NSR Seaways will become profitable with an average cargo flow volume of 1 m t (now 0.2 m t) per ice-breaker. The ice-breaker charges will not exceed 5 USD/TN.

For the purpose of economical modelling, the rate of ice-breaker charges in Project WP8, according to the CNIIMF’s opinion, may be taken equal to 4 USD/TN.

3.3. Liability Coverage. Principles of Marine Insurance for the NSR

In accordance with the Regulations for Navigation [1, Article 5] vessels not having the certificate confirming proper financial security of the shipowner’s civil liability sufficient to cover possible damage to marine environment and Northern Coast of the RF, are not permitted to navigate along the NSR. Availability of the insurance certificate or any other document proving financial coverage of civil liability in case of possible pollution of the NSR waters shall, as it is stipulated in Article 2.1. of the Regulations for Ice-breaker-assisted Pilotage [9], be included into the application for leading.

Types of insurance are considered in INSROP in general [16] or for certain transport vessels [17].

Russian position as to marine risk insurance is as follows [19]:

Special attention is drawn to civil liability insurance (P & I) of shipowners for the marine environment pollution. It is the pollution owing to accidents with vessels that caused the most serious danger to international flora and fauna and life conditions of the peoples in the extreme North.

The shipowners of vessels without insurance coverage certificate or if the latter is not valid in the navigable waters of high latitudes may use the services of the Russian insurance companies POOL which insure liability of shipowners - “Russian P&I POOL” [20].

The POOL has been operating since 1996 and incorporates Investflot Insurance Co., Industrial Insurance Co., Industrial Insurance Co., Yakor Insurance Co., Zurich Insurance Co. (Russia). The principles of new practices in liability insurance have been adopted by the RF Ministry of Transport, as well as by representatives of RAIS, URS and Jurinflot. The participation in the POOL of the leading Western Insurance companies (the main one being Munich Re) whose share in the maximum loss is from 87,5 to 97,5 % , depending on the limit, insures financial guarantees of reimbursement of heavy losses. International financial and freight markets recognize the POOL insurance too. Interconsult Co. (129085 Moscow, Olminskiy Lane 3A, 508, ph (095) 216-6416) is the managing body of the POOL.

Table 3 shows approximate P&I insurance tariffs [21]. The managing body of the POOL, however, is of the opinion that P&I tariffs should not be indicated at the moment. P&I insurance offers will vary for any individual vessel or a group of them.

Table 3.

**Approximate tariffs of civil liability insurance (P&I) for vessels using
Murmansk - the NSR - Dutch Harbor seaway (annual rate) [21]**

Amount of coverage/ Type of vessel	Tanker	Dry cargo vessel	Other vessels
Responsibility for pollution only	USD 4.55/GRT	USD 1.65/GRT	USD 1.40/GRT
Standard packet of risk	USD 9.10/GRT	USD 8.10/GRT	USD 7.00/GRT

Russian P&I insurance policy may serve as a possible proof of proper financial security of the shipowner's liability in conformity with the Regulations for the Navigation along the NSR.

In case of H&M insurance, if the policy is not available or it does not cover the costs of sailing along the NSR, Milinsure Co (103031 Russia, Moscow, Bolshaya Lubyanka Str., 11a, Building 1, ph (095) 785 2776, fax 296 7525) offer its services (Table 4). The Milinsure Co. has over 80 branch offices in all large centers of Russia, and after 5 years of activities has become one of the leading insurance companies of the RF, being one of the five leaders of the insurance market.

Table 4.

**Approximate H&M insurance tariffs for vessels on the NSR
(annual rate, pro rata in % of the insurance sum) [21]**

Type/class of vessel	L1	UL	ULA
Bulker/container carrier	0.92-2.29	0.78-1.95	0.63-1.60
Tanker	1.03-2.63	0.90-2.24	0.74-1.84

Notes: tariffs are quoted for bulker/container carrier of cost from USD 60,000,000 and tanker of cost USD 75,000,000. The particular amount of franchise is calculated for each vessel individually, a separate voyage is also taken into consideration, after the reception of application for leading.

For the purpose of rising the level of services and ensuring guaranteed coverage the Milinsure Co. placed its reinsurance programme at the London market. It signed the reinsurance contract, through Lloyds-Harris & Dixon Insurance Brokers, with first-rate underwriters of Lloyd and the Institute of London Insurers on the principle of exceeding losses for the whole portfolio of sea risks.

On the whole the Russian policies regarding tariffs on the NSR sea risks insurance will be improved together with the development of international commercial shipping along the NSR.

3.4. Special Requirements to Vessels

“Requirements for the Design, Equipment and Supplies of Vessels Navigating along the NSR” are set forth in the Guide [18]. These requirements apply to vessel’s hull, her mechanical installations, stability and unsinkability, aids to navigation and means of communication, supplies and emergency equipment, manning of vessel.

At the same time attention should be drawn to the importance of the experience of the master or another person conning the vessel in ice instead of him and the necessity of taking a State ice pilot. In compliance with Article 9.2 of the Requirements [18] the master or the person who performs his duties during the bridge watch shall have minimum knowledge and experience in navigating a vessel in ice conditions along the NSR of not less than 15 days. Masters without such experience shall use the services of an ice pilot. The same requirement is confirmed by Article 2.8 of the “Regulations for Ice-breaker Leading of Vessels through the NSR” [9]. The Article also envisages, in case of necessity and with master’s application, that the vessel may hire a helmsman who has ice navigation experience. Therefore the provision of Article 4 of the Regulations for Navigation [1], that “in case where those persons have no such experience, or when the master requests so, the NSRA (MOH) may assign a State ice pilot to the vessel to assist in leading it through the NSR”, shall not be interpreted as recommendation but as a general requirement to ensure the safety of navigation. Thus the Requirements [18] and Regulations for Ice-breaker-Leading [9] define concretely the provisions of Article 4 of the Regulations for Navigation [1].

3.5. Inspection of Vessels

An inspection of the vessel, according to the provision of Arctic 6.1 of the Regulations for Navigation on the Seaways of the NSR, may be carried out in cases where unfavourable ice, navigational, hydrographic, weather, and other conditions occur that might endanger a vessel, or where there is a threat of polluting marine environment or the Northern Coast of Russia.

With regard to the procedure of vessels inspection the provisions of Articles 2.11, 2.13, 2.14, 2.16, of the Requirements [18] must be underlined. The inspection of the a vessel to verify the compliance with the Requirements is fulfilled for the account of shipowner and may be carried out in ports of Murmansk, Nahodka, Vladivostok, Provideniya as well as in any other port suitable for shipowner. The inspection is made by inspectors. The NSRA may employ for the purpose any organisations recognized by it. Judging by the findings of the inspection the State Inspector or organization issues the Permission for leading (see pro forma).

The term “Permission” used in the document, shall be considered as a technical but not a juridical one. Therefore the “Permission” shall not be interpreted as a step back to the former “permissible” order of the foreign vessels access to the NSR seaways witch existed in the USSR during the “Cold War” period. As the shipowner or shipmaster intending to navigate along the NSR shall send notification and application for leading, his vessel is considered to be satisfying the Requirements [18], and the applicant is capable of paying costs of services rendered to him on the NSR, the above document shall be interpreted as a consent to carry out leading.

The final act of ship access to the selected routes is a “Contract” between the shipowner or his representative (master) on one hand, and representatives of the MSC or FESCO on the other. Details of the escort, liabilities and duties of contract’s parties and terms of payment are indicated in the “Contract”.

While sailing along the NSR and if unfavorable ice, navigational and other conditions occur which threaten sea environment, Representative of the NSRA may fulfil the control inspection of ship [1, Article 6]. The place of the control inspection (port, road, etc.) is defined by the NSRA (MOH) with respect to the route of ship.

4. ORDER AND NAVIGATIONAL SUPPORT OF VESSELS ON THE SELECTED ROUTES

Normative legal side of the control and order of navigation on the selected routes is included in this section. Besides, the escorting system “Foreign vessel - State pilot - Ice-breaker” is taken into consideration. Navigational safety support consists of navigational and hydrometeorological parts, radio communication and emergency rescue services.

4.1. Management of Ice Operations

The selected routes lie within the MOHs zones of responsibilities of the NSR western and eastern regions. In compliance with the Regulations [9] the MOHs effect control over traffic and direct marine ice operations in the NSR western and eastern regions. The demarcation line between the MOH zones of responsibilities is the meridian 125° E. MOHs have been established in the western region (port of Dikson) by the MSC, and in the eastern region (port of Pevek) by the FESCO. However, the actual MOH zone of the western region extends as far as the port of Pevek and even farther eastward to the Bering strait, because leading to the ports of Chukot peninsula and the Republic of Sakha (Yakutiya) is effected by more powerful atomic ice-breakers which are operated by the MSC. The FESCO zone is mostly responsible for leading to the southern coast of Chukot peninsula and the Okhotsk sea ports in winter period.

The existing volumes of transported cargoes and stable radio communication with vessels and clients enable MOHs to direct ice operations through the bases in Murmansk and Vladivostok as it had been done during the Arctic navigation in 1997. The FESCO MOH is functioning in summer and autumn periods, while the MSC MOH is functioning constantly, because navigation in the Kara Sea (Yamal coast and the port of Dudinka) is going on all year round. The MOHs include specialists from Rosgidromet (AARI, DHEM), Rosmorflot (HB, SAR) and FAC.

The following are main duties of the MOHs: fulfillment of the marine operations plans; choosing the best, in the existing conditions, routes; rendering ice-breaker leading services; forming convoys for ice leading; safety of ice navigation; uninterrupted control over positions and traffic of all vessels on the routes; compliance with the Regulations for Navigation on the Seaways of the NSR .

Form	
Northern Sea Route Administration of the Ministry of Transport RF	
<u>PERMISSION No</u>	
<u>for leading vessel through the seaways of the NSR</u>	
Name of the ship; Flag	
Year of build	
Call signs	
Port of registry	
Gross tonnage, reg.t (GRT)	
Ice class	
Output of the main engines	
Screw (construction, material)	
<p>I, the undersigned _____ (Name) _____ certify that the m/ "_____" (Name of ship) "can navigate on the Northern Sea Route in the region (s) _____ from "_____" 199__ yr. to "_____" 199__ yr. with a State ice pilot NSRA on board while sailing and shall navigate following recommendations of the Marine Operations Headquarters.</p> <p>This PERMISSION does not give the right to conduct any scientific research in Russian Arctic, any fishing or tourism, while passing through the Northern Sea Route.</p> <p>This PERMISSION is valid until "_____" 199__ yr.</p> <p>Certified by the authority of the Northern Sea Route Administration at _____ (Place) "_____" 199__ yr.</p> <p>Administration Representative (s) of NSRA _____</p> <p style="text-align: right;">(Name, signed and sealed)</p>	
<p>Security satisfying the requirements of Arctic VII of the International Convention on Civil Liability for oil Pollution Damage 1969.</p> <p>Type of Security _____</p> <p>Duration of Security _____</p> <p>Name and address of the Insurer(s) and/or Guarantor(s)</p> <p>Name _____</p> <p>Address _____</p> <p>Captain of the ship m/v _____</p> <p style="text-align: center;">Signature _____ / _____</p> <p style="text-align: right;">Name in block letter</p> <p>"_____" 199__ yr.</p>	

The NSRA co-ordinates the activities of both shipping companies and their MOHs. The NSRA also: look for potential cargo shippers; considers applications and informs the applicants of the possibility of leading; together with the MSC and FESCO works out rates of ice-breaker and pilotage fees reasonable for shipowners; forms the insurance system for the NSR.

In accordance with applications for leading the NSRA together with the MSC and FESCO determines positions of ice-breakers along the NSR. Last years the full volume of transit cargo transportation along the NSR. was effected by the MSC.

4.2. Order of Navigation

A vessel taken for leading embarks the State ice pilot in the approaches to the Kola Gulf, in the outer roadstead of the port of Provideniya, and in positions indicated by the Representatives of the NSRA or MOH. Further sailing of a vessel along the selected routes will be directly controlled by the MOH. Depending upon the season of navigation and ice conditions the following types of leading may be used.

Along the Southern route (Fig. 1-3), in the period of summer navigation, usual pilotage prevails; in Vil'kitskogo and Longa straits ice-breaker-assisted pilotage is mostly used. In September and October the route around Cape Zhelaniya is feasible (recurrence is 55-80%). In a prolonged navigational season (May-June in spring and November-December in winter) ice-breaker-assisted pilotage by leading or towing is also possible. In June and July the most favorable route lies northward of Novosibirskiye islands.

Along the Northern route in the period of summer navigation ice-breaker-assisted pilotage is mainly used. The most favorable route goes through Vil'kitskogo straits (recurrence 95-100%), in winter period (until June) it goes northward of the Severnaya Zemlya islands. In the Laptev Sea, before the period of Taymyr ice-massif destruction, the route goes along the southern edge of the ice-massif and in the period of August-October - directly through the ice-massif. In the region of Novosibirskiye islands the route goes northward of the islands, along the Novosibirskaya non-freezing polynia. In the eastern stretch the most favourable route goes along the edge of fast shore ice and after breaking of the latter it continues along the Chukot coast. The Ayon and Vrangeli ice-massifs present heavy ice conditions. They close Longa straits from westward and eastward in certain years.

The above recommendations regarding ice-breaker-assisted pilotage and most favourable routes are based on average long-term ice conditions [3, pp.63-73]. Actual ice conditions may result in a substantial deviation of vessel from the selected routes. In all such situations the shipmaster shall follow the orders by MOHs. To ensure safety of navigation MOHs are entitled to order a change in the type of guiding. If a vessel does not comply with the provisions of the Regulations for Navigation along the NSR [1], she may be withdrawn outside the limits of the NSR. The NSRA and MOHs bear no liability for any damage to the vessel caused during leading in ice conditions unless it has not been proved that such damage was caused through their fault [1, Article 11].

4.3. Regulations for Co-operation: “Foreign vessel - State ice pilot - Ice-breaker”.

The main provisions regarding duties and responsibilities of shipmaster, ice-breaker masters and State ice pilot during leading along the NSR are set forth in the Regulations for Ice-breaker- [9, Article 3].

The work on the “Status” regarding State ice pilot is coming to an end and is expected to be published soon. The Regulations for Navigation [1], the Regulations for Ice-breaker assisted Pilotage [9], the Status on the State sea Pilot of 1973 and experience in ice-breaker-assisted pilotage of foreign vessels in the period from 1991 to 1997 along the NSR served as a basis for working out the regulations for duties and responsibilities of the State ice pilot.

The basic conventional principle has been observed in the co-operation link between the State ice pilot and the master of a foreign vessel - attendance of pilot on board does not discharge the master or his navigating officers from responsibility for the safety of the vessel.

If ice-breaker-assisted pilotage is effected in complicated ice conditions, the pilot receives orders directly from the master of the ice-breaker by radio-telephone. With the shipmaster’s consent, in order to speed up a manoeuvre, the pilot may give orders to the helmsman and engine-room; all such orders will be deemed to be the master’s orders for which he shall bear responsibility.

The State ice-pilot shall follow the orders of the MOH as to ice-breaker support, choice of easiest routes in ice, designated type of leading, and he also supervises observance of the regulations for preventing marine environment pollution. In the course of ice-breaker-assisted pilotage in any conditions, and during conventional pilotage, when in the areas of complicated ice and navigational conditions, the State ice pilot shall stay on the navigation bridge.

In any situation the master of a foreign vessel shall take into consideration the experience of the State ice pilot, his knowledge of ice pilotage tactics, special features of sailing in the areas with difficult navigational conditions along the NSR and radio orders.

Co-operation between the master of a foreign vessel and the ice-breaker’s master is considered here for the situation when the master of a foreign vessel has at least 15 days’ experience in ship’s conning while sailing along the NSR in ice conditions without being assisted by the State ice pilot (Article 4 of the Regulations for Navigation [1] and Article 9.2. of the Requirements [18]).

The master of a foreign vessel, when following the ice-breaker in ice, shall comply with the orders of the ice-breaker’s master as to manoeuvring in ice and take appropriate measures. The actions of the foreign vessel’s master must assist the ice-breaker’s master in their safe passage through an ice zone. The success of ice-breaker-assisted pilotage depends equally on the experience of the ice-breaker’s master and that of the

master of the piloted vessel. Along stretches with comparatively easy ice conditions MOHs may permit guiding by the leading vessel. In this situation the master of the leading vessel has all the rights of the ice-breaker's master regarding the led vessel.

The ice-breaker's master and her owner bear no liability for damage caused to the vessel by leading in ice [9, Article 3.1.]. If the master of vessel led by ice-breaker or State ice pilot has damaged, through his wrong manoeuvres, either the ice-breaker or another vessel, the liability, in accordance with the RF legislation, will lie with the shipowner.

4.4. Navigational Support

In accordance with the Regulations [9, Article 4] guiding along the NSR is to be carried out by means of Russian nautical charts and other publications. The vessel sailing along the NSR shall be supplied with Russian nautical charts and publications corrected to the date of leaving port. During the whole voyage nautical charts and publications shall be corrected as soon as the latest information has been received.

The complete set of nautical charts and publications for the chosen routes is selected from the Catalogue of Charts and Books, The Arctic Ocean No. 7107, GUNIO edition 1977, 70 pp. The cost of the complete set of nautical charts and publications for foreign users is shown in the List of Prices No. 708-1 (Table 5).

Foreign users may hand in an application for nautical charts and publications to the State organization "NAVI-DALS" (197046, St.Petersburg, Chapaev str. 17; telefax (812) 233-4437). The application is to be handed not later than 3 months in advance. The application for "The Guide to Navigation through the Northern Sea Route" (in English) is to be sent to the State Hydrographic Department of the RF Ministry of Transport, (190031, St.Petersburg, Moskovskiy pr. 12, Russia; telefax (812) 310-3768).

Nautical charts and publications for the selected routes may be delivered on board a foreign vessel by the Russian State ice pilot.

All information with regard to changes in navigational situation on the NSR is transmitted through the MOHs by radio-stations "Dikson", "Tiksi", "Pevek" and "Cape Schmidt". Following the ice-breaker does not discharge the vessel's master from the responsibility for maintaining control over safe navigation of his own vessel. The vessel's master who had neglected the warnings on changes in navigational situation on the NSR may not, later on, plead ignorance of sudden dangerous conditions which he was unable to foresee.

Table 5.

**Cost of complete set of nautical charts and publications
for the selected routes [22]**

Name and No	Piece	Cost of piece USD	Required number of editions	Total cost USD
Guide to Navigation through the Northern Sea Route, No. 4151 B, 1996	1	50	1	50
Catalogue of nautical charts and publications. The Arctic Ocean, No. 7107, 1997	1	16	1	16
List of Lights and Radio- Technical Navigational Aids of the Karskiye Vorota-Enisey region, No. 2107	1	15	1	15
Radio-Technical Navigatio- nal Aids of the Arctic and Atlantic Oceans, No. 3001	1	15	1	15
Nautical charts	1	12	60	720
TOTAL	-	-	-	816

Note: The number of nautical charts is shown for the Southern route between the Karskiye Vorota and Bering straits. The number of nautical charts for the Northern route is 20 pieces less.

4.5. Hydrometeorological Support

The general provisions on hydrometeorological services rendered during transit sailing along the NSR are set forth in the Guide [3, pp 73-80]. Functions of the Rosgidromet organizations serving Arctic shipping are mentioned in it too.

The MOHs directly supply the masters of ice-breakers, State ice pilots and shipmasters with ice and hydrometeorological information. Navigational recommendations on the choice of most favourable route are based on ice and meteorological forecasts valid for 1-3 days. These forecasts are prepared by Operational Scientific Groups included into the MOHs.

The definite periods and volume of hydrometeorological forecast information is stipulated in the Contract for leading. The cost of information is included into the total costs of leading (Table 2).

When planning navigation along the selected routes a foreign shipowner may order both long - and medium - term hydrometeorological forecasts from the State Scientific Centre of the RF - AARI (199397, St.Petersburg, 38 Bering str., fax. (812) 352-2688). The Centre may also supply the following information on the contract basis (Table 6):

The chart of actually existing ice conditions on the selected route shows current ice situation registered within 1-5 days before receiving the request.

Table 6.

**Hydrometeorological forecasts, navigational recommendations
and their costs [23].**

No.	Type of information	Approximate cost in USD
1.	Chart of actual ice conditions on the selected route	1200
2.	Ice distribution forecast for 8 days	200
3.	Ice distribution forecast for 30 days	350
4.	Forecast of various ice conditions (times of stable ice formation, making and destruction of fast shore ice, freeing from ice, etc.) for 1-3 month	1500
5.	Meteorological forecast for 10 days	250
6.	Sea level forecast on separate, limited by depths, stretches of the route	200
7.	Navigational recommendations for 8 days	200
8.	Navigational recommendations for 30 days	350
9.	Navigational recommendations for 6 months	1200

Navigational recommendations take into consideration service properties of the led vessel (ice class, age, displacement, principal dimensions, engine power). Navigational recommendations include the following information:

- ice situation charts, text with navigational recommendations and co-ordinates of the easiest route in ice, type of ice-breaker leading (for 8 days when sailing through a certain stretch of the selected route);
- type of navigational difficulties; sailing in patches of close ice, broken ice, fast shore ice; deviation from the selected route in the areas of ice massifs; speeds for individual vessels and convoys; time total of the leading through the route (for 30 days when sailing through the whole length of the selected route);
- type of navigational difficulties during spring, summer and autumn periods; times of commencement and close of ice-breaker navigation, most intensive leading period and unassisted sailing of vessels; times for leading through the selected routes (for 6 month).

4.6. Radio Communication

Radio communication with vessels is carried out in accordance with “The Directions on Communication for the Period of Arctic Navigation through the NSR”. “The Directions” are made public by Rosmorflot and vessels are supplied with them by shipping companies (shipowners). “The Directions” may be delivered on board foreign vessels by State ice pilots and Inspectors surveying vessels for their compliance with Requirements [18].

Any vessel navigating along the NSR shall carry on board, along with conventional means of communication:

- ship's ground station for satellite communication;
- receiver of navigational warnings (NAVTEX);
- satellite emergency radio-buoy;
- recording and receiving facsimile apparatus including reception of charts with hydrometeorological information;
- VHF station for communication with aircraft, helicopters and other vessels in convoy.

The use of the international marine satellite system "Inmarsat" and the Russian marine satellite communication system "Ocean" will improve the methods of managing the shipping along the NSR by radio.

These systems enable vessels to maintain radio communication with:

- MOHs, DHEM and HB via radio centres in ports Dikson, Khatanga, Tiksi, Pevek and Provideniya;
- shipping companies via the radio centres in ports Murmansk, Arkhangelsk, Nahodka and Vladivostok.

On the whole the use of satellite systems of radio communication and ice information opens the way to creation of an integrated system of shipping management on the NSR with the common managerial centre [13].

4.7. Emergency and Rescue Support

MOHs are directly responsible for the safety of ice-navigation and prevention of accidents in ice. Emergency, rescue and repair parties are carried on board of ice-class salvage tug-boats (in ports Dikson and Pevek) and on liner ice-breakers.

The station of COSPAS-SARSAT system (fixing of geographical positions and nationality of distressed vessels, aircraft and other mobile objects) is located in Arkhangelsk.

The selected routes of the NSR are covered by the Global marine system of safety communication in distress and for safety control (GSSCDS). The system is to be put into operation on 1 February, 1999 [24]. The posts of emergency radio control working on distress and SAR frequencies in the course of salvage operations are located in ports listed in table 7.

Every vessel, before commencement of her voyage along the NSR, shall carry on board spare parts and emergency equipment as stipulated in Articles 8.2 and 8.3 of the Requirements [18]. In case of suffering damage in the course of leading through the NSR the shipmaster shall immediately notify MOH and the shipowner of the accident. Rendering assistance to the distressed vessel is carried out in accordance with the recommendations of the Guide [3, pp 315-316].

The selected Western regional route links the area of West Arctic and Europe, but the Eastern regional route links the area of East Arctic and Japan/Far East. Regional routes envisage calling of foreign vessels at Russian ports. The following ones are open for foreign vessels: Murmansk, Arkhangelsk, Kandalaksha, Onega, Mezen, Nariyan-Mar, Igarka and Provideniya.

Table 7

Stations and objects of the GSSCDS system on the NSR

Stations and objects	Department	Distress radio watch on distress frequencies and SAR communication*	NAVTEX system **
<i>Amderma</i> Amderma's DHEM radio station	Rosgidromet	-	^ Only in the period of navigation
<i>Dikson</i> Dikson's DHEM radio station	Rosgidromet	-	^-
<i>Tiksi</i> Yakutskoe DHEM	MT RF	^ Only in the period of navigation	^-
<i>Yanrangay</i> Kolyma's HB	MT RF	-	^-
<i>Pëvek</i> FESCO radio station	MT RF	^ Only in the period of navigation	-
<i>Cape Schmidt</i> FESCO radio station	MT RF	^ Only in the period of navigation	-

Notes: * Distress radio watch is maintained: until 1 February, 1999 on frequencies 500kc, 2182kc, VHF channels 16 and 70; beginning since 1 February, 1999 - on frequencies 2187 kc, VHF channels 16 and 70.

** NAVTEX system - transmission of navigational warnings and meteorological information in English (letter printing) to vessels in the coastal waters.

^ Participation in receiving and transmitting of information.

5. LEGAL REGIME FOR FOREIGN VESSELS CALLING AT ARCTIC PORTS

In connection with participation of foreign tankers in transporting fuels and refrigerated carriers in the importing of foodstuffs to the Russian North the Government issues annually the "permit of calling" to foreign vessels at a number of other Arctic ports and stations for the period of navigation. The corresponding list includes 70 of them. The peculiarity of the established regime for foreign vessels' calling at the mentioned ports and stations provides for border-guard control and customs examination to be held both on arrival in and before departure from these ports and stations of RF open to foreign vessels (e.g. Murmansk and Provideniya). Together with the development of international shipping the Government will open ports to carry out the above procedure either in the same single order [25] or on constant basis.

5.1. Port Dues

The rates of port dues from vessels in the merchant ports of RF were approved by the Ministry of Economics in 1995 [26]. Russian vessels on international voyages and foreign vessels shall pay dues in USD. The rates of dues in Arctic ports are shown in Table 8.

Table 8.

Rates of dues in Russian Arctic ports

Port	Port dues, USD/per cu.m.						
	Tonnage	Light	Berth	Anchorage	Environment	Navigation	Pilotage
Murmansk	0.230	0.025	0.0050	0.0001	-	0.0067	<u>0.0013</u> 0.0060
Amderma	0.218	0.025	0.0050	0.0001	-	-	<u>0.0013</u> 0.0070
Khatanga	0.216	0.025	0.0050	0.0001	-	-	<u>0.0013</u> 0.0070
Tiksi	0.216	0.025	0.0050	0.0001	-	-	<u>0.0013</u> 0.0070
Pevek	0.175	0.025	0.0070	0.0001	-	-	<u>0.0013</u> 0.0070
Provideniya	0.210	0.025	0.0070	0.0001	0.022	-	<u>0.0038</u> 0.0088

Notes:

Tonnage - payment for each inward passage. Payment not to be collected if the vessel does not carry out cargo operations of commercial nature;

Light - payment for each inward passage;

Berth - daily payment for each day in berth; payment for inward passage to go through border-guard control and customs examination;

Anchorage - payment for each hour of lying at anchor in the inner or outer roadstead; no payment is collected for first 12 hours of lying at anchor;

Environment - payment for inward passage; no payment to be collected if the vessel does not carry out cargo operations of commercial nature;

Navigation - payment for inward passage;

Pilotage - the numerator indicates payment for coastal pilotage (per cu.m./mile); the denominator indicates payment for harbour pilotage (per cu.m./operation). The boundaries of the coastal and harbour pilotage are determined by the Compulsory Port Regulations;

Cu.m. - stowage factor counted in cubic metres which is determined by the product of three quantities indicated in the vessel's documents: length overall, extreme beam, maximum depth.

To make calculations of all kinds of dues and fees the stowage factor of Ro-Ro, Lo-Ro, Ro-Flo, OBO and container carrying vessels is to be multiplied by the factor equal to 0,7; for tankers with double bottom, double sides and tanks for segregated ballast, the stowage factor is to be multiplied by the factor equal to 0,85.

Vessels in transit shall guarantee payment of dues by radiotelegraphy. Harbour master has the right to prohibit the vessel's transit passage through port waters if no guarantee has been granted.

5.2. Border-guard Control and Customs Examination

The Regulations for calling at and lying in the open ports (roadstead) have been established by "The Law on the RF State Border" of 1993, other legislative acts of the RF and special Decrees of the RF Government published in the Notices to Mariners.

Foreign vessels proceeding to the RF ports (roadsteads) shall advise port of destination Authorities of their ETA. Vessels of foreign States which established for Russia vessels the "permissible" or "notification" regime for calling at their ports may call at the RF ports only after having received permission to do so from the Russian competent bodies according to the principle of reciprocity [4, Article 25] .

The places and duration of lying at the checkpoints of the State border are to be indicated by sea port administration and approved by the Federal Border-Guard Service of the RF and the State Customs Committee of the RF. The operational regime of the border-guard and customs stations in merchant seaports shall be established by the RF Ministry of Transport.

The border-guard control is effected in compliance with the Law "On the State Border of the RF" of 1993. The border-guard control includes:

- verifying the reasons for crossing the State border by people, means of transport, cargoes, goods and animals;
- examining means of transport, cargoes and goods;
- finding out and detaining persons breaking the rules of crossing the State border, transported cargoes, goods and the animals which are prohibited for import/export to or from RF by the RF legislation.

The order, means and methods of border-guard control are established in accordance with the Law [4] through regulatory acts issued by the RF Ministry of Transport and agreed with the RF Ministry of Justice. The border-guard officials hold inspection on ship's and navigational documents and, in case of necessity, ship's spaces. The ship-master shall, on the requirement of the border-guard officials, open holds, rooms, other spaces and the transported cargoes for inspection. The vessel may leave port only after border-guard control officials have issued an appropriate permission.

Customs examination is carried out in compliance with the Customs Code of 1993 [27]. When goods and means of transport have been brought on the RF Customs territory, the shipowner (shipmaster) advises the RF Customs House of crossing the RF Customs border. The Customs House indicates time and place where the vessel must be taken to effect her clearing in. These provisions do not apply to vessels crossing the customs territory of the RF if they do not intend to make a stop in ports located on the RF territory. The shipmaster shall submit master's declaration, ship's papers and cargo documents for carrying out customs examination. Customs officials may require opening holds, rooms, tanks and other ship's spaces, as well as packing of goods. After all stages of customs examination have been over, the relevant document is stamped - "Cleared in".

Fees and duties are to be paid for border-guard and customs registration as shown in Table 9.

Table 9.

Fees and duties collected for border-guard and customs registration

Type of registration	Rates of fees and duties
Border-guard registration	Seven minimum monthly remunerations of labour for the examination of sea-going cargo vessels of 1000 GRT plus 0.1 minimum monthly remuneration of labour for each ton in excess.
Customs registration	0.1% of customs value of goods and means of transport

Notes:

1. On 1 December 1997 minimum monthly remuneration of labour in the RF was 83,490 roubles.
2. Fees and duties are collected in foreign currency the rate of which is quoted by the RF Central Bank.
3. Means of transport shall be interpreted as any means used to transport goods, sea-going vessels included.

CONCLUSION

1. Legal evaluation of the selected routes testifies that Russia has established a favourable regime for international commercial shipping through the NSR. The common legal status is in effective for the selected routes irrespective of the sea areas they actually cross. The provisions of Article 234 of the UN Convention on the Law of the Sea of 1982 ratified by the Federal Law No.30-FZ of 26 February 1997 serve as the basis for regulation of shipping. These provisions deal with “ice covered regions” within the limits of the exclusive economic zone. The Regulations for Navigation on the Seaways of the NSR [1] extend the effect of these provisions over the whole scope of activities on the NSR. A vessel having been taken by MOH for leading is thus granted the right of passing through all parts of Russian internal and territorial waters and Arctic straits met on these routes. The main goals of shipping regulation are safety of navigation and prevention of sea and Russian Northern Coast pollution from vessels.
2. The legal regime for vessels’ access to the NSR takes into consideration the interests of international commercial shipping. The favourable “notification” principle of using the NSR has been introduced on condition that vessels satisfy special requirements [18] and their leading is regulated by MOHs under the State supervision of the NSRA. From the legal point of view a common legal regime applies to both routes as well as any other route.
Seasons of the year, ice conditions and vessel’s draught will determine the type of leading. Only the Northern route is feasible for vessels drawing over 12.5 metres. A vessel drawing 9 metres may be led along the Southern route and in favourable ice situation along the Northern one as well.
3. The order of foreign vessels navigating along the selected routes is considered from the legal point of view only. Both routes are within the zone of responsibility of MOHs. The MOH of the Western region of the NSR is functioning all year round; the MOHs of the Eastern region are formed in the summer period of navigation in order to effect directly regulation of sea-ice operations. Leading may be successful if the rules of co-operation “Foreign vessel - State ice pilot - Ice-breaker - MOH - NSRA” have been complied with.
4. An analysis of navigational and hydrometeorological support, radio communication and salvage support has been carried out with regard to legal and organisational assessment. When support is rendered as required by the Guide to Navigation through the NSR of 1996, economic effectiveness of the adopted system of regulating and servicing the NSR demonstrates a cut in transport expenses of not less than 10%. It has been achieved due to the fact that the system of the NSR management allows to choose an optimal and safe route for transport vessels, as regards the ice situation, and increases transporting speed by 1 knot.
5. The legal regime for foreign vessels calling at Arctic ports is based on the provision that only the port of Igarka on the NSR is open for foreign vessels. However, every year the RF Government issues an Order [25] which permits foreign cargo vessels to call at other Arctic ports and stations, numbering over 40, during the pe-

riod of navigation. State border-guard control of foreign vessels and their customs examination are carried out both on arrival in and before departure from the RF in the ports open for foreign vessels (such as Murmansk and Provideniya).

6. Certain sections of this paper include tables with rates of fees, duties, tariffs and lists of prices to be paid for the services rendered to vessels sailing along the selected routes. They are:
 - ice-breaker and pilotage fees. New “Regulations for Ice-breaker Fees” are currently under development. The ice-breaker fees will not exceed 5 USD;
 - insurance tariffs for ship’s hull and machinery and P&I civil liability for the NSR (approximate value);
 - cost of set of nautical charts and publications for the selected routes;
 - cost of hydrometeorological forecasts and navigational recommendations; (approximate value);
 - port dues;
 - border-guard and customs registration fees and duties.

These cost tables may be used for economic modeling in the Project WP8 (Simulation based on Year-round and Seasonal Operation Scenarios).

7. On the whole the legal evaluation of the selected routes has been carried out in accordance with the international legal provisions and Russian legislation. The Regulations for Navigation on the Seaways of the NSR regulate shipping along the selected routes on the non- discriminatory basis. Special emphasis has been placed on foreign vessels’ sailing because research is oriented towards organization in the framework of INSROP experimental commercial voyage of a foreign vessel along a selected route.

REFERENCES

1. Regulations for Navigation on the Seaways of the NSR. Approved by the Ministry of Merchant Marine of the USSR, dated September 14, 1990.
2. Douglas Brubaker. The Legal Regime of Straits in Russian Arctic Waters - Internationality. Chapter 4 - INSROP Working Paper, No.57, 1996, IV.3.1. - In English.
3. Guide to Navigation through the Northern Sea Route. No 4151 B - St.Petersburg: Head Department of Navigation and Oceanography of the Russian Ministry of Defense of RF, 1996. - In English.
4. The Law "On the State Border of the Russian Federation", dated April I, 1993, No. 4370-I.
5. The Decree of the Supreme Soviet of the USSR - "On the Economic Zone of the USSR", dated February 28, 1984, No. 10864x.
6. The Decree of the Supreme Soviet of the USSR - "On the Intensification of Nature Protection in the Regions of Extreme North and Sea Areas Adjoining the Northern Coasts of the USSR", dated November 26, 1989, No 1422-IX.
7. The List of Geographical Co-ordinates Determining the Basic Lines for the Calculation of the Width of Territorial Waters, Economic Zone and Continental Shelf of the USSR". The Decrees of the Soviet of Ministers of the USSR, dated February 7, 1984 and January 15, 1985.
8. "The Provision of the Northern Sea Route Administration of the Ministry of Merchant Marine of the USSR". The Decree of the Soviet of Ministers of the USSR, dated September 16, 1971, No 683.
9. Regulations for Ice-breaker Leading of Vessels through the NSR - Section of "Guide to Navigation through the NSR", No 4151 B, 1996, pp. 84-89. - In English.
10. N.Koroleva, V.Markov, A.Ushakov. Legal Regime of Navigation in the Russian Arctic. - INSROP Discussion Paper, 1995, IV.3.1.- In English.
11. "On the Measures for Realization of the Decree of the Presidium of the Supreme Soviet of the USSR", dated November 26, 1984, "On the Intensification of Nature Protection in the Regions of Extreme North and Sea Areas Adjoining the Northern Coasts of the USSR". - The Decree of the Soviet of Ministers of the USSR, dated July I, 1990, No.565.
12. The Provisional Regulations for Issuing Permissions to Organize Scientific Research, Expeditions and Tourism in the Regions Adjoining the Northern Coasts of the USSR.- The Decree of the Soviet of Ministers of the RSFSR, dated July 15, 1991, No.400.
13. H. Yamaguchi. Experimental Voyage through the Northern Sea Route. - University of Tokyo, 1995, pp. 39-63. - In English.
14. "On the Intensification of the Control over the Forming of Means for the Maintenance and Operation of Ice-breakers and other Capital Assets Serving the NSR". - The Order of the Ministry of Transport of the RF, dated July 27, 1996, No. 57.
15. Basic Data for the Calculation of Pilotage Costs through the NSR for Foreign and Russian Vessels Chartered by Foreign Companies. Approved by the General Manager of the DSC "Murmansk Shipping Company", dated December 1995.

16. E.Gold, J.Cantello, and P.Wright. Marine Insurance for the NSR: Towards a New Risk Regime? - INSROP Working Paper, No. 46-1996, IV.3.3. - In English.
17. T.Takamasa, K.Kondo, K.Miyashita, S.Hayashi, I.Aya. The Potential of the NSR with a Nuclear Ice-breaking Container Ship. - INSROP Working Paper, No 73-1996, III.07.6. - In English.
18. Requirements for the Design, Equipment and Supplies of Vessels Navigating along the NSR. - Section of "Guide to Navigation through the NSR", No. 4151 B, 1966, pp. 317-323. - In English.
19. Y.Ivanov. Marine Insurance on the NSR. Technical Report INSROP IV.3.3. - St.Petersburg: CNIIMF, 1997, 3pp. - In Russian.
20. The Regulations for the Insurance of Shipowners' Civil Liability. Moscow: Russian P&I POOL, 1996. - 18 pp.
21. Suggestions on the Insurance of Marine Risks on the NSR. Reference. - Branch of MILINSURE Co. in St.Petersburg, 1997, 3pp.- In Russian.
22. List of Prices No. 708-1 for the Publications of the Head Department of Navigation and Oceanography of the Ministry of Defence of RF. - Notices to Mariners No. 16, 1996. Pp. 5-6.
23. Hydrometeorological Forecasts and Navigational Recommendations for the NSR. Preference. - St.Petersburg: AARI, 1997. - 1p.
24. "On the Foundation and Functioning of the Global Marine System of Communication in Distress and for Safety Control". The Decree of the RF Government, dated July 3, 1977, No.813.
25. "On Issuing Permits for Calling of Foreign Cargo vessels at Arctic Ports and Stations (according to the Annex)". The Order of the RF Government, dated July 17, 1998, No 958-p.
26. Rates of Fees and Duties in the Sea Ports of the RF. Approved by the RF Ministry of Economics, dated August 4, 1995. - In Russian and English.
27. The Customs Code of the Russian Federation. Adopted by the State Duma, dated June 18, 1993 No. 5221-1 (with Amendments dated June 19 and December 27, 1995).

PART II ENVIRONMENTAL EVALUATION OF THE SELECTED ROUTES

ACTIVITY SCENARIO ON THE NSR

1. SHIPS ENGAGED IN TRANSIT PASSAGES

For the purpose of this work regarding environmental assessment of the selected route it is assumed that 20 container carries of about. 40000 t dwt trading from Asia to Europe will be involved [1]. Ships navigate only in summer and early autumn season from July till September. Each ship will make two voyages during the navigational season. The ship will have the following particulars (Table 1).

Table 1

Particulars of Container Carrier

Particular	Value
Length overall, m	236
Breadth, m	32
Displacement, m ³	55200
Container capacity, PCs	1990/2664
Dead-weight capacity, t	38850
Type of propulsion machinery	Low-spced diesel engine
Power of main engine, kW	21700
Load speed, mile/hr	20.7
Ice class (category)	L2
Fuel tank capacity, m ³	3800
Specific fuel consumption, t/day	123.6
Complement, pers	34

2. MARINE POLLUTION

2.1. Operational shipboard wastes

In accordance with the requirements of the MARPOL 73/78 and draft Polar Navigation Code which is expected to be adopted by IMO within the next few years, every ship sailing along the NSR should be equipped with oil filtering equipment, incinerators and sewage processing installations. The equipment should provide for oil content of the undiluted effluent not exceeding 15 mg/l (15 PPM). Sewage when discharged in the open sea should be purified to the level at which the e-coli count does not exceed 1000 per litre and the ship should proceed at a speed of more then 4 knots. Only that sewage is subjected to purification which definition is given in paragraph 3, Regulation 1, Annex IV of MARPOL 73/78

«Sewage», which is sometimes referred to as «black water», means:

- drainage and other wastes from any form of toilets, urinals and WC scuppers;
- drainage from medical premises (dispensary, sick bay, etc.) via wash basins, wash tubes and scuppers located in such premises;
- drainage from spaces containing living animals; or

d) other waste water when mixed with the drainage defined above.

MARPOL 73/78 and the national Russian Regulations for Protection of Sea Coastal Waters from Pollution set forth no requirements for discharge of so-called grey water, that is drainage from showers, galleys, wash-basins, etc.

Discharge of garbage from ships into the sea along the NSR is prohibited. The garbage should be incinerated in the incinerator or transferred to shore reception facilities.

Using the procedure [2] applied for estimating the quantity of wastes produced, it becomes possible to determine the quantities of bilge water, sewage water and garbage. Results of the calculations are given in Table 2.

Table 2

**Quantities of wastes produced on board in the process
of normal operation**

Characteristic	Unit	Value
Bilge water	m ³ /day	7
Sewage water		
black water	l/day	3400
grey water	l/day	5700
Garbage		
domestic waste	kg/day	100
operational waste	kg/day	15
cargo waste	t/voyage	1.5

In view of the fact that duration of a transit passage along the NSR in summer does not exceed 12 days, the total quantities of wastes produced on board the ship when proceeding through the NSR come to:

84 m³ in respect to oily water, 41 m³ in respect to sewage water (black water) and 61 m³ (grey water); garbage 1.2 t in respect to domestic waste and 180 kg in respect to operational waste.

Bearing in mind that oil concentration at the oil filtering equipment outlet does not exceed 15 ml/l the total quantity of oil discharge from one ship will be 1260 g.

When it is considered that 40 voyages are scheduled annually along the NSR the total quantities of wastes will come to:

3360 m³ in respect to oily water; 1640 m³ in respect to sewage water (black water) and 2440 m³ (grey water); 48 t in respect to garbage (domestic waste) 7.2 t (operational waste) and 7.2 t (cargo waste). About 50 litres of oil will be discharged into sea in this case.

2.2. Accidental oil pollution of Arctic by shipping

Considering minor number of ship accidents entailing hull side or bottom damage, prohibition of carrying fuel in ship tanks which walls are contiguous to the environment, small number of voyages (40) as well as the fact that the voyages will be made only in the summer navigation season, it can be argued with confidence that the likelihood of a container carrier accident involving oil outflow will be virtually equal to zero. The likelihood of ship accident where it can be completely broken down and sink is still lower (1 case out of 300000 voyages). On this basis, when assessing environmentally the seaways selected on the NSR the accidental oil pollution factors may be eliminated from the number of detrimental factors.

2.3. Anti-fouling, self-polishing paints

The most harmful for marine life are paints containing tributyltin (TBT). Such paints are not produced in Russia but until the present time they are used widely at ship-building and ship-repair yards in other countries. Therefore this problem is the subject of wide speculation within IMO, in the Marine Environment Pollution Prevention Committee (MEPC). At the last 40th meeting of MEPC held in September 1997, the following arrangements have been mapped out:

1. The need to develop measures to restrict use of TBT in anti-fouling coatings within 5 years;
2. The need to develop measures aimed at a total ban on the use of all persistent organic pollutants in anti-fouling coatings within 10 years;
3. The development of measures aimed at encouraging the development of non-polluting anti-fouling technologies with the ultimate aim of applications that are free of hazardous substances;
4. At present only those paints are recommended which washout rate is less than $4\mu\text{g TBT}/\text{cm}^3\text{-day}$. [MERS Resolution 46(30)].

In view of the fact that Russia by now do not use TBT-containing paints, Japan banned the use of TBT on non aluminium hulls in 1990, and EC gets ready to abandon use of these paints it may be safely suggested that the container carrier will not be coated with the TBT-containing paint and to exclude accordingly that factor from consideration in environmental assessment.

3. AIR POLLUTION

3.1. Noise

When a ship moves through the Arctic waters there are two kinds of noise sources: noise produced by ship's machinery and noise arising due to ice and ship interaction. The level of the first noise kind does not exceed 105 dB, data on the level of the second noise kind are not available. Considering that the sound intensity is in inverse proportion to the distance squared from the noise source; it may be assumed that at a distance in excess of 100 m the intensity of sound caused by operation of the propulsion plant will be virtually of background pattern.

3.2. Emissions from diesel engines

3.2.1. Emission of sulphur and nitrogen oxides

In accordance with the new Annex VI to MARPOL 73/78 «Prevention of Air Pollution from Ships» adopted in 1997 emissions of nitrogen oxides into atmosphere from ships should not exceed 17 g/kW-hr NO_x , i.e. a container carrier which engine has a power output of 21700 kW will emit no more than 360 kg/hr of nitrogen oxide. The total sulphur content of any residual fuel used on board of ship shall not exceed 4.5 per cent. The greatest possible emission of the sulphur oxides from the container carrier will be 18 g/kW-hr or 391 kg/hr.

To burn 1 kg of fuel in an internal combustion engine 30 kg of air are consumed, having regard to the excess air factor. Fuel consumption (Table 1) is equal to 5.15 t/hr. Then, the air consumption will be 145 t/hr. Considering density of air being 1.29 kg/m³ air consumption will amount to $1.1 \cdot 10^5$ m³/hr.

Concentration of the nitrogen oxides in the exhaust air at the funnel edge will be equal to 3.2 g/m³, and that of the sulphur oxides – to 3.5 g/m³. Ground level concentration of the sulphur and nitrogen oxides for the most unfavourable conditions of their mixing with air (high humidity, still air, etc) may be calculated from the equation:

$$C_{m''} = \frac{A \cdot M \cdot F \cdot n}{H^{4/3}} \quad (1)$$

Where

- C_m – ground level, maximum concentration of a harmful substance, mg/ m³;
- A – coefficient dependent on climate conditions;
- M – quantity of harmful substances emitted into atmosphere, g/s;
- F – coefficient accounting for settling rate of the harmful substances in air (F=1 for gas);
- n – coefficient accounting for the condition of the harmful substance discharge from the funnel, depends on gas velocity v_m , determined by the equation:

$$v_{m''} = 1.3 \frac{\omega_0 \cdot D}{H}, \text{ m/s} \quad (2) \text{ at } v_m > 0.4 \quad n=2.4$$

Where

- ω_0 – mean velocity of gas mixture at the funnel outlet, m/s:

$$\omega_0 = \frac{V}{S} \quad (3)$$

- D – funnel diameter, m;
- H – funnel height, m;
- V – volume of the air emitted, m³/hr;
- S – sectional area of the funnel, m²;
- κ – coefficient, s/m², to be determined by the equation (4):

$$\kappa = \frac{D}{8V}, \text{ s/m}^2 \quad (4)$$

By making a calculation by the equation (1) we obtain that the ground level concentration of the nitrogen and sulphur oxides will not exceed 5 mg/m³ i.e. are lower than the maximum permissible concentrations for these substances. It is worth noting therewith that the calculation has been made by an equation for fixed point source of pollution, for the movable source these concentration will be significantly lower owing to additional dilution by the counter air current.

3.2.2. CO₂ emissions

When 1 kg of fuel is burnt in a diesel engine 3.15 kg of CO₂ and 1 kg of steam will be produced, on the average. Thus, a container carrier consuming 123.6 t of equivalent fuel per day will emit into atmosphere 389.3 t of CO₂ /day or 16.2 t/hr. One of the possible ways of reducing CO₂ emissions is to reduce fuel consumption. For the existing diesel engines this is equivalent to lowering of ship's speed because the fuel consumption depends cubically on the speed (an increase in ship's speed by 25 per cent entails a two-fold increase in fuel consumption). The design of the diesel engine and its working cycle are such that any modifications aimed at reducing CO₂ emissions will result in greater NO_x emissions. Considering that NO_x pose a great threat to the environment (acid rains, smog) and that the emissions from ships are insignificant as compared to those from the land-based plants as well as the economic expenses IMO has decided not to design at the present time any restrictions on CO₂ emissions. Therefore, the new Annex VI to MARPOL 73/78 «Prevention of Air Pollution from Ships» adopted in 1997 contains no requirements for reducing CO₂ emissions.

On this basis, in assessing impact exerted by shipping on the Arctic environment the harmful greenhouse effect may be neglected. Table 3 gives values of the harmful factors arising when the container carriers pass through the NSR.

Table 3

Factors which have harmful effect upon the environment

Parameters	Unit	Value	
		one voyage	40 voyages
Operational wastes			
oily water	m ³	84	3360
sewage water	m ³	41	1640
garbage include cargo waste	t	2.7	108
Operational discharges			
oil	kg	1.26	50.4
Specific operational emissions			
noise	dB	105	
nitrogen oxides	kg/hr	360	
sulphur oxides	kg/hr	391	
carbon dioxide	t/hr	16.2	
Total operational emissions			
nitrogen oxides	t	103	4120
sulphur oxides	t	112.6	4504
carbon dioxide	t	4700	18700

4. LEGISLATION FIELD COVERING THE INSROP REALIZATION WITH REGARD TO INTERACTION WITH NATURAL ENVIRONMENT

As postulated by the laws of a number of countries, any large-scale economic activity covering considerable areas is, to a certain extent, a danger to the very existence of the activity's environment and impedes its development.

Realisation of INSROP involves large areas in Arctic seas, islands and seaboard which, being the property of Russia and under its jurisdiction, are subject to the Russian Federation's legislation.

Development of the environment protection legislation of the former USSR and, correspondingly, Russia was halted and is now 15-20 years behind laws of the advanced countries. However, in the end of 80ies - beginning of 90ies this lag was quickly overcome due to democratic transformations underway in Russia. The newly introduced laws have been covering «white spots» as to nature use and environment protection, though sometimes with defects regarding quality analysis of probable consequences and mechanism of laws implementation.

Legislative, legal, normative field of rational environmental management is formed by:

- Federal Laws of the Russian Federation valid over the whole territory of the federation and regional laws;
- Presidential decrees, decisions by the State Duma (some of the decisions of the previous Supreme Soviet which are still in force) and by the Government of the Russian Federation, administrative acts of the regions being subjects of the Federation;
- Set of Federal Standards (GOST) and Building Codes (SNIP);
- Set of special standards (OST and RD);
- Set of departmental research and technical documents;
- International treaties, conventions, agreements and other deeds to which the Russian Federation is a participant or successor.

As already mentioned, the legal base for nature management and protection has been presently formed to the sufficient extent; the framework of the present paper does not allow to consider the legal base in full. The whole number of the documents in 1997 amounts to several hundred units. Therefore, we have to limit our analysis to those general provisions and some particular details which are vital for the development and subsequent realisation of INSROP, contain definite restrictive provisions and, in case of their violation, entail material or judicial responsibility.

We will content ourselves with consideration of those legislative deeds which relate to the current or future activity within the INSROP's frames. Since decision-makers need more information on the legislation field, in future we suggest an appropriate section to be arranged in the database of INSROP.

The paper presents consideration of the basic federal legal acts directly concerning INSROP and giving general outline of the legal field around the project.

A list of laws in force and international agreements is also provided with special reference to those directly concerning INSROP.

The other documents specify and make the basic laws fulfilment more concrete and provide procedures for their realisation and control.

4.1. The Constitution of Russian Federation

The basic law of the Russian Federation was adopted in December 1993. Article 9 of the Constitution provides for protection and use of land and nature resources as basic requirement for the life of citizens. This Article proclaims state, private, municipal and other types of land ownership and natural resources in Russia. Article 36 specifies possibility of utilisation of land and nature resources for all types of owners, provided «this utilisation is not detrimental to the environment and does not violate lawful rights and interests of other persons». Finally, Article 42 proclaims the right for favourable environment, reliable information on its conditions and compensation for damage to health and property caused by infringement of ecological legislation.

The Constitution of the Russian Federation is the direct action law; however, its provisions require legislative commenting, since specialists and all educated people from the public are well aware that any economic activity results in quantitative and qualitative alterations that might be regarded as certain damage to environment and in some way detrimental to interests of other persons or parties.

4.2. The law on environment protection

The basic law on environmental protection was adopted in December 1991 in the former USSR. Therefore it was somewhat revised in 1992 and 1993 with consideration for political changes in Russia.

This law had been enforced prior to adoption of the Russian Federation Constitution and such important international documents as, for instance, Rio Declaration (1992). Therefore the Law does not mention the concept of sustainable development, though the basic provisions of the Law do not contradict to this conception. Article 3 of the Law proclaims basic principles of environment protection as a scientifically substantiated combination of ecological and economic interests of society, rational utilisation of natural resources with due account to nature principles, potentialities of natural environment, requirement for reproduction of natural resources and prevention of irreversible consequences for the environment and man. Other principles are the following:

- Inevitability of responsibility;
- Openness (glasnost) and participation of the public;
- International co-operation;
- Priority in protection of human life and health, creation of favourable ecological conditions.

Besides basic natural environments, the Law mentions nature reserves and other protected territories among targets for protection (Article 4). The Law establishes differentiation in power and responsibility between different levels of authorities in protection of natural environment (Article 5-10). Articles 11-14 are dealing with the right of Russian citizens for healthy and favourable environment (Section 2). In particular, this Section provides for compensation of damage inflicted on health of citizens by environment pollution, in particular by accidents and catastrophes, and responsibility of those guilty in violation of ecological safety.

Mechanism for the realisation of those law provisions has been generally outlined. Basic principles of this mechanism are the following:

- registration and assessment of natural resources;
- material and technical support of environment protection;
- licensing of integrated nature use;
- limitation of permissible nature utilisation;
- payment for natural resources;
- payment and penalty for environmental pollution differentiated according to the level (within permissible limits and beyond those);
- formation and functioning of ecological funds;
- ecological insurance;
- economical stimulation by tax exemption of nature protection and restoration.

Articles 25-34 of Section IV are dedicated to fixing the environmental quality rates. Permissible pollution rates for environmental components are subdivided into differentiated (substance concentrations, level of noise, radiation, other physical impacts) and integral (for particular enclosed natural or man-made objects, i.e. rivers, lakes, enterprises, etc). The main standardising principle is non-exceeding of an adaptive capacity of man and a particular ecosystem.

Articles 35-39 of Section V deal with ecological expertise. Since this area of nature protection activity is considered by special law adopted in 1995 and containing detailed description of basic provisions, this subject will be discussed in due place.

Sections VI (Articles 40-44) and VII (Articles 45-57) contain certain requirements to design, construction and operation of economic enterprises and structures of various branches of economy. These sections present detailed description of basic regulations from previous sections of the Law with account for basic principles of international agreements on environmental protection. Special attention is given to rules of treatment of industrial and municipal wastes and sanctions for violation of those rules including limitation of banning of economic activity. Since law on wastes in the Russian Federation is not yet adopted, these provisions remain the basic principal legal act dealing with wastes (Law for waste management has been adopted in 1998).

Section VIII is devoted to emergency ecological situations. Its provisions have found detailed development in a special law.

Section IX (Articles 60-67) deals with specially protected natural territories and targets. Its provisions, especially important for INSROP, are considered in detail in special law of the same title and will be discussed later.

Section X is devoted to ecological control and section XI – to ecological education and research. Section XII (Settlement of disputes in environmental protection field) is of general interest to INSROP, as to an important economic program involving vast areas. It is stipulated in the section that international ecological disputes are solved on the basis of agreements between separate nations or international agreements.

Section XIII specifies basic principles of responsibility for ecological violations including disciplinary, administrative, material measures and criminal responsibility for ecological violations.

Section XIV provides for complete compensation of loss caused by ecological violation and describes principles of assessing and claiming penalties for the damage incurred. There are rates and standards developed on this subject.

Section XV (Articles 92-94) confirms Russia's devotedness to principles and norms of international ecological law and its priority over the national legislation in case Russia has signed those international acts.

In general the basic law proclaims principles and approaches which are detailed in particular laws of the Russian Federation. Those particular laws are being intensely developed in the country; however, the process has not been completed yet.

4.3. Federal law on ecological expertise

Despite a seemingly particular nature of this law, scope of its force in the area of development of new types of economic activities or involvement of new territories into active economic use is excessively wide, and system of limitations and sanctions for its violation is rather severe.

Probably this law will be revised in future towards a better balance between the interests of various social groups involved in its observation and control. Some of the procedures provided by the law are incompatible with the logic of present-day development and could do more harm than good to the national economy and the environment which it is intended to protect.

Here we are going to limit ourselves to a short outline of those provisions of the law, which may concern the development and realisation of INSROP, as well as brief comments to its most important or most controversial provisions.

The law is directed towards prevention of unfavourable environmental impacts and provision of ecological safety.

Basic concepts of an ecological expertise are the following:

- presumption of potential ecological risk from any planned economic or other activity (one of the rather extreme provisions of the law, Article 3);
- an obligatory ecological expertise to be provided prior to decision making on a project execution;
- comprehensiveness;
- consideration for ecological safety requirements;
- reliability and completeness of information;
- independence of experts;
- scientific substantiation of conclusive statements;
- openness and public's participation;
- responsibilities of an expertise participants for an expertise quality.

According to provision of competence, INSROP falls into category of projects requiring an expertise at the federal level, since this project is realisable on the territory of several subjects of the federation (Article 11).

The federal level of the expertise is predetermined by an international use of nature of the Arctic and adjacent areas of the Global Ocean, as well as by requirement to sign an international treaty for realisation of the project.

Evidently, representatives of the Russian regions within the scope of INSROP activities will be invited to participate in the ecological expertise (Article 12).

Some of the law provisions directly refer to arrangement of ecological expertise, rights and obligations of experts.

Expenses for the expertise are charged to the Customer. A mandatory condition for ecological expertise is submission of environmental impact assessment statement and its approval by federal control and supervision agencies and local self-governing bodies (Article 14).

A final decision of Ecological Expertise is made by a qualified majority of the Commission of Experts.

Positive decision of the Ecological Expertise is one of obligatory conditions for subsequent financing and execution of a project. Negative decision is a base for banning the execution of a project.

After the Customer has revised and modified the project, the latter may be subjected to a repeated expertise. Decision of the State Ecological Expertise may be claimed in a legal way by proceedings in a court (Article 18).

The law provides for possibility and arrangement of a public expertise and determines its possible participants and customers. Decision made by public expertise is submitted to relevant state authorised agency. If approved by this agency, decision of public expertise becomes basically equal to decision of the state expertise.

The law provides for responsibilities for violation of its provisions as well as mechanisms of funding and conducting ecological expertise, means of settlement of disputes. The law enunciates the principle of a priority of international agreements on ecological expertise over the federal law. As a follow-up of the Ecological Safety Law, the federal government has adopted resolution N 628 of 11.06.96 approving the provisions for arrangement of a state ecological expertise, thus cancelling previous provisions of 1991 and 1993.

A unified form of the conclusive statement of the state ecological expertise has been approved by decree N 398 of 28.09.95 (issued by the Ministry for the Environment and Nature Resources). Provision for environmental impact assessment (EIA) has been authorised by ministerial order N 222 of 18.07.94 (the same ministry). The Addendum to this Order lists enterprises of national economy and other types of activities obligatorily subjected to EIA. Among them there are «ports, terminals, shipyards, international ferry services as well as inland waterways and ports for inland navigation which accept vessels of displacement equal to or exceeding 1350 t (item 23 of Addendum). Provisions of this particular item might be regarded as pretext for the requirement of ecological expertise for INSROP. However, the law refers only indirectly to the major part of the project territory and concerns directly the problems of navigation in the vicinity of ports and estuaries and mouth sections of rivers.

Federal State Committee on environmental protection has recently elaborated new EIA provisions with wider interpretation of targets subject to EIA (any types of economic activity capable of inflicting environmental damage). The above provisions are now under consideration.

The procedure of state ecological expertise provides for compliance between the project and EIA statement in terms of requirements of supervising agencies (sanitary-epidemiological, Emercom, Committee for the northern territories, etc). The relevant normalising and standardising documents underlying the requirements of those agencies are not analysed here, however, their existence should be kept in mind.

4.4. Federal law on specially protected natural territories (Adopted on 15.02.1995)

Specially protected territories are plots of land, water surface and air space above, where natural landscapes and objects of a particular nature protection value as well as of a scientific, cultural, recreational and health-improving value, are located, which are completely or partially withdrawn from economic activity by relevant official decision and enjoy the conditions of special protection.

Those territories are referred to as national heritage. Specially protected territories are classed into following types:

- a). state national reserves including biosphere reserves;
- b). national parks;
- c). nature parks;
- d). state natural sanctuaries;

- e). monuments of nature;
- f). dendrology parks and botanical gardens;
- g). medical and health-improving localities and resorts.

Besides other protected territories fixed by the government of the Russian Federation or by subjects of the federation, local self-governing bodies may make some coastline, river networks, natural landscapes protected, which may touch on the interests of NSR.

Land plots or areas adjacent to officially protected territories may also acquire the status of protected territories with controlled economic activities. Depending on their status, protected territories may be distinguished as federally, regionally or locally controlled. Relevant authorities establish a status of territories, their management, and operation control.

All data concerning those territories, their location and conditions of natural resources are introduced into official territorial cadasters. Any activity which may inflict damage to a natural complex of these objects is prohibited in the areas included into national reserves and parks, including a change of a hydrological system, moving and parking of vehicles being outside the activity of these structures. Expansion of an economic activity on these territories is not allowed. Zone with limited scope of nature utilisation is arranged around national reserves and parks. Certain limitations of are also imposed on less severely protected natural territories.

Thus the following conclusions may be drawn from the provisions of the above law on specially protected territories:

- For purposes of design and realisation of INSROP it is highly advisable to make detailed specification of boundaries of protected territories and pay due attention to boundaries of the protected natural areas when identifying navigation routes, ports of entry, scheduled or emergency or preventive standing of ships. It is not improbable that the present boundaries of protected territories may be revised or new territories arranged under the authority of the federal government or relevant local administrations. Therefore the administration or design agencies of NSR shall be always in contact with the above authorities to exclude unjustified limitations for navigation conditions or unfavourable impacts on and consequences for natural systems.

4.5. Russian legislation for the NSR environment pollution prevention

The Russian legislation pertaining to ecological safety of shipping at sea including the Arctic, is based on the following laws of the Russian Federation:

1. The Environment protection law (1992)
2. The Continental shelf law (1995)
3. The Code of Water (1995)

The Environment protection law defines the main principles of the environment protection, authority of administration of different levels, authority of different ecological public organisations, economic instruments of the environment protection, including liability and remuneration for damage caused to the environment and health of population; regulations for establishing ecological funds; the main requirements for the environment quality standards, ecological requirements for location, designing and operation of industrial enterprises, organisation and realisation of an ecological control/monitoring.

The Continental shelf of Russia law and the Code of Water establish the status of the continental shelf, water sources, sovereign rights and jurisdiction of Russia in their implementation, development of natural resources of the continental shelf and water sources, liabilities for their contamination during industrial activities, including shipping. The law and the Code set the fee for use of water sources and continental shelf.

The bodies responsible for ensuring ecological safety and ecological control on the NSR are the State Committee on the Environment Protection (Goskomecology) and the Northern Sea Route Administration (NSRA), as defined by the law. Goskomecology is responsible for carrying out state ecological expertise, identification of protected areas, keeping the Red Book of Russia. Inspectors of Goskomecology and NSRA are authorised to stop and inspect Russian and foreign ships and other sea craft for control of their compliance with the environment protection legislation, ecological norms and rules. In case violations are found the inspectors are entitled to detain ships until the decision is made with regard to remuneration the damage caused.

In 1984 "Regulations for off-shore waters and seas pollution prevention" were adopted and in 1988 "Sanitary regulations and norms for off-shore waters and seas pollution prevention in areas where population use water" No 4631-88 (further referred to as the Regulations) were adopted, which include regulations for pollution prevention from ships, floating and stationary installations with the aim of investigating and developing sea bottom resources and as a result of port activities.

The Regulations cover the territorial seas, river mouths and the continental shelf of Russia as well as the land territory 2 km wide. The Regulations pertain to issues of marine environment pollution prevention and elimination, creation of favourable conditions for life and reproduction of fish, sea fauna and flora, development of conditions safe and favourable for human recreation and other purposes.

According to the Regulations it is prohibited to discharge garbage and any harmful substances from ships into water, if a limited permissible concentration of these substances is not established for sea areas. It is prohibited to contaminate the ice cover along the NSR with industrial, domestic, oil and other wastes, which can be washed into water and cause marine pollution. It is prohibited to store garbage and any other wastes on ice.

It is permitted to discharge wastes on the NSR with observance of the following conditions:

1. Oily mixtures from ships shall be discharged in accordance with the MARPOL 73/78 requirements for special areas.
2. Processed domestic sewage can be discharged if the ship is under way and the coli-index does not exceed 1,000 per 1 l.

Safety of navigation on the NSR is governed by "Regulations for navigation along the NSR" and requirements of the Sea Register of Russia for construction of ships. When navigating along the NSR ships must comply with special requirements ensuring safety in ice conditions and the shipmaster must have experience of handling a ship in ice. Compulsory pilotage and icebreaker assistance is established in the straits of Vilkitsky, Shokalsky, Ivan Laptev and Sannikov because the navigational situation in these waterways is particularly difficult. Safety of ships under pilotage and icebreaker assistance is ensured by the Northern Sea Route Administration through the headquarters of sea operations. Navigation can be suspended in certain areas if a navigational situation presents danger to navigation or the environment. Vessels non-complying with Regulations for navigation along the NSR can be directed to leave the NSR.

4.6. Selection of environmentally hazardous impact factors

4.6.1. Short outline of impact scenarios suggested for consideration

As outlined in the framework of the INSROP Programme for 1988, the volume of navigation has a number of features distinct from the future large-scale programme in the quantitative and qualitative composition of transported freights, period and areas of navigation. Basic preconditions limiting the scope of the present INSROP scenario are the following:

- navigation activity is limited by participation of dry cargo-container carriers and, if needed, ice breakers for towage. Diesel or nuclear power plants equip these vessels.
- nomenclature of transported cargo excludes oil and oil products (except for the fuel for ship's own needs), liquid chemicals, coal, ore and other bulk freight.
- the schedule provides for transit navigation with no calls to rivers and ports available along the NSR. Only emergency situations might evidently force to violate this condition.
- temporary schedule is limited by the most favourable navigation time between July and September.
- probability of emergency conditions during the navigation was analytically determined as negligible.

The above limiting provisions permit to exclude a number of intensive environmental impact sources and certain potential VECs from subsequent consideration. At the same time those impact hypotheses that are still valid require re-evaluation due to the above limitations.

The present study is based on previous INSROP reports as initial data sources as well as on data and evidence obtained during work on this project. It should be noted that even such a simplified version has evidently disclosed a number of complexities and ambiguities.

In the present section the validity of previous impact hypotheses (Larsen et al, 1995; Bakken et al, 1996; Wiig et al, 1996) according to the suggested model scenario of transit trouble-free navigation (regular operation scenario) along the NSR is evaluated.

4.6.2. Adaptation of impact factors

The impacts retaining their actuality under the conditions of the model scenario are italicised in the Table 4. As mentioned above, no emergency impacts are taken into account.

Table 4

Environmental impact factors

Specific (in situ) activities	Specific impact factors	
	Regular operation	Accidental event
Ship		
Ship in operation:	<i>Physical disturbance</i> <i>Noise from ice-breaking (to sea)</i>	Physical disturbance
Ship operation: • Energy production	<i>Emissions to air:</i> • <i>NO_x</i> • <i>SO_x</i> • <i>CO₂</i> • <i>Particles</i> • <i>Residues from combustion</i> • <i>Freon</i> <i>Noise from engine (to sea and air)</i>	Releases of: • Fuel oil (bunker) • Diesel oil • Radioactive material
Cargo operation: • Evaporation of cargo • Loss of cargo	Emissions to air: • Volatile organic components (VOC) • Halon Discharges to sea: • Hydrocarbons • Chemicals • Minerals • Dry goods • Others	Releases of: • Hydrocarbons • Chemicals • Minerals • Dry goods • Others
Handling of ballast water: • Shifting • Tank washing Handling of waste and spill: • Cargo residues • Fuel residues and sludge • Bilge • Waste Anti-fouling treatment of hull/wetted surface	<i>Emissions to air:</i> • <i>Waste residues</i> <i>Discharges to sea:</i> • <i>Ballast water</i> • <i>Cargo residues</i> • <i>Oily water; fuel residues, sludge, bilge water</i> • <i>Garbage and litter</i> • <i>Sewage</i> Releases of: • <i>Organo-tin compounds</i>	Releases of: • Ballast water • Cargo residues • Oily water, fuel residues, sludge, bilge water • Garbage and litter • Sewage

Specific (in situ) activities	Specific impact factors	
	Regular operation	Accidental event
Support routines	<i>Noise from helicopter (to air)</i>	Physical disturbance Releases of: <ul style="list-style-type: none"> • Cargo • Fuel oil
Use (sea-borne) <ul style="list-style-type: none"> • Energy production • Cargo operation 	Emission to air: <ul style="list-style-type: none"> • NOx • SOx • CO₂ • Particles • Residues from combustion • Freon Discharges to sea: <ul style="list-style-type: none"> • Hydrocarbons • Chemicals • Minerals • Dry goods • Oily waste/water • Others Physical disturbance Noise	Releases to air: Discharges to land and sea: <ul style="list-style-type: none"> • Hydrocarbons • Chemicals • Minerals • Dry goods • Oily waste/water • Others Physical disturbance Noise

4.6.3. Adaptation of valued ecosystem components: VECs not subjected to impacts according to present scenario are marked by (-) sign (Table 5).

Table 5

No	Valued Ecosystem Components	When identified	Validity of VECs according model scenario
A1	VEC Benthic invertebrates	1993	+
A2	VEC Marine estuaries and anadromous fish	1993	+
A3	VEC Plant and animal life in polynyas	1993	+
B1	VEC Seabirds	1993	+
B2	VEC Marine wildfowl	1993	+
B3	VEC Waders in resting and feeding areas	1993	+
C	Marine mammals	1993	+
C1	VEC Polar bear	?	+
C2	VEC Walrus	?	+
C3	VEC Bearded seal	?	+
C4	VEC Ringed seal	?	+
C5	VEC White whale	?	+
C6	VEC Gray whale	?	+
C7	VEC Bowhead whale	?	+
D1	VEC Human settlement	1993	-

D2	VEC Water/land border zone	1993	-
E1	VEC Protected areas	1997	+
F1	VEC Indigenous people	1997	-
	VEC Wild reindeer	1997	+ (but no data available)

This paper presents description and assessment of possible impacts of navigation on Valued Ecosystem Components specified on the basis of previous research in the framework of projects II.4.-1-4. Data submitted by the INSROP has been used as the only sources. Recently identified new valued ecosystem components, namely wild reindeer, were not included into the assessment study since no relevant data are so far available.

4.6.4. Adaptation of impact hypotheses (IH)

The IHs are given the categories as follows:

- A. The hypothesis is assumed not to valid.
- B. The hypothesis is valid and already verified. Research to validate or invalidate the hypothesis is not required. Surveys, monitoring, and/or management measures can possible be recommended.
- C. The hypothesis is assumed to be valid/ Research, monitoring or survey is recommended to validate or invalidate the hypothesis. Mitigating measures can be recommended if the hypothesis is proved to be valid.
- D. The hypothesis may be valid, but not worth testing for professional, logistic, economic or ethical reasons, or because it is assumed to be of minor environmental influence only or insignificant value for decision making.

Our description of impact hypothesis is based on the list of important factors suggested by Thomassen et al (1994) for regular operation scenario with consideration for more detailed information offered for the present model scenario. Impact hypotheses previously classified into B, C, D categories have been subjected to evaluation; the hypotheses previously rejected (A) were not considered. Thus, the hypotheses associated with hazardous situations were also excluded. Detailed comments to each of impact hypotheses are given in the Annex.

As many as 56 hypotheses classed into B, C, D categories have been tested for all types of VECs exposed to the impacts under the assumed conditions of the activity scenario described in 2.1. Since the model scenario excludes such types of impact as oil spills or waste dumps, 22 hypotheses were rejected. Another 14 hypotheses were accepted valid though requiring additional research and monitoring for evaluation of particular consequences and their significance (dark shaded in the Table 6).

Table 6

Impact hypothesis verification results according to model scenario.

Valued Ecosystem Components	VEC No	IH No	Impact hypotheses (IH)	Category	
				in general	this scenario
VEC Benthic invertebrates	A1	A1-1	• Accidental discharges of pollutants will affect benthic invertebrates.	B	-*
		A1-2	• Pollution from ship traffic will affect survival of pelagic larvae of benthic invertebrates at certain times of the year.	C	D
		A1-3	• Chronic pollution will cause accumulation of pollutants in benthic invertebrates.	B	D
		A1-4	• Hardbottom epifaunal organisms can access new substrates by colonising the surface of dumped waste.	D	-**
VEC Marine, estuaries and anadromous fish	A2	A2-1	• Accidental pollution will cause reductions in certain fish stocks if it affects areas with high concentrations of fish, such as migration, nursing or feeding areas.	C	-*
		A2-2	• Due to low diversity at each tropic level, effects on one single species will cause major impacts in the rest of the food chain.	B	D
		A2-3	• Discharges of oil or other pollutants in fresh water or along the coastal NSR area will cause increased mortality and reduced production in anadromous fish populations.	C	D
		A2-4	• Physical disturbance to fishes by the ship moving in ice will cause increased mortality in cryopelagic fishes.	C	C
VEC Plant and animal life in polynyas and marginal ice zones	A3	A3-1	• Any effect of NSR traffic will be manifested to a greater extent in polynyas than in other areas.	C	C
		A3-2	• Noise from ship traffic will scare fish, mammals and seabirds away from important feeding, resting and breeding areas in and near polynyas.	C	C
		A3-3	• Oil spills in polynyas will reduce primary production, and thus affect the whole feeding network.	C	-*
		A3-4	• Even minor oil spills in polynyas, from regular NSR traffic, will cause suffering and death to vertebrates.	B	-*

Valued Ecosystem Components	VEC No	IH No	Impact hypotheses (IH)	Category	
				in general	this scenario
		A3-5	<ul style="list-style-type: none"> Chronic pollution of polynyas may affect reproduction and survival of individual at all tropic levels. 	C	D
VEC Seabirds	B1	B1-1	<ul style="list-style-type: none"> Oil slicks at sea may cause increased mortality and reduced reproduction of the seabird populations. 	B	_*
		B1-2	<ul style="list-style-type: none"> Disturbance in nesting colonies and feeding areas resulting from the NSR activity will cause reduced reproduction and/or the abandonment of areas. 	C	C
		B1-3	<ul style="list-style-type: none"> An increase in the population of large gulls, skuas and Arctic Fox resulting from increased food availability (dumping of edible waste etc.) will cause increased predation on seabirds and their eggs and chicks. 	C	_**
		B1-4	<ul style="list-style-type: none"> Increased ship traffic will result in reduced local seabird populations due to increased hunting pressure and egg harvesting. 	A	A
		B1-5	<ul style="list-style-type: none"> Emission of toxic substances (other than oil components) from ships or other activity related to the NSR will cause increased mortality and reduced reproduction of seabirds. 	D	D
		B1-6	<ul style="list-style-type: none"> Oil pollution will cause increased mortality and reduced reproduction in the seabirds food organisms. Reduced availability of food will result in a reduction in seabird populations. 	D	D
		B1-7	<ul style="list-style-type: none"> Increased human activity in connection with NSR (e.g. pollution, hunting and noise) can reduce the population of large gulls, skuas and Arctic Fox. This will reduce the predation on other seabirds and their eggs and chicks, and have a positive effect on the seabird population. 	A	A
		B1-8	<ul style="list-style-type: none"> Increased icebreaker traffic in ice filled waters will make the access to food organisms easier for seabirds and result in a population increase. 	D	D
		B1-9	<ul style="list-style-type: none"> The propellers on the ship will whirl up sand and mud from the bottom and reduce the visibility for diving seabirds. 	A	A
		B1-10	<ul style="list-style-type: none"> Ship traffic will cause increased mortality and reduced reproduction in seabirds food organisms. Reduced availability of food will result in a decrease in seabird population. 	D	D

Valued Ecosystem Components	VEC No	IH No	Impact hypotheses (IH)	Category	
				in general	this scenario
VEC Marine wildfowl	B2	B2-1	<ul style="list-style-type: none"> Disturbance near breeding areas can result in reduced reproduction of marine wildfowl through increased predation and reduced egg and chick survival, and may lead to abandonment of breeding areas. 	B	***
		B2-2	<ul style="list-style-type: none"> Disturbance in resting, moulting and feeding areas will result in increased energy expenditure, less time for food intake and accordingly increased mortality of adult wildfowl and reduced reproductive success. 	B	C
	B2	B2-3	<ul style="list-style-type: none"> Oil slicks in marine areas may cause increased mortality and reduced reproduction of the wildfowl pop. 	B	*
		B2-4	<ul style="list-style-type: none"> Toxic substances discharged into the sea may be accumulated in, and will possibly kill, benthic fauna forming part of the diet of marine ducks. This may result in reduced access to food and possibly poisoning of birds, and accordingly reduced reproduction and increased mortality. 	C	D
		B2-5	<ul style="list-style-type: none"> An increase in population of large gulls, skuas and Arctic Fox resulting from increased dumping of edible waste will cause increased predation on wildfowl and their eggs and chicks. 	C	***
		B2-6	<ul style="list-style-type: none"> Increased ship traffic will result in reduced local populations of wildfowl due to increased hunting pressure and egg harvesting. 	D	***
		B2-7	<ul style="list-style-type: none"> Extensive disturbance in breeding areas will reduce the number of suitable breeding areas and lead to reduced reproduction and reduced population sizes of marine wildfowl. 	D	***
		B2-8	<ul style="list-style-type: none"> Increased human activity in connection with NSR (e.g. pollution, hunting and noise) can reduce the population of large gulls, skuas and Arctic Fox. This will result in a reduction in predation of breeding marine wildfowl. This will give reduced mortality and increased reproduction of wildfowl. 	A	A
VEC Waders in resting and feeding areas	B3	B3-1	<ul style="list-style-type: none"> Disturbances in resting and feeding areas can result in reduced possibility for the waders to store enough energy for the autumn migration. 	C	C
		B3-2	<ul style="list-style-type: none"> Toxic substances released into feeding areas 	C	D

Valued Ecosystem Components	VEC No	IH No	Impact hypotheses (IH)	Category	
				in general	this scenario
			may accumulate in, and possibly kill, organisms, which are normally preyed upon by waders. This can lead to direct poisoning or reduced access to food.		
		B3-3	<ul style="list-style-type: none"> Oil spills affecting concentrations of waders in resting and feeding areas will cause increased mortality resulting both from direct oiling and habitat degradation. 	C	_*
Marine mammals	C	C0-1	<ul style="list-style-type: none"> <i>For all marine mammals:</i> Pollution to ice and water can be accumulated through the food chain and reach such high concentrations in marine mammals as to have a toxic effect. 	C	D
VEC Polar bear	C1	C1-1	<ul style="list-style-type: none"> Oil pollution in polar bear habitats will cause suffering and death for the affected polar bears and may result in a decrease of the population 	B	_*
		C1-2	<ul style="list-style-type: none"> Waste from installations and traffic will cause a local increase in the polar bear population. 	B	_**
		C1-3	<ul style="list-style-type: none"> Reduced seal occurrence resulting from disturbance and pollution from activity will cause a decrease in the polar bear population in the area. 	D	D
		C1-4	<ul style="list-style-type: none"> Installations and traffic in or near dinning areas will cause reduced reproduction in the polar bear pop. 	C	C
		C1-5	<ul style="list-style-type: none"> Disturbances and obstacles caused by ship traffic in polar bear migration and feeding areas will result in a reduced population 	C	C
		C1-6	<ul style="list-style-type: none"> Activity in the ice creating artificial leads will cause a local increase in polar bear prey and accordingly a local increase in the occurrence of polar bears 	D	D
VEC Walrus	C2	C2-1	<ul style="list-style-type: none"> Disturbances resulting from traffic and installations will reduce the walrus population. 	C	C
		C2-2	<ul style="list-style-type: none"> Oil spills caused by traffic will reduce the walrus population. 	C	_*
VEC Bearded seal	C3	C3-1	<ul style="list-style-type: none"> Disturbance (traffic, ice breaking) will result in a reduction in the local bearded seal populations. 	D	D
		C3-2	<ul style="list-style-type: none"> Oil spills in the sea will cause suffering and death for affected bearded seals and reduction in local bearded seal populations. 	C	_*

Valued Ecosystem Components	VEC No	IH No	Impact hypotheses (IH)	Category	
				in general	this scenario
VEC Ringed seal	C4	C4-1	• Disturbance (traffic, ice breaking) will result in a reduction in the local ringed seal populations.	C	C
		C4-2	• Oil spills in the sea will cause suffering and death for affected ringed seals and reduction in local ringed seal populations.	C	_*
		C4-3	• Activity causing changes in local predator populations will affect the ringed seal population of the area.	D	_**
VEC White whale	C5	C5-1	• Oil spills caused by traffic will reduce the white whale population..	C	_*
		C5-2	• Disturbance (traffic, ice breaking) will result in a reduction in the local white whale populations.	C	C
VEC Grey whale	C6	C6-1	• Oil spills caused by traffic will reduce the grey whale population.	D	_*
		C6-2	• Disturbance (traffic, ice breaking) will result in a reduction in the local grey whale populations.	C	C
VEC Bowhead whale	C7	C7-1	• Oil spills caused by traffic will reduce the bowhead whale population.	D	_*
		C7-2	• Disturbance (traffic, ice breaking) will result in a reduction in the local bowhead whale populations.	C	C
VEC Protected areas	E1	E1-1	• NSR activities will come in conflict with Russian legislation of protected area.		C

« - » – hypotheses rejected due to absence of particular impact according to scenario:

- * - emergency oil spill
- ** - sewage storing and dumping
- *** - terrestrial activity

Thus,

- *impact on benthos, fishes and marine life in polynyas* can not be assessed quantitatively due to short exposure and low intensity.
- *main impacts on seabirds and mammals* would be disturbance, and, in extreme cases, direct conflicts with a vessel in the case of impossibility to abandon the area (e.g. conflict with mass concentration of moulting ducks in polynya).

- cases of forced and random calls of vessels into *protected water areas* are fraught with possible violation of Russian national ecological legislation.

4.7. Cost estimate of environmental damage incurred during implementation of INSROP model stage.

4.7.1. Conceptual Design

The review of strategies and instruments for economic quantitative assessment of environmental consequences of project implementation has been made by Kjell Moe (1) in 1977. This review gives a sufficiently detailed outline of various strategic approaches to the problem; it also touches upon the problem of effect of environmental damage cost estimate study on the economic efficiency of the project in the whole.

In general, a total environmental cost may be associated with any industrial operation, given by the sum of the costs of prevention or reduction of pollution and the costs of compensation and restoration for the residual pollution:

$$C_t = C_r + C_l + C_p$$

- C_t - total environmental cost of operation
- C_r - cost of restoration of residual pollution
- C_l - cost of environmental losses
- C_p - cost of prevention of pollution

For each design option under consideration, there are a range of different pollution control options which may be applied. Clearly this will lead to modifications in the cost of pollution prevention (C_p). Different pollution control options could lead to increases or decreases in the level of pollution, resulting in a corresponding shift in the extent and cost of pollution. The most economic optimum for any process option would clearly be given by the conditions resulting in the lowest value of C_t .

The economic value of C_p can be assessed using conventional engineering cost calculations, i.e. by determining the net present value of capital and operating costs. When considering different pollution control options, account must be taken not only of alterations in capital and operating costs but also of other costs or benefits which may accrue (e.g. improved production efficiency).

For releases which result in pollution, there are generally a number of options available for clean up. Given a defined end-point as regards environmental quality, the costs of restoration C_r can be readily determined again using conventional engineering cost calculations as the cost of restoration is a function of capital (e.g. clean up equipment) and operating (e.g. labour, materials) costs, both of which may be determined. C_r is really a cost-effectiveness analysis (CEA) in that the objective is clearly defined (i.e. to restore the environment to a certain quality) and the only issue is how to achieve this in the most cost effective manner for each clean up option considered.

The cost of loss services, C_l , is not readily amenable to conventional cost analysis and the use of techniques for valuing the environment need to be considered. Some or all of the approaches outlined above may need to be utilised to determine C_l . Overall, the objective is, for a given pollution control option (and therefore a defined C_p), to minimise the sum of C_l and C_r and therefore to minimise C_t for the pollution control option.

Thus there are two levels of interaction between the components of C_t : between C_r and C_l (i.e. for a given amount of damage, what is the optimum balance between restoration and compensation for loss), and between C_p and $C_r + C_l$ (i.e. what is the optimum balance between prevention and mitigation). Both of these interactions lead to a need for iteration in determining the overall economic optimum for pollution control.

The most important environmental costing issue which should be decided on a policy level is the approach to CBA: should it be applied in a conventional manner as for other economic evaluations, or in a modified form to reflect a greater priority for environmental protection? The answer may depend on particular circumstances: for example, conventional CBA may be applied to routine pollution, while modified CBA may be applied when a high level of risk perception and concern for the environment arises, e.g. for accidents.

On a more detailed level, the way in which environmental costing is carried out should reflect the organisation's environmental objectives and performance targets, which may be quantitative or qualitative, as well as relevant legislation on environmental protection. It is common within the organisation's EMS to define a range of quantifiable indices for describing these objectives and targets: these are referred to as Environmental Performance Indicators (EMIs). EMIs can be used objectively to measure and evaluate environmental performance. The desire to meet an EMI target may significantly influence the way in which environmental cost data is interpreted.

The decision-making process must also include a decision on which types of environmental cost should be evaluated (e.g. use values only, use and non-use, cost of human health, etc.). Depending on the nature and objectives of the project, some costs could be excluded. Projects can be evaluated in terms of forecasted cash flows to and from the company over the project lifetime. The pattern of cash flow is often represented in a cumulative cash flow diagram. This is constructed using predictions of the net cash flow into the company each year from inception to termination of the project. An environmental project (i.e. one that involves cash flow as a result of pollution prevention, loss or restoration) may be evaluated in the same way by expressing environmental costs as suggested above, and balancing benefits in terms of reductions in environmental pollution against costs of implementing pollution reduction measures. The cost of implementing different environmental performance targets may be evaluated in this way.

The criteria used in judging the cash flow pattern of an environmental project is based on company policy. The criterion could be strictly economic, i.e. an environmental project must be profitable (for example by saving energy costs or reducing waste). Alternatively, a non-profitable or marginally profitable project may be accepted on

grounds of public image, political advantage, or social goodwill. Measures of overall cash flow frequently used include:

- **Payback Time (PT)** - this is the time to the break-even point, typical acceptability values for PT are 2-5 years depending on the level of risk and industry. PT is crude but useful for screening purposes, when projects are subject to high risk, uncertainty in long-term cash flows, or the value of the project does not justify the cost of full cash flow prediction
- **Return on Investment (ROI)** - this is usually expressed in percentage terms, as the average yearly profit over the project lifetime, divided by the total initial investment.
- **Net Present Value (NPV) and Discounted Cash Flow Return (DCFR)** - these measures use the concept of discounting to reflect the time value of cash flow. The NPV of a project is the sum of all discounted present values of the yearly cash flows of the project. The DCFR of a project is the value of the discount factor for which the project NPV is zero, i.e. DCFR is the discount factor at which the project will break even.

Specific criteria for PT, ROI, NPV or DCFR could be defined for environmental projects, to reflect the special conditions affecting their economic balance.

4.7.2. Application to Development Projects

There are four main applications for environmental costing within a development project:

- comparison of environmental costs with financial criteria or other types of cost
- assistance in the selection of design or operational options
- identification and ranking of major sources of environmental pollution
- identification and evaluation of corresponding pollution control measures.

Other potential applications include: assessment of pollution risks for insurance purposes, development of contingency plans, and submissions to government authorities.

The following potential environmental costs may be considered within the scope of an environmental costing study:

- lost production/equipment damage from environmental pollution waste disposal costs
- pollution taxes
- revamp costs due to imposed emission criteria
- compensation/restoration costs for damage to market valued resources
- compensation for intrinsic value of destroyed resources
- costs of investigation, litigation and fines
- costs due to public awareness and image effects
- effects of pollution on insurance costs

It is important to define at the outset which types of cost need to be calculated, and to check that costs are not double-counted (e.g. lost production may be covered elsewhere). It is also important to note that some costs may be identified which may not be incurred by the organisation, e.g. damage costs which are not claimed for. It is considered desirable to identify all possible costs initially, and then consider which party would bear them.

Of even more importance is the acceptance of such methods among the decision-makers, stakeholders and scientific community; the approach relies on communication of the results. In many cases the method forms a supplement to the discipline-oriented environmental damage, impact and risk assessment, and could in no way replace any of these.

Since the Russian standardisation and legislation practices in determining the value of environmental damage and amount of compensating payment for the damage incurred is partly based on similar methodical approaches, we think it is reasonable to turn our attention directly to the outline of those strategies and instruments.

As noted above, the basic principle worded as «it is polluter who pays» has been included into the leading acts of the Russian legislation. As a follow-up of legislative acts, the Council of Ministers of RSFSR in its statement N 632 (28.08.92) authorises the «Procedure of settlement of payments and specification of their limits for environmental pollution, siting of wastes and other harmful practices» together with amendments thereto of 27.12.94 N 1428.

A more detailed strategy outline can be found in «Instructional and methodical directions concerning payments for environmental pollution» (March 1993) and «Recommendations for settlement of penalty margins for environmental pollution» (December 1993) issued by Federal Ministry for Environmental Protection and Nature Resources. The same ministry has worked out a «Provisional procedure for assessment of and indemnification for environmental damage resulting from accidents» (Order N 200 of 27.07.94); no detailed treatment of this document is needed here since the probability of accidental pollution during the 1998 navigation (as outlined in the framework of INSROP) is negligible.

If entitled with right of industrial economic management on the territory of the Russian Federation, legal organisations and persons (including individual citizens) are charged for environmental pollution independent of nationality and types of property they represent as nature-users. Payments for environmental pollution are charged from nature users whose activity is fraught with the following damaging consequences:

- emission of pollutants from stationary and mobile sources;
- discharge of pollutants into surface and underground basins as well as any form of underground burial of pollutants;
- siting of wastes;
- other types of harmful impacts (noise, vibration, electromagnetic or radiation effect).

The effected payment does not relieve users from taking protective measures as well as from paying penalties for violation of ecological legislation and compensating for losses caused to national economy, human health and property.

4.7.3. Rates of payments for environmental pollution

Rates of payments for emissions and discharges are based on payment standards authorised by the Council of Ministers statement N 13 (January 1991). Due to changing levels of prices, special index coefficients are established, actual at the moment of assessment

The current reference rates are based on Standard of 1991 with respect to charges for air and water pollution and standards of 1990 with respect to charges for waste distribution.

The environmental pollution fee is type of reimbursement for damages inflicted on nature complex, which shall be sufficient for compensating the expenses for nature protection, rehabilitation and prevention arrangements. The fee is calculated in terms of pollutants unit mass accounting for its toxicity for man and environment. The evaluation of reduced mass for each substance is made using coefficient A:

$$A_i = 1/MPC_i$$

MCI is an average daily rate for atmospheric air; evaluations for water targets are based on MPC values established for fishery basins.

The following base rates of fees are authorised for officially agreed emissions/discharges into the environment:

- for amounts of pollutants within the accepted standard limits
- for amounts of pollutants within temporarily accepted limits.

Payments are established at a differential rate depending on particular environmental conditions.

4.7.4. Evaluation of differential payments rates

Differential fee payment is established with account for the current rate of anthropogenic loading, ability of impacted environment to adaptation and self-healing and ecological importance of particular environment (river basins, abundance of particular plant and animal species on the global or local level, their reproduction capacity etc). The rate coefficient equal to 2 has been established for nature users whose managing activities falls on ecologically hazardous areas, Extreme North (Arctic) zones or similar localities, territories of national reserves, ecological resorts and territories covered by international conventions.

Rate coefficient 1.2 is set for nature users acting on territories of large industrial centres and cities.

Payment rates are settled using a special evaluation technique with consideration of the above coefficients; rates for environmental pollution beyond the limits are increased 5fold for each substance.

4.7.5 Examples of estimating fees for environment pollution.

Let us consider atmosphere air pollution as the most typical event which occurs due to operation of engines of ships going on NSR. A specific fee for permissible emissions of pollutants (coming from movable sources if 1 ton of fuel of different types is used) is estimated as follows:

$$Y_e = \sum_{e=1}^n H_{bni \cdot atm} \times M_{i \cdot trans} ,$$

Where

- Y_e – a specific fee for permissible emissions of pollutants coming when 1 ton of a e -type fuel is used (RUR);
- i – a pollutant type ($i - 1, 2 \dots n$);
- e – fuel type;
- $H_{bni \cdot atm}$ – a fee basic norm for emission of 1 ton of a i -type pollutant if its amount does not exceed emissions limited permissible norms (RUR);
- $M_{i \cdot trans}$ – a mass of a i -type pollutant contained by worked-out gases emerging from a vehicle being in good repair and meeting standards in force and technical requirements by manufacturer, if 1 ton of a e -type fuel is used (according to the data by NIAT of Ministry for Transport of Russia).

Fee for permissible pollutants emissions to the atmosphere from movable sources is estimated as follows:

$$F_{n \cdot trans} = \sum_{e=1}^r Y_e \times T_e ,$$

Where

- $F_{n \cdot trans}$ – fee for permissible pollutants emissions to the atmosphere from movable sources (RUR);
- E – fuel type ($e - 1, 2 \dots r$);
- Y_e – a specific fee for permissible pollutants emissions to emerge, if 1 ton of a e -type fuel is used, (RUR);
- T_e – amount of a e -type fuel used by a movable source during a reported time (t).

A total fee for the atmosphere air pollution by movable sources is determined by summarising emission amounts within norms and beyond norms (with coefficient 5) when considering the atmosphere air quality as mentioned before.

$$F_{n \cdot trans} = (F_{n \cdot trans} + F_{bn \cdot trans}) \times K_{e \cdot atm}$$

Where

$K_{e\ atm}$ - coefficient 2 for the NSR region, e.g. in the Arctic region

$F_{bn\ trans}$ - fee for emissions beyond norms

Fee for a loss caused by water media contamination and for wastes placing is estimated by the same way.

4.7.6. Evaluation of damage caused to plant and animal world, calculations of compensation.

Besides legislation, nature utilisation in Russia concerning issues of living nature protection is under control of a number of standardising documents issued by the Federal Government, Ministry for Environment and Nature Protection, and other official agencies. These documents include «Provisional procedures for assessing damage caused to fish reserves as result of construction, renovation and expansion of enterprises, installations etc and execution of various activities at fishery basins», 1989, «Rates for calculation of penalties for damage....» inflicted in cases of unauthorised destruction of plant species included into the Endangered Species List (ESL), terrestrial mammals, birds, reptiles, amphibians and terrestrial invertebrates, animals included into ESL (authorised by Ministry for the Environment in 1994 (N 126) and Ministry of Justice (N 592)). Evaluation of physical damage is made in mass units for fishes and by the piece for big animals. Thus, even this concise and incomplete review is demonstrative of the availability in Russia of sufficiently developed legal base for assessment of danger caused to environment by human economic activity and calculation of compensation fees. Besides, there is a system of privileges and exemptions for those legal persons who are utilising part of payment resources for purpose of damage reduction or prevention.

4.7.7. Some problems and indeterminacy

Since basic legislation in the area of nature utilisation and environmental protection provides for priority of international agreements to which Russia is a full partner, there may arise some misunderstanding if fees for environmental pollution would be raised in some cases from requirements of Russian standards not adequately covered in international agreements. There also may arise some problems of payments for pollution beyond the permitted limits.

Some complexities may occur when identifying actual estimates of damage caused to the environment by participants in NSR activities and identifying payments shares of particular entities (vessels, companies etc). There evidently might arise a requirement for providing navigators, ship owners and official participants of the project with possibly complete set of basic normative documents in the original or translation what concerns legal field of environmental protection of INSROP.

4.8. Preliminary impact assessment of suggested activity scenarios

The 1998 navigation scenario provides additional load of 20 container carriers of 40 000 dead-weight each, equipped by MOD type diesel engines for established term of navigation between July and September.

Realisation of the above scenario and the reference data on predictable physical and chemical impacts (Semanov, present Paper, Section 2.1) are adequate for making a preliminary environmental impact assessment according to the INSROP assessment technique and current Russian standards.

An important assumption in assessment considerations is the fact that additional navigation activity would account for 2-5% of the current rate. It is assumed that the navigation would be realised by updated vessels permitting to consider failure hazard potential in no way higher than the present one characteristic for worn out vessel fleet in current operation.

Basic environmental impacts may be outlines as follows:

- engine noise and noise from broken ice;
 - environmental pollution by emissions/discharges from vessel power plants, machinery and human life products;
 - physical disturbance and separation effect from breaching and movement along navigation channel in ice;
 - propeller-induced water turbulence, crushing and overturning of ice blocks;
 - possibility of violation of boundaries of protected territories.
- Those impacts may vary in intensity depending on navigation conditions; however, the scale of variation does not produce substantial effect on benthos.
 - A somewhat greater effect would be produced on fishes, especially amphipod feeding sympagic polar cod.
 - Significant disturbance may be caused to sympagic fauna tending to concentrate along the ice edge and in polynyas.
 - The impact on higher vertebrates (seabirds and mammals) would largely depend on navigation conditions, especially ice conditions.

4.8.1. Ice conditions scenarios

The extent of potential damage would be depending on conditions of particular season, primarily ice conditions responsible for:

- particular realisation scheme of the navigation scenario (route, use of ice breaking and aircraft support);
- distribution patterns of marine life over the water basin.

The fact whether seasonal navigation will be performed unattended or attended by ice breakers and aircraft support, is sufficiently important for assessment of the types and intensity of impacts on marine birds and mammals. Since the model scenario suggests participation of L2 class vessels capable of unattended navigation only in certain types

of closed floating ice (concentration below 4/10), the probability of unattended navigation through the entire NSR is practically nil.

Since ice and logistic conditions of model scenario realisation are not specified, two assessment alternatives are evaluated here. In practice, the alteration of below described versions will be most likely take place along the route depending on ice conditions.

Version A:

- favourable ice conditions
- no aircraft support
- no ice breaker escorting.

Version B:

- intermediate and unfavourable conditions
- ice breaker escorting
- aircraft support

4.8.2 Overlap technique

Impact assessment is made using the data and tools of the «Environmental Dynamic Atlas». Identification of high risk conflict areas was made using the overlapping of «impact corridors» suggested by the scenario and the VEC seasonal distribution charts.

The above technique showed some limitations with respect to marine birds impact assessment due to poor data on at sea distribution. Thus, for instance, if a seabird colony itself is outside the impact corridor, this colony is not presented on overlapping charts. At the same time, foraging areas located around the colony (sometimes at a distance of tens of kilometres) and possibly representing conflict zones, are not shown on the map. As a general technical comment, it may be noted that the corridors are identified on maps in a mechanistic manner, and for transit navigation scenario (i.e. the activities involving water areas only), large coastal portions may sometimes get into the influence zone.

4.8.3 Impact assessment

Version A

Favourable ice conditions minimise the probability of direct conflict with **mammals** inhabiting drift ice zones and ice edges (polar bear, ringed seal, bowhead whale, partly walrus). An important negative impact could be noise disturbance caused to larger whales at the easternmost portion of the route (Chukchi Sea) and disturbance caused to walruses in the zones of their frequent occurrence nearby coastal rookeries. It has been noted that coastal rookeries are more characteristic and more abundant in years of light ice conditions. However, coastal rookeries are located on lowland shores (beaches, sand bars and spits) surrounded by shallow water unapproachable for vessels.

Marine birds, being not much limited by ice, will be more uniformly distributed along the water area hence, accumulations forced by heavy ice would not be expected to occur. In open ice or ice free water there is also a possibility to avoid the danger of direct conflict with a vessel. The only hazardous event predictable is a direct collision of a vessel with a raft of flightless moulting ducks. Marine birds seem not to be disturbed by noise from a moving vessel.

The impact on protected territories can be primarily characterised as violation of established normal conditions in cases of entry into protected areas. An expectance of violation of protected areas for purposes of better navigation safety seems almost improbable due to good navigation conditions (in terms of ice conditions).

Thus,

the species most vulnerable to risk are as follows:

- grey whale, bowhead whale, walrus;
- long-tailed duck, in all probability spectacled eider and king eider.

the most likely conflict areas are as follows:

- southern portion of the Laptev sea between East Taimyr Peninsula and New Siberian Islands;
- coastal waters of the Wrangel Island and Chukot Peninsula to the east of Chaun Bay.

Taking into account low navigation intensity according to given scenario in the case of *Version A*

- the probability of critical situations may be regarded negligibly small hence the damage caused to marine birds and mammals is estimated insignificant.
- the probability of violations of protective regime may be regarded negligibly small hence the damage caused to protected areas is estimated insignificant.

Version B

Numbers and diversity of disturbance sources increase. Probability of possible direct conflicts with and level of disturbance of pagphilous species and species keeping to the ice edges also increase.

Marine mammals. Under certain ice conditions, vessels passing along the navigation route may cause trouble to polar bears moving to dinning areas (Wrangel and Herald Islands, Severnaya Zemlya Archipelago, North Taimyr). In more severe ice conditions walruses haul out on pack ice what increases the probability of direct conflicts between animals and vessels. Maximum walrus density is reported from the area of East Taimyr - Lena Delta - New Siberian Islands and zone of North Chukotka - Wrangel Island. Given highly gregarious behaviour of walruses and their high vulnerability to disturbances as well as their low abundance and isolation of Laptev walrus population, the damage even from a single conflict may exceed minor value.

Bowhead whales keeping in summer along the ice edge zones of the Chukchi Sea may penetrate navigation channels deep into the ice and find themselves entrapped. Quite a

significant damage could be caused to relatively small populations of grey and bow-head whales even through loss of a single animal.

Marine birds. Heavy ice restricts the migration routes and availability of moulting sites for some birds. A vessel moving across a system of leads or along a flow polynya can act as a source of conflict with sea ducks and Brunnich's guillemot.

Complicated navigation conditions of Version B increase probability of negative effect on **protected areas**. Many Strict Reserves and other protected areas are located in straits or adjacent to straits (Vaigachskiy reserve borders with Kara Gate and Yugor Shar Straits, Great Arctic Reserve is close to the Vilkitsky Strait, New Siberian Islands borders with Laptev and Sannikov Straits, Wrangel Island Reserve borders with De Longa Strait) where ice conditions often appear more severe than at open sea. Penetration of vessels into protected water areas may represent by itself a case of violation of environmental legislation. By the international standards, vessel calls into these waters may be permissible only in emergency cases for safety reasons. These cases are fraught with the following negative consequences:

- engine noise, collision of vessel hull with ice, acoustic signals of navigation instruments (echo sounder etc) may cause disturbance to the behaviour of fishes, mammals and birds;
- overturning of ice floes, especially in the case of towed guiding would be responsible for carry out and disturbance of sympagic fauna.

It should be noted that the actual damage inflicted to protected areas is estimated in a double compensation sum. Other impact types are not likely to cause any notable damage; however, it is still desirable to minimise their risk and make all possible provisions against violation of natural conditions in protected areas.

Thus,

the species most vulnerable to risk are as follows:

- walruses, grey whale, bowhead whale, and, possibly, polar bear;
- seaducks, Brunnich's guillemot.

the most likely conflict areas are as follows:

- south portion of the Laptev sea between East Taimyr and New Siberian Islands;
- coastal waters of the Wrangel Island and North Chukotka eastward from the Chaun Bay, mainly zone of leads and flow polynays.

Taking into account low navigation intensity according to given scenario in the case of *Version B*, it may be assumed that potential hazard

- to seabirds and most mammals can be assessed as minor
- to the Laptev walrus, bowhead and grey whales may exceed minor value.

Impact hypotheses evaluated as valid are outlined in the Annex in Section 2.4.4, Table 3.

4.8.4 Economic assessment of the damage

Despite the fact that the Russian laws and standards provide for compensating payments in cases of damage incurred to living nature or environmental pollution, the actual situation due to occur by realisation of the 1998 navigation scenario (as envisaged in the format of INSROP) and evidently under larger-scale scenarios remains comparatively obscure. The available rates of economic assessment of damage caused to animal world (Rates...) provide for payment of compensating fees for destruction/elimination of animals. At the same time the damage assumed by the realisation of the present scenario basically suggests remote and indirect effects (decrease of reproduction success, redistribution of animals across the territory and abandonment of optimal habitats, decrease of survival rate etc.), meaning that the available damage assessment approaches are invalid for those cases. However, even in case of successful realisation of the model operational (trouble-free) transit scheme, there remain chances of animal losses induced by navigation. One of such probabilities is loss of walrus in panic caused by navigation or loss of whales in ice traps. According to the above standards, economic damage in such cases is assessed as a sum proportional to minimum payment amount specified for each animal species/group. It may be noted that so far there is no sufficient data on possible numbers of animals to be subjected to negative impacts. Evidently, the first step for proper environmental damage assessment shall be the arrangement of ecological monitoring in most vulnerable sites along the NSR. Such sites shall naturally include protected areas. Due to conditions provided, the personnel of these protected areas could be involved in maintenance of same. Within the INSROP format it seems reasonable to prepare some normalising documents based on the relevant available international and Russian documents for future agreement with participating nations.

CONCLUSIONS AND RECOMMENDATIONS

1. Analysis and adaptation of environmental impact scenario for the 1998 navigation model have evaluated some valid hypotheses attributed as Category C which proves the requirement for further studies and observations for final verification.
2. Despite the fact that the «Environmental Dynamic Atlas» has accumulated a vast database and presents reliable analytical and prediction making potential, the information currently accumulated on biota quantitative distribution remains insufficient.
3. With available solidarity of opinions concerning the importance of some of the impact types there is an evident shortage of relevant data on predicted consequences. This inadequacy may be illustrated by an example of the impact of underwater noise on birds and mammals. These issues are also requiring further research.
4. Currently available Russian and international normative base for quantitative assessment of environmental damage allows for its justifiable use only for the consequence analysis of important hazards. Quantitative assessment of implicit impacts and long-term consequences from the standard operating conditions and minor violations of navigation regime is presently problematic from legal and factual stands.
5. The preliminary impact assessment obtained for the NSR area provides a background for conclusion of minor negative impact from the assessed activities in the case of following conventional navigation practice and due account for the features characteristic for the specific areas.
6. Basic recommendations:
 - NSR navigation performance shall avoid approaching sites of bird and mammal accumulations (colonies, rookeries and temporary staging sites) without critical necessity, especially in close vicinity of protected areas where animals are less shy and fearful and hence more vulnerable;
 - for obtaining of relevant data on present-day animal population abundance and dynamics, for possibility to predict population changes, ecological monitoring along the NSR should be established involving personnel presently available in the reserves and experts from Goskomgidromet;
 - in the INSROP format, it is desirable to focus on systematisation of Russian legal documents and international agreements with special attention to quantitative assessment of and compensation for damage to natural environment in the NSR standard operating conditions and identification of mechanism for purpose-oriented use of received funds.

REFERENCES

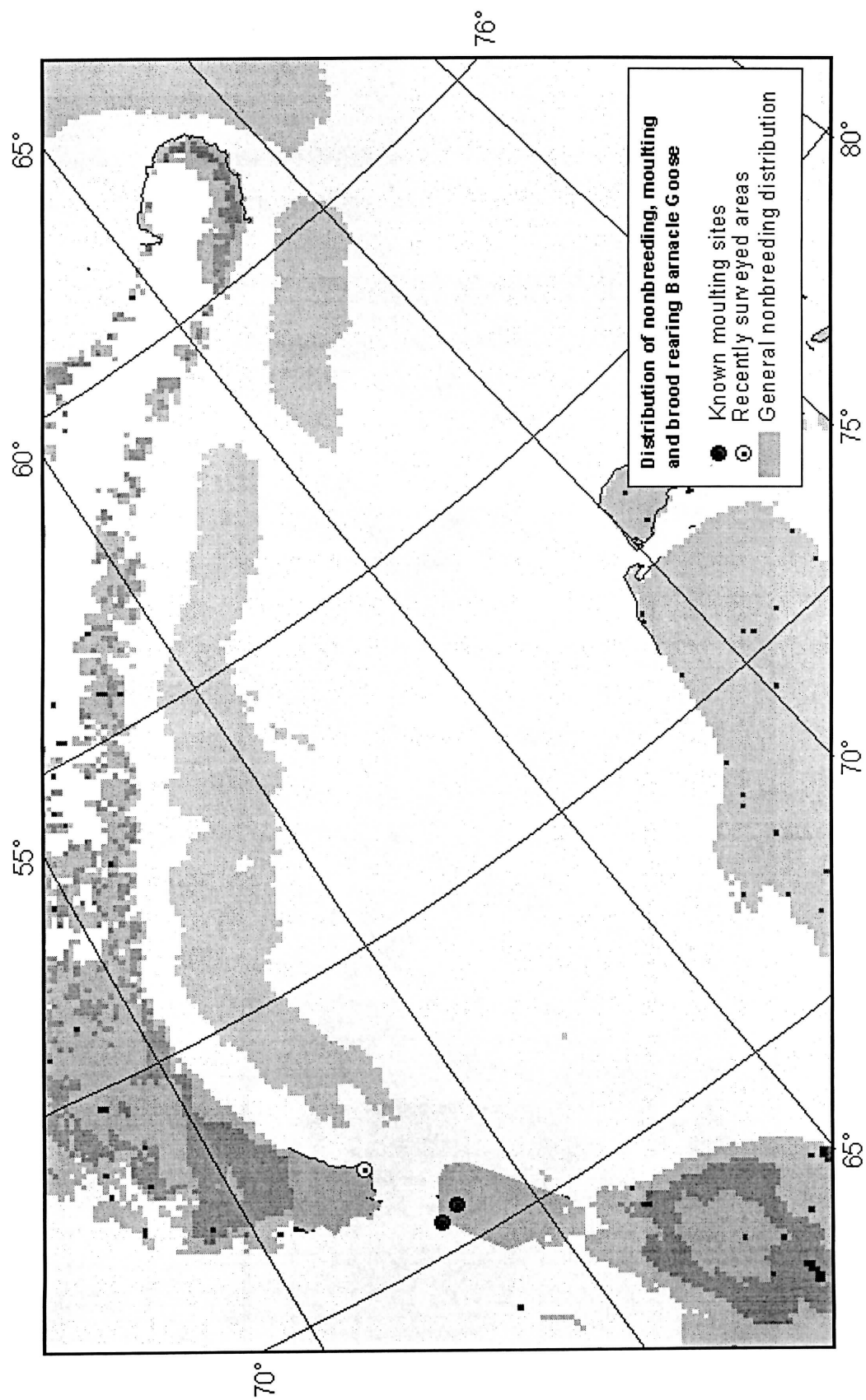
1. Bakken, V; Gavrilov M.V; Isaksen, K & Strann K.B., 1996; Selection of marine bird Valued Ecosystem Components and description of impact hypotheses in the Northern Sea Route Area. INSROP Working Paper N 60, 1996, 56p.
2. Larsen L.H; Evenset A & Sirenko B, 1995. Linkages and impact hypotheses concerning the Valued Ecosystem Components (VECs) Invertebrates, Fish, coastal zone and large rivers estuaries and deltas. INSROP Working Paper N 12, 1995; 38p.+app.
3. Wiig, Belikov S.E; Boltunov A.N. & Garner G.W, 1996. Selection of marine mammal valued ecosystem components and description of impact hypotheses in the Northern Sea Route Area. INSROP Working Group Paper N 40, 1996, 70p.
4. Jaques, R., Janes, H., Moe, K.A. & Schreiner, P. 1994. Methods for Economic Evaluations of Environmental Effects. Det Norske Veritas, Report No. 94-3305.
5. Pearce, D.W. 1991. Blueprint 2. Greening the World Economy. Earthscan Publications Ltd., London.
6. Winpenny, J.T. 1991. Values for the Environment. A Guide to Economic Appraisal. HMSO, London.

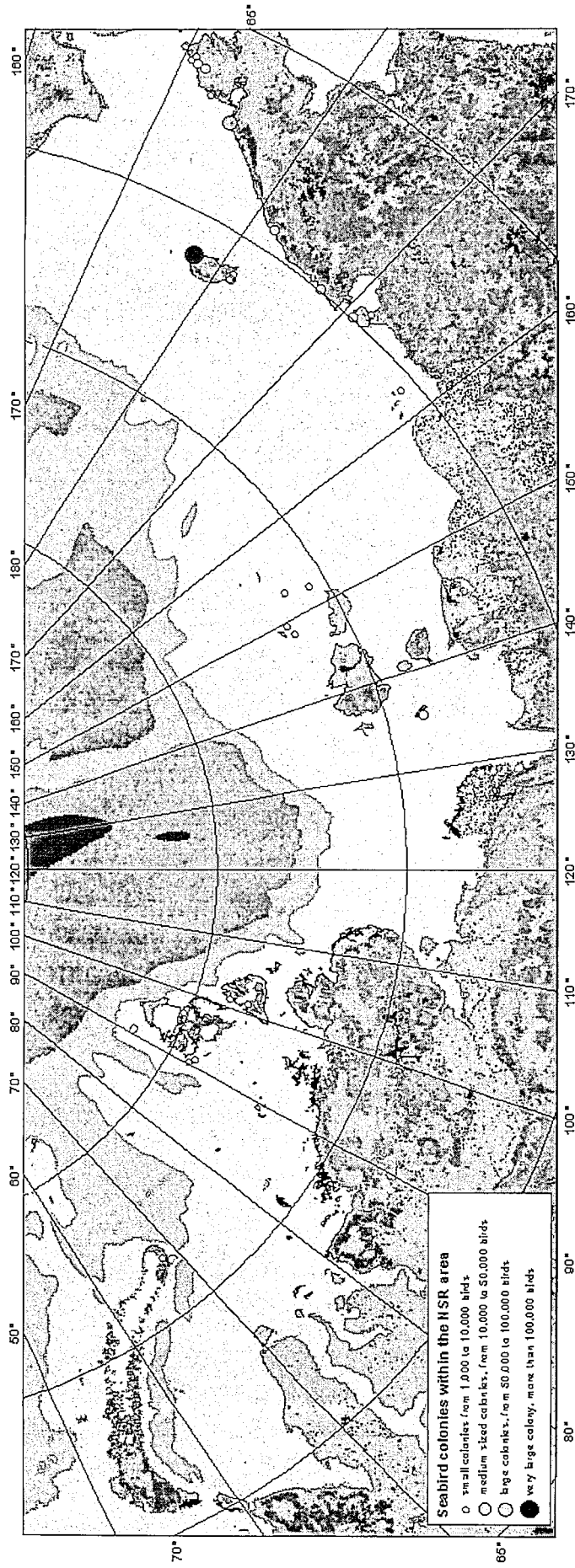
Russian Federal Laws:

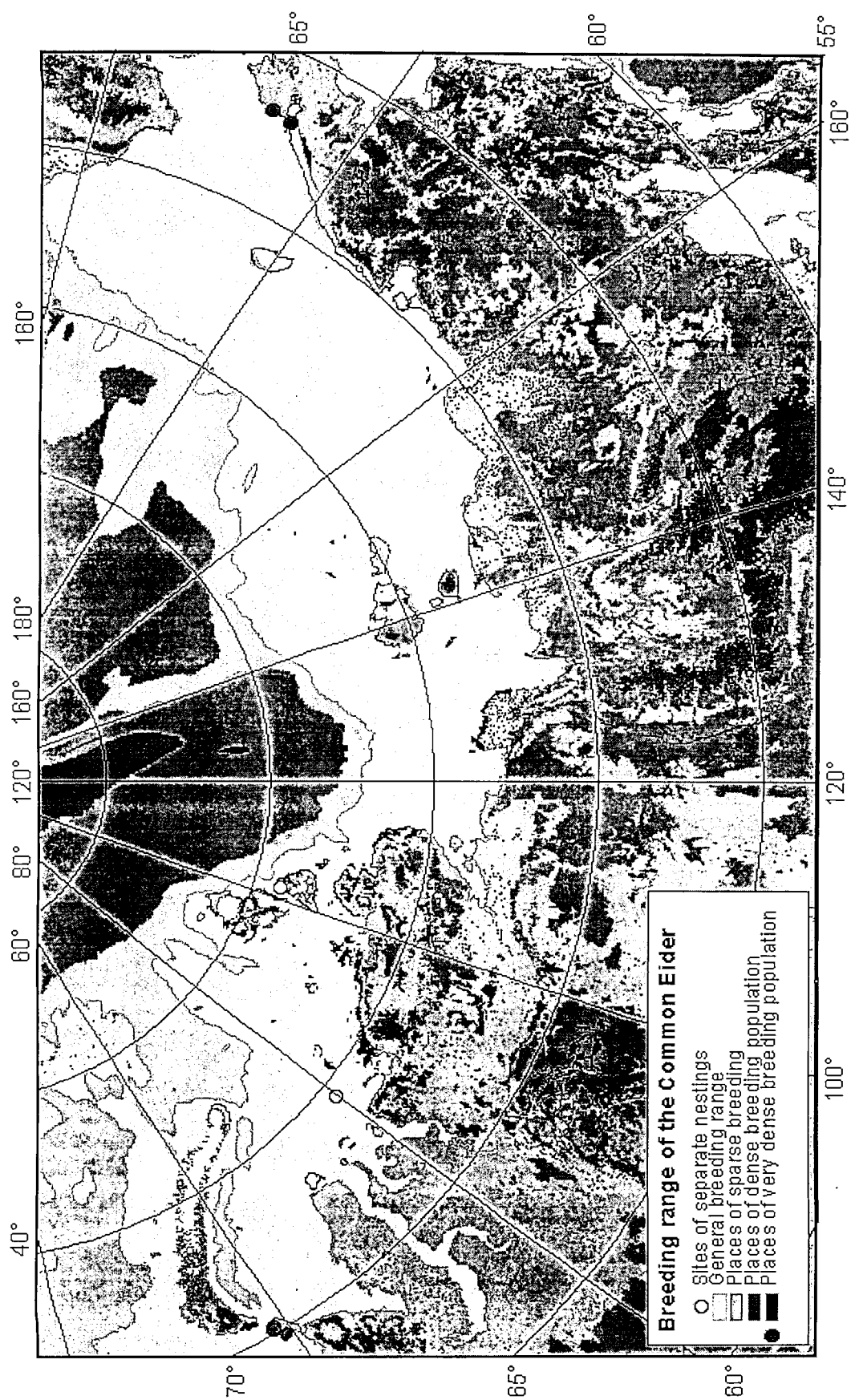
- Protection of economic base for sovereignty of RSFSR 31.10.90 N 293-1
- Enterprises and entrepreneurship in RSFSR 25.12.90 N 445-1 (edition of 30.11.94 N 52-F3)
- Sanitary-epidemiological safety of population 19.04.91 N 1034-1 (edition of 19.06.95 N 89-F3)
- Investment activities in RSFSR 26.06.91 N 1488-1 (edition of 19.06.95 N 89-F3)
- Foreign investments in RSFSR 04.07.91 N 1545-1 (edition of 19.06.95 N 89-F3)
- Local self-government in RSFSR 06.07.91 N 1550-1 (edition of 28.08.95 N 154-F3 (edition of 22.04.96 N 38-F3)
- Land rent 11.10.91 N 1738-1 (edition of 27.12.95 N 211-F3)
- Environmental Protection 19.12. 91 N 2060-1 (edition of 02.06.93 N 5076-1)
- Consumers' rights protection 07.02.92 N 2300-1 (edition of 09.01.96 N 2-F3)
- Revisions and additions into Articles 6, 8 and 12 of Land rent law 14.02.92 N 2353-1
- On territorial, regional Soviet of Peoples' Deputies and territorial, regional administration 05.03.92 N 2949-1 (edition of President's decree of 22.12.93 N 2266).
- On mineral wealth 21.02.92 N 2395-1 (edition of 03.03.95 N 27F3)
- Essentials of urban planning and construction in Russian Federation 14.07 .92 N 3295-1 (edition of 19.07.95 N 112-F3)
- Essentials of forestry legislation in the Russian Federation (Approved by Supreme Soviet of RSFSR 06.03.93 N 4613-1)
- Unification of measurements 27.04.93 N 4871-1
- Standardisation 10.06.93 (edition of 27.12.95 N 211 -F3)

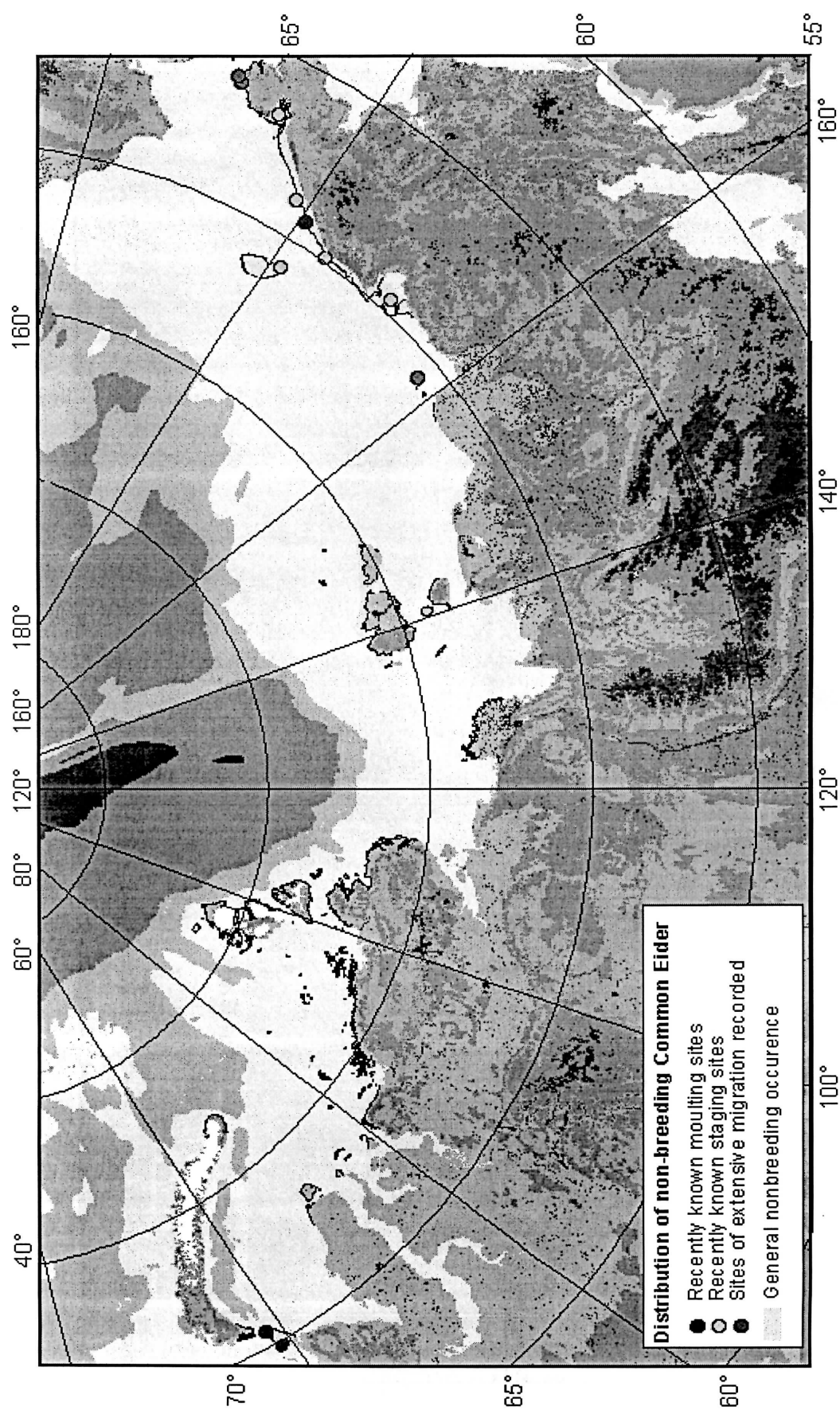
- Certification of products and services 10.06.93 N 5151-1 (edition of 27.12.95 N 211-F3)
- Ratification of Basel Convention on control for trans-boundary transfer of dangerous wastes and their removal 25.11.94 N 49-F3
- National curative resources, curative-recreational territories and resorts 23.02.95 N 26-F3
- Amendments and revisions into federal law on mineral wealth 26.06.92 N 3134-1
- Amendments and revisions into federal law on mineral wealth 03.03.95 N27-F3
- Specially protected territories 14.03.95 N 33-F3
- Power sources saving 03.04.96 N 28-F3
- Animal world 24.04.95 N 52-F3
- Amendments and revisions to be introduced into federal legal acts in connection with adoption of federal laws on standardisation, on unification of measurements, on certification of products and services 19.06.95 N 89_F3
- State control over foreign trade activities 13.10.95 N 157-F3
- Basic principles underlying the arrangement of local self-government in the Russian Federation 28.08.95 N 154-F3 (edition of 22.04.96 N 38-F3)
- On ecological expertise 23.11.95 N 174-F3
- Architectural activities in the Russian Federation 17.11.95 N 169-F3
- On continental shelf in the Russian Federation 30.11.95 N 169-F3
- Agreements on division of production 30.12.95 N 225-F3
- On geodetic and map-making 26.12.95 N 209-F3
- Radiation safety of population 09.01.96 N 3-F3
- Land reclamation 10.01.96, N 4-F3
- Amendments and revisions into federal law On protection of consumers' rights and Code of Administrative law violations 09.01.96 N 2-F3.

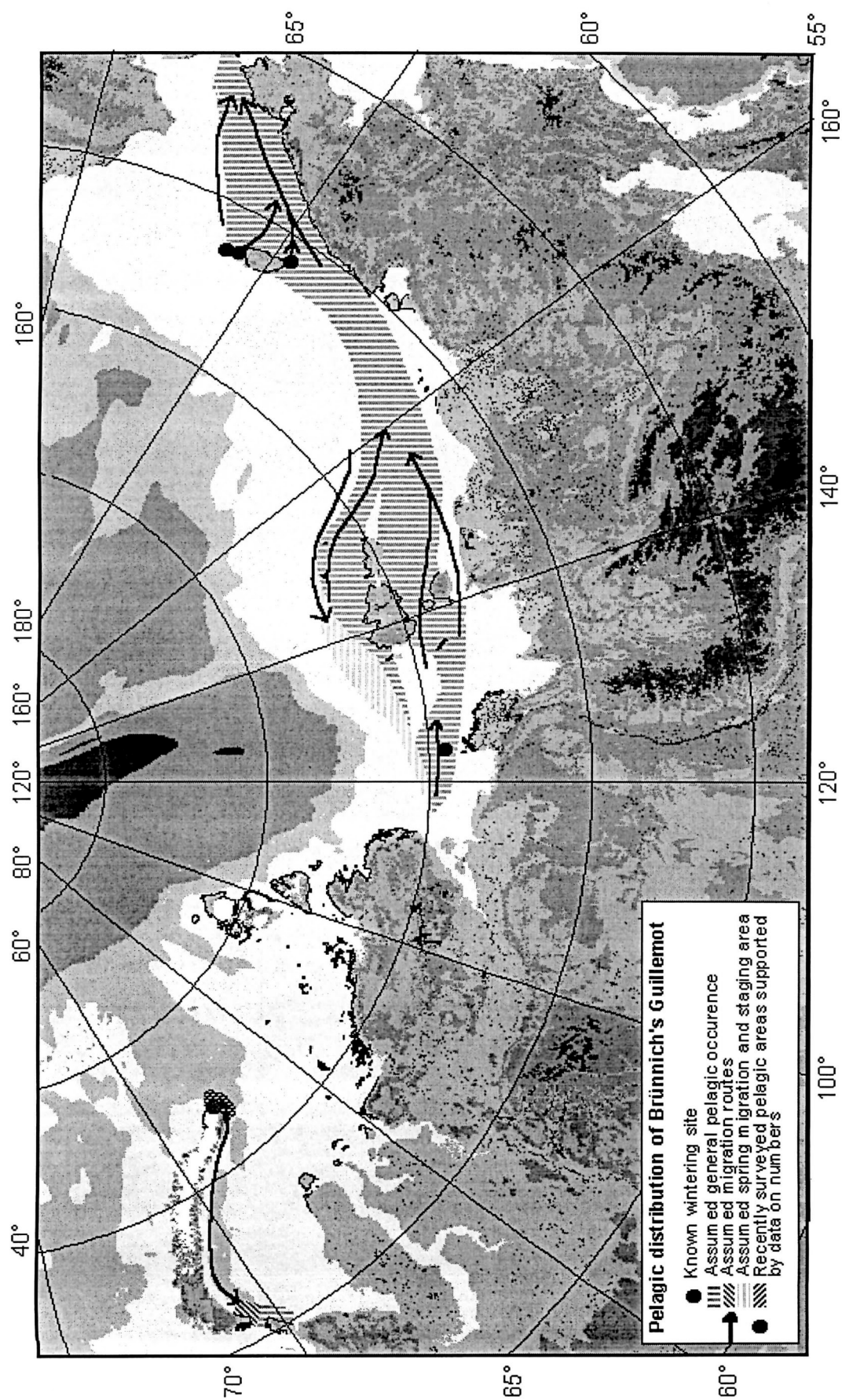
ECOLOGICAL ATLAS

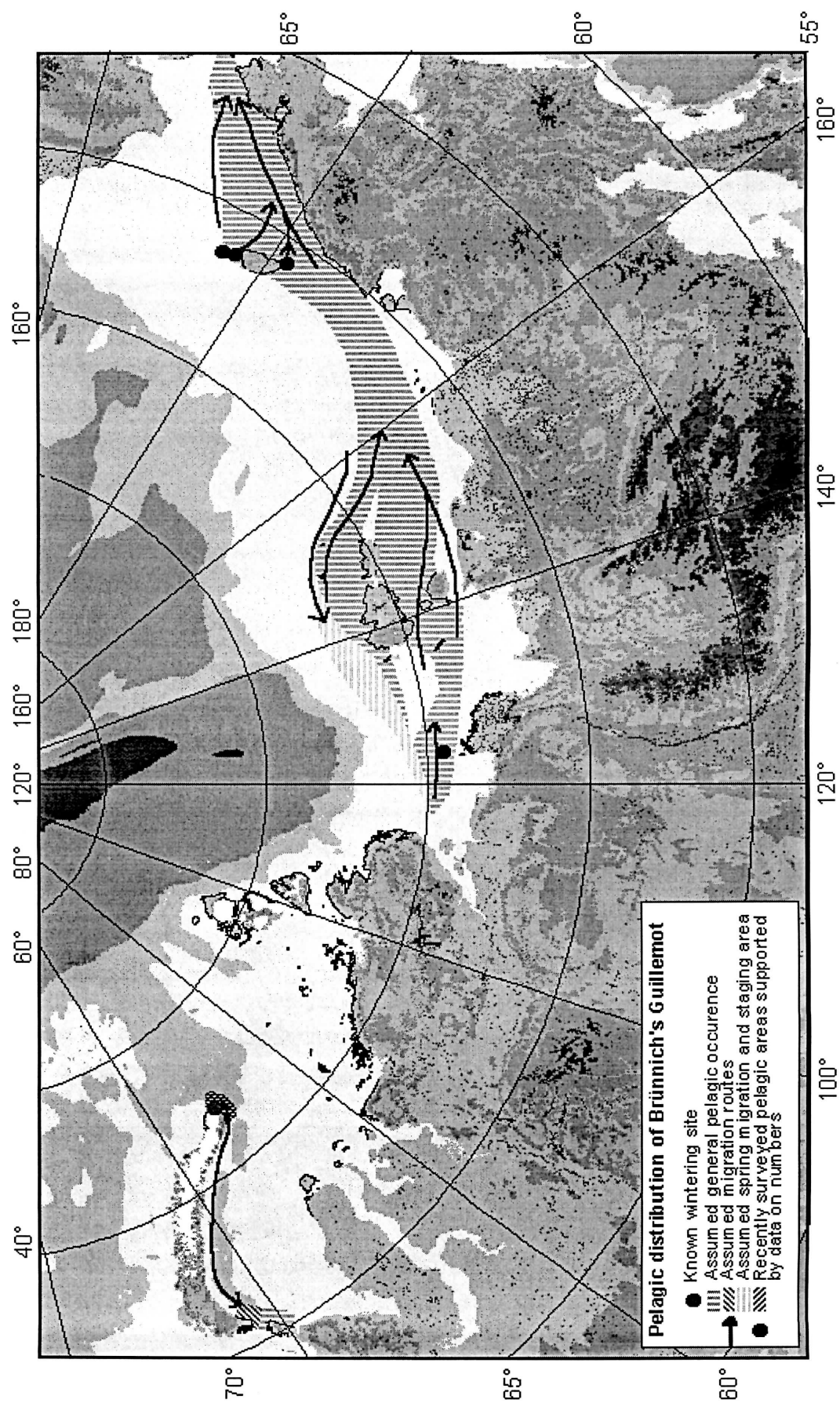


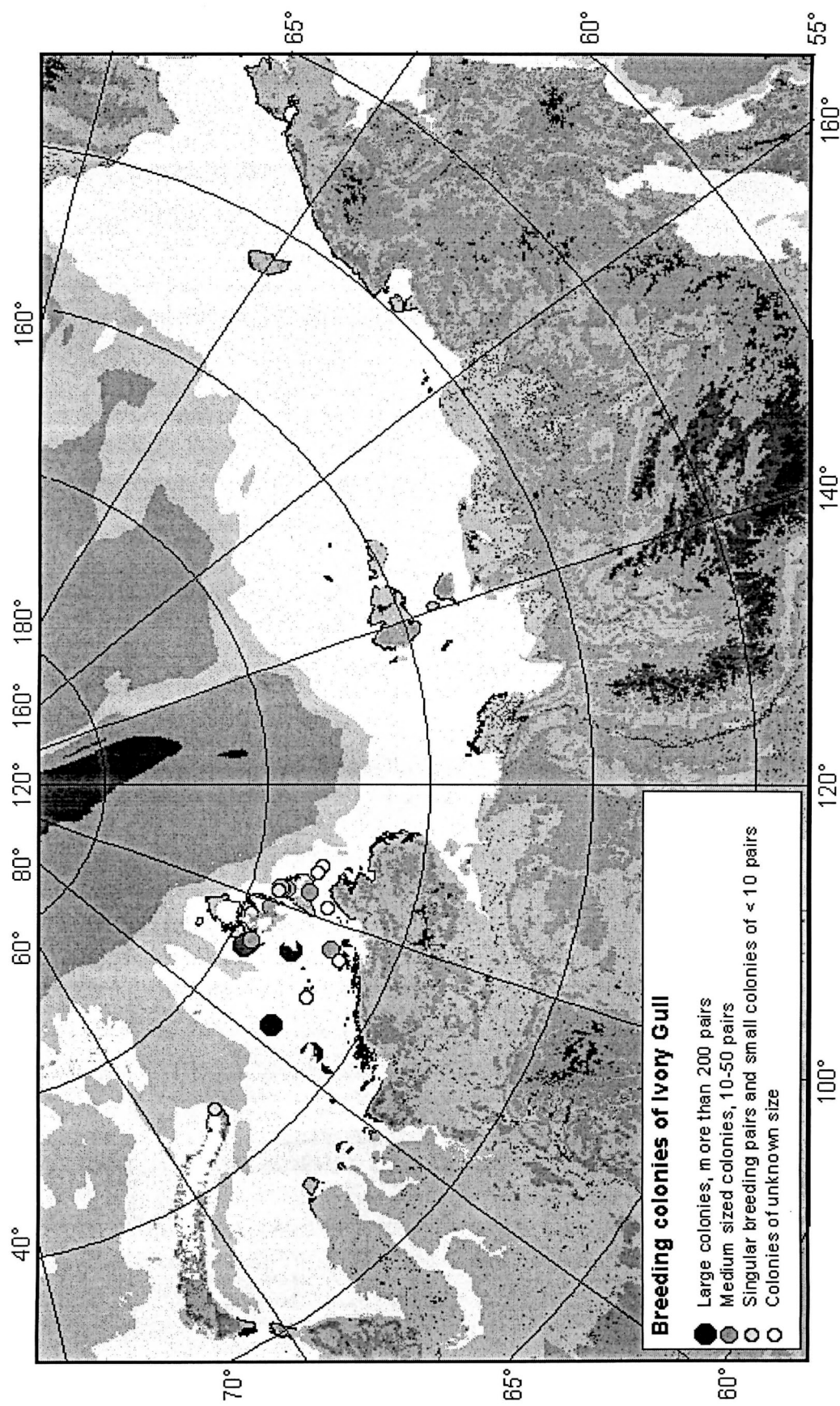


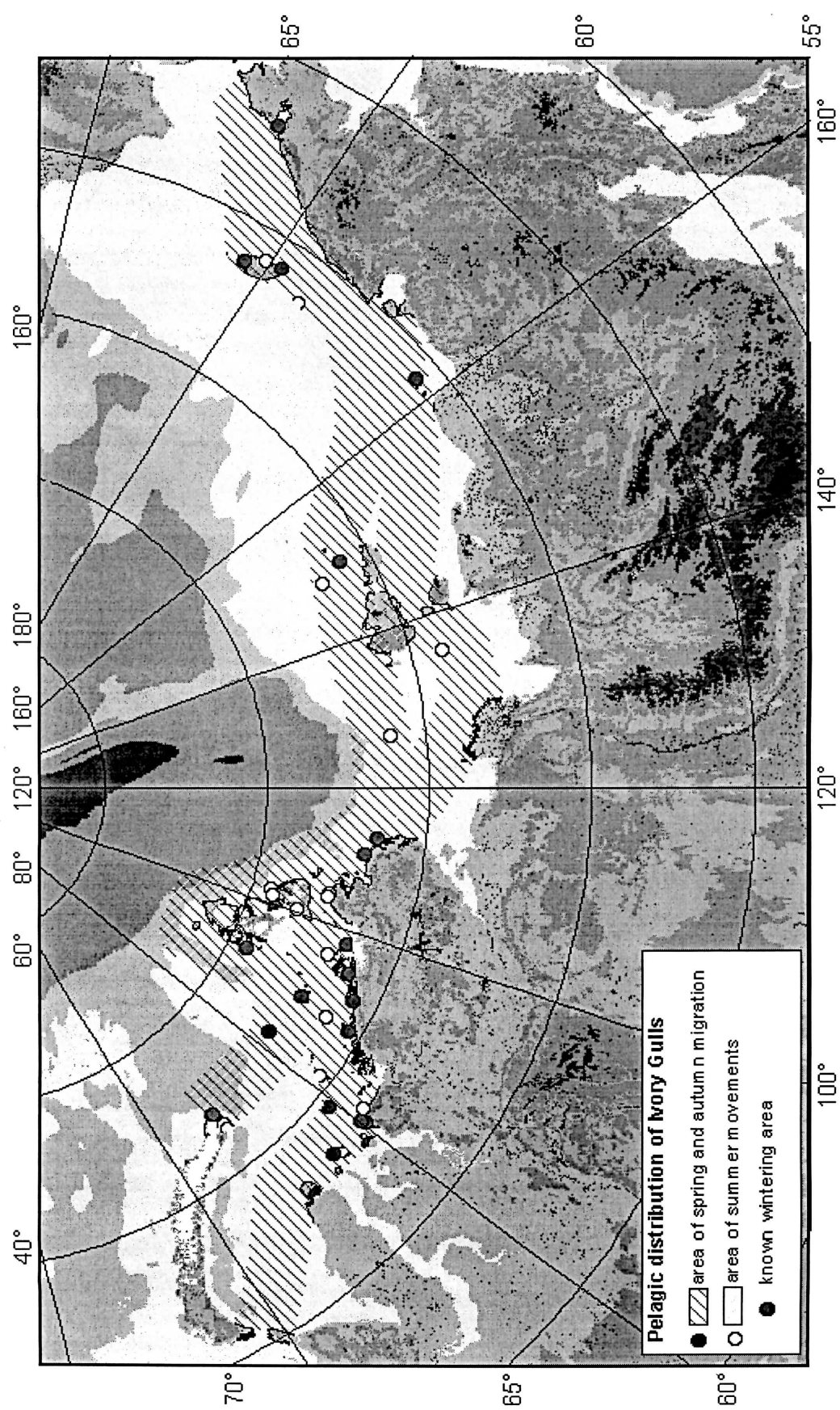


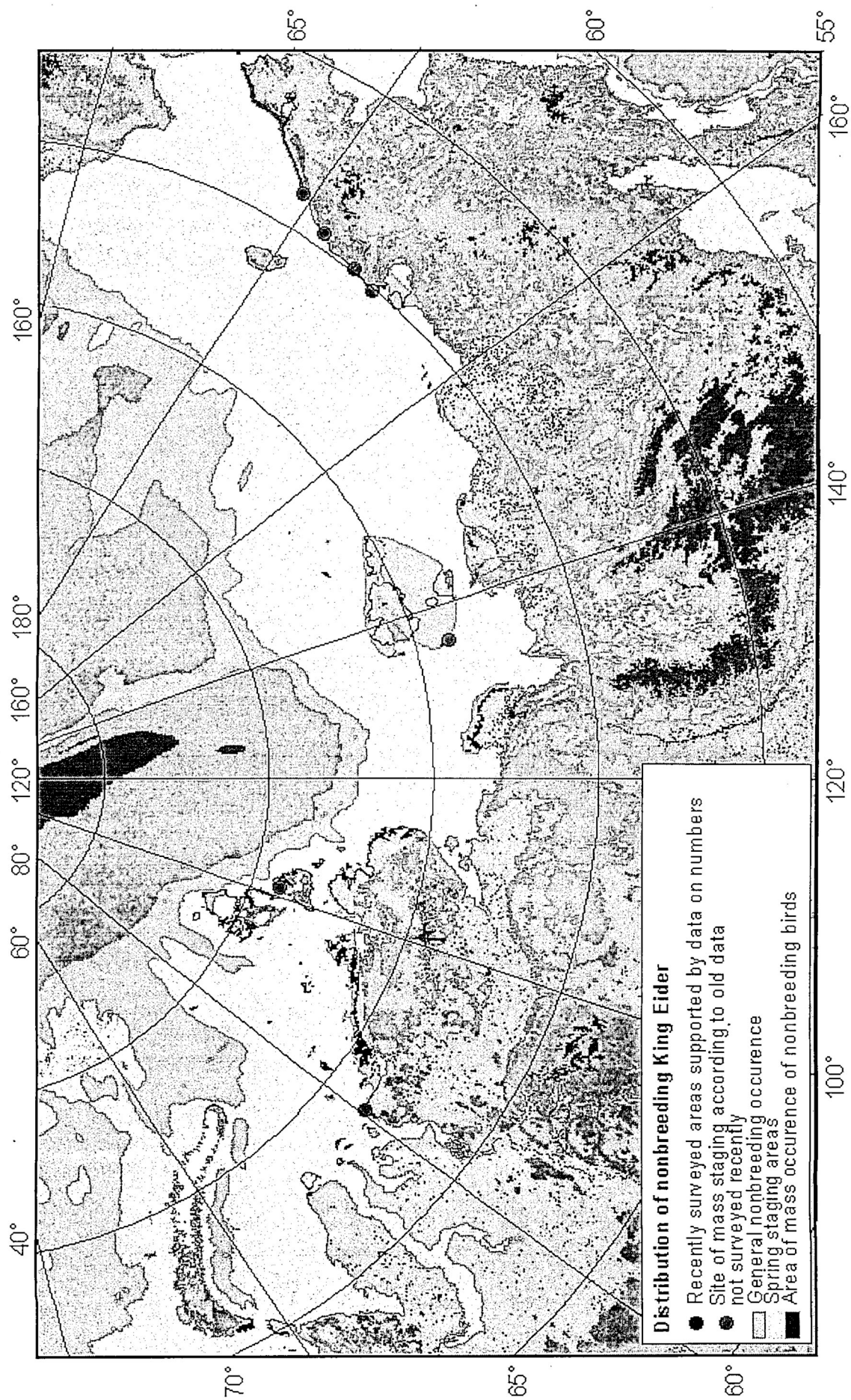


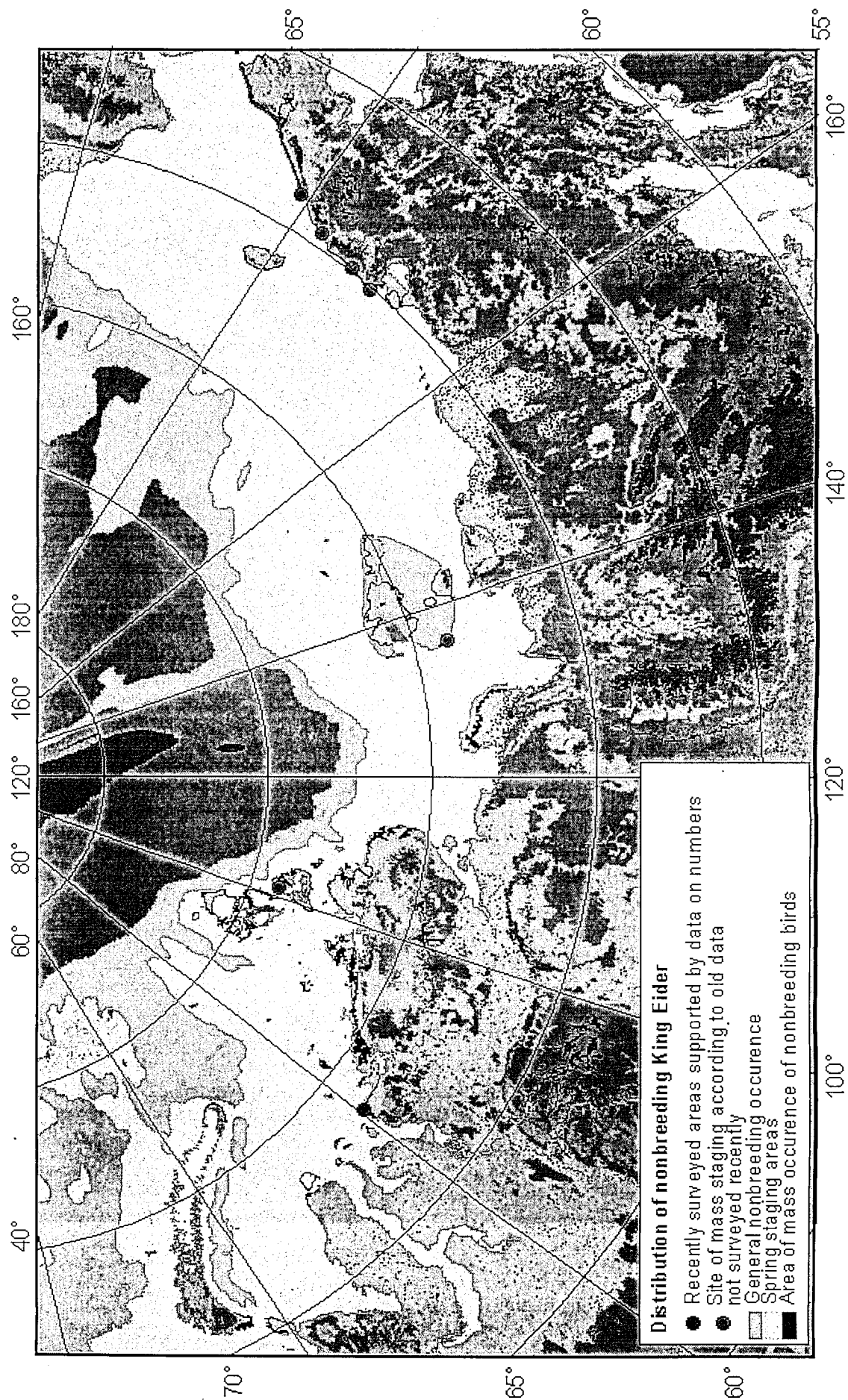


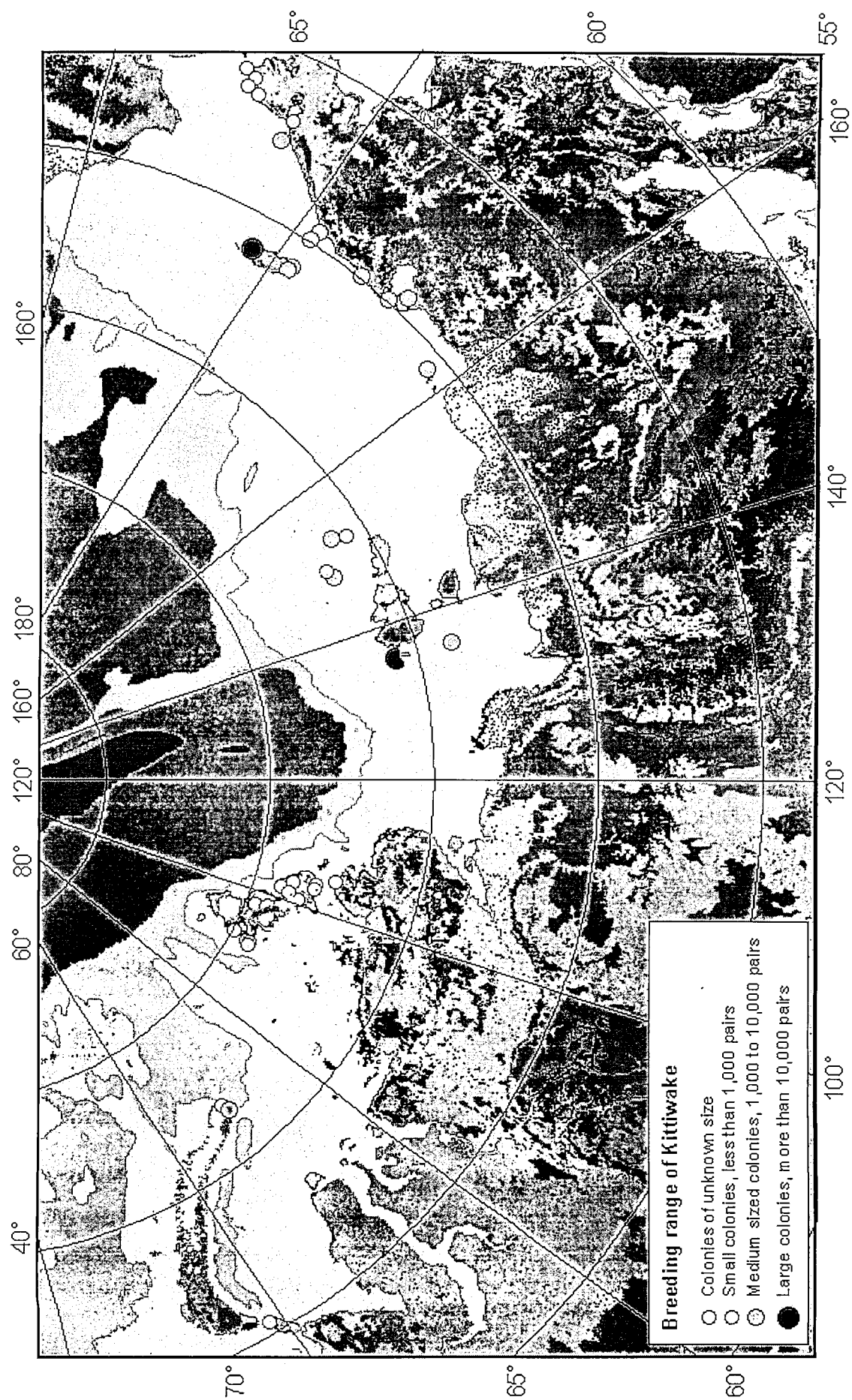


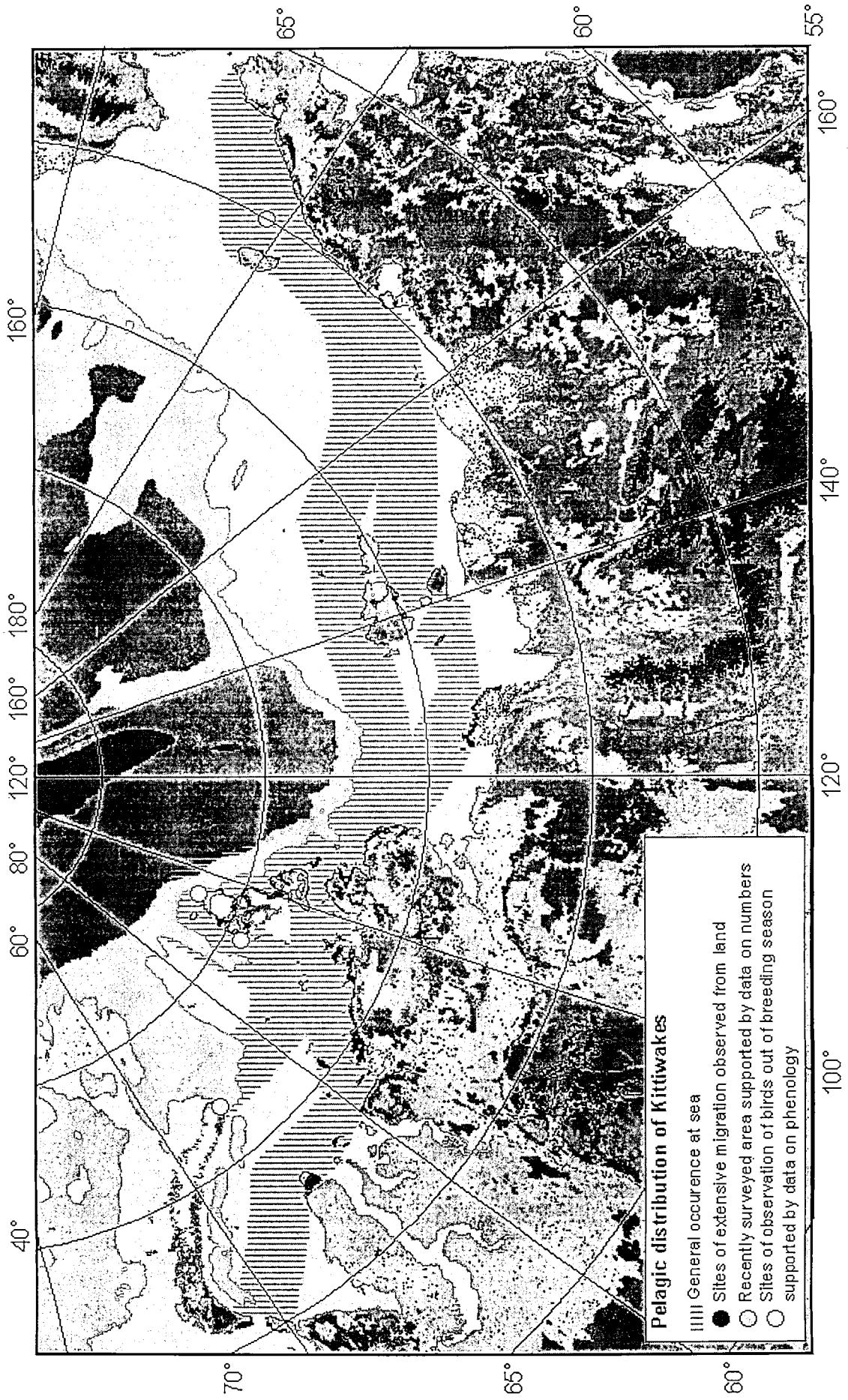


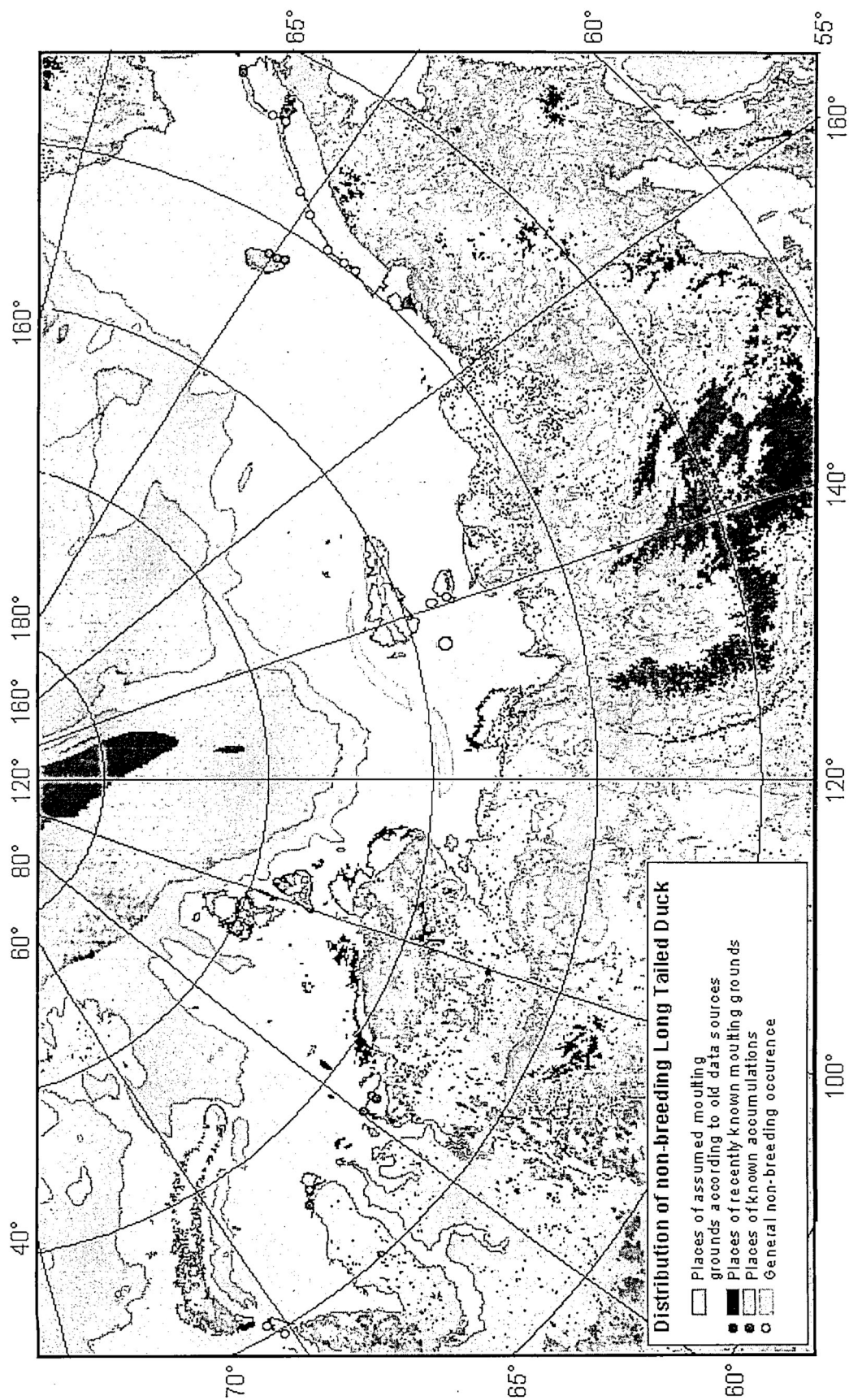


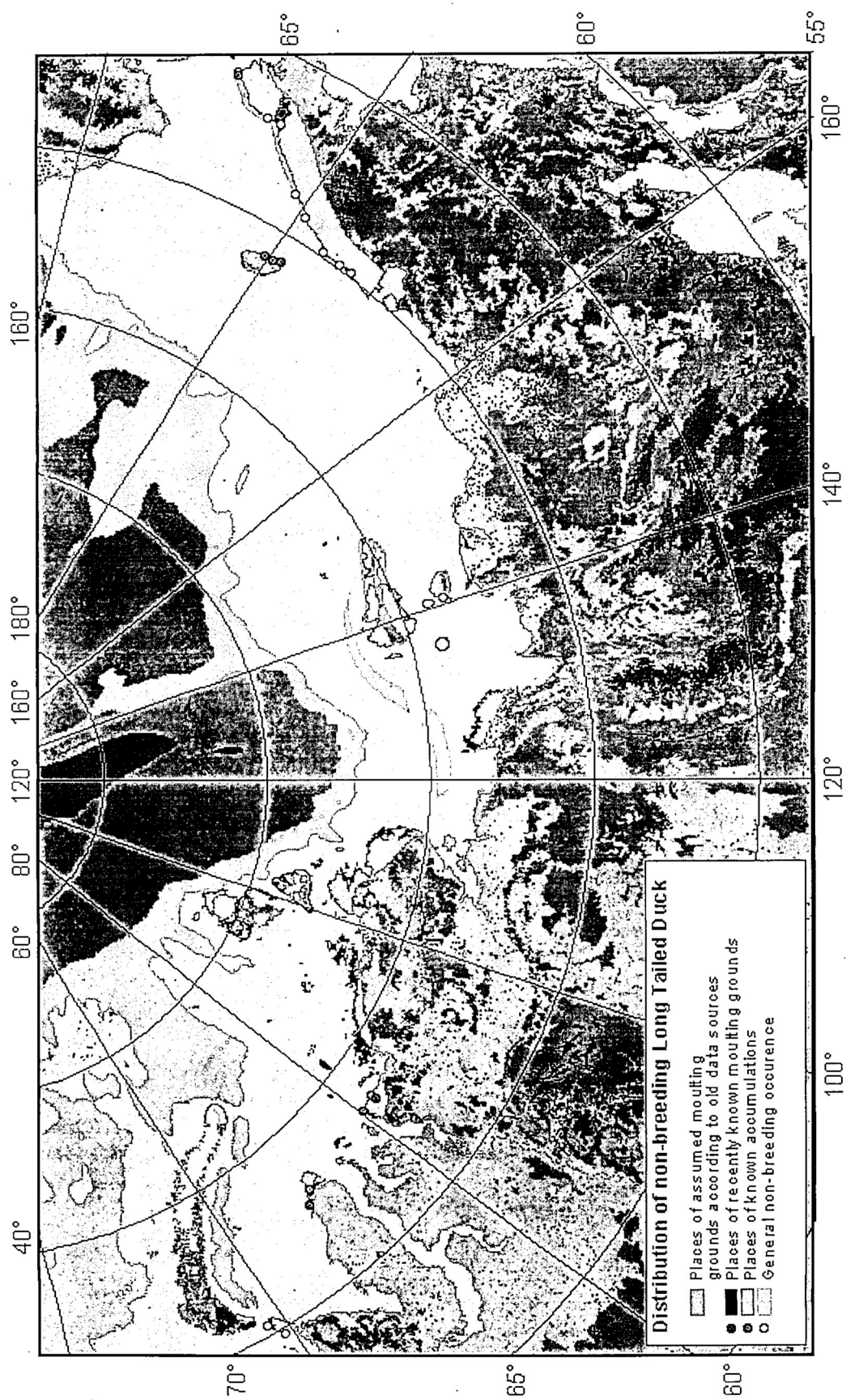




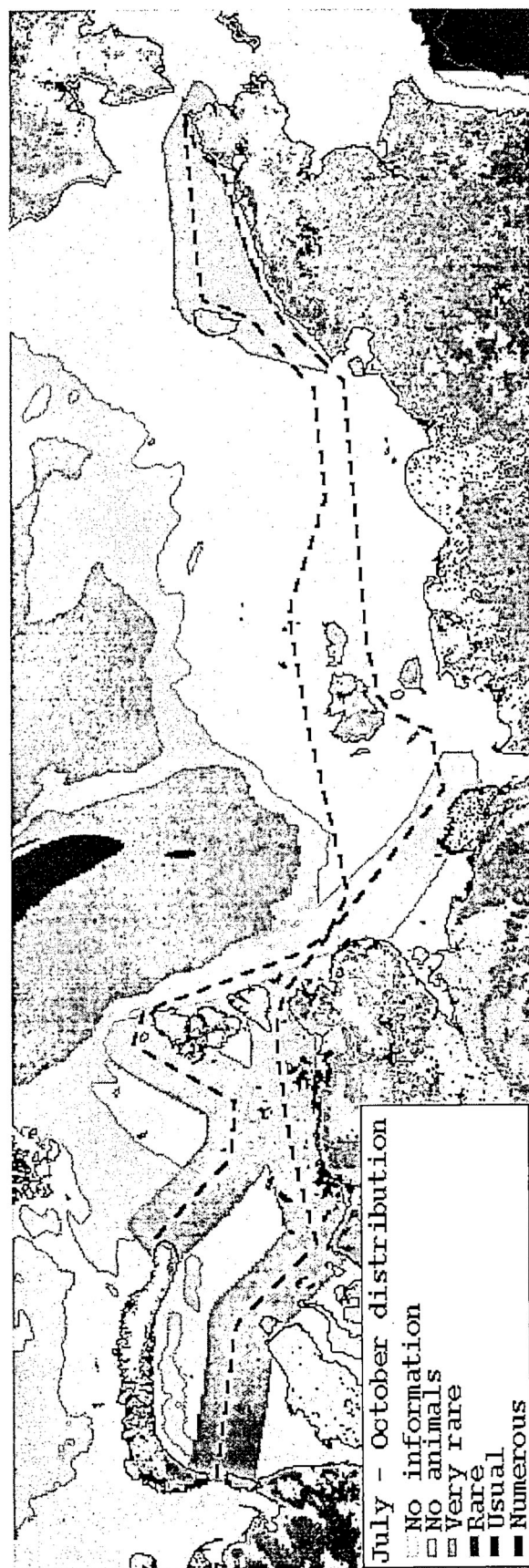




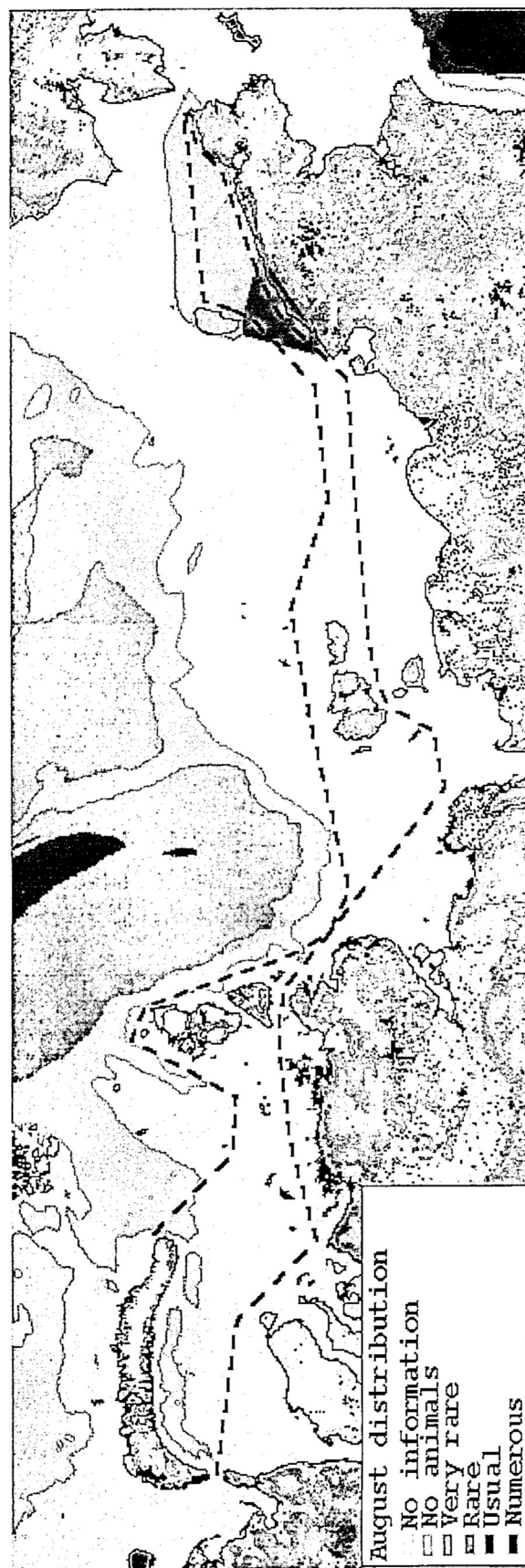
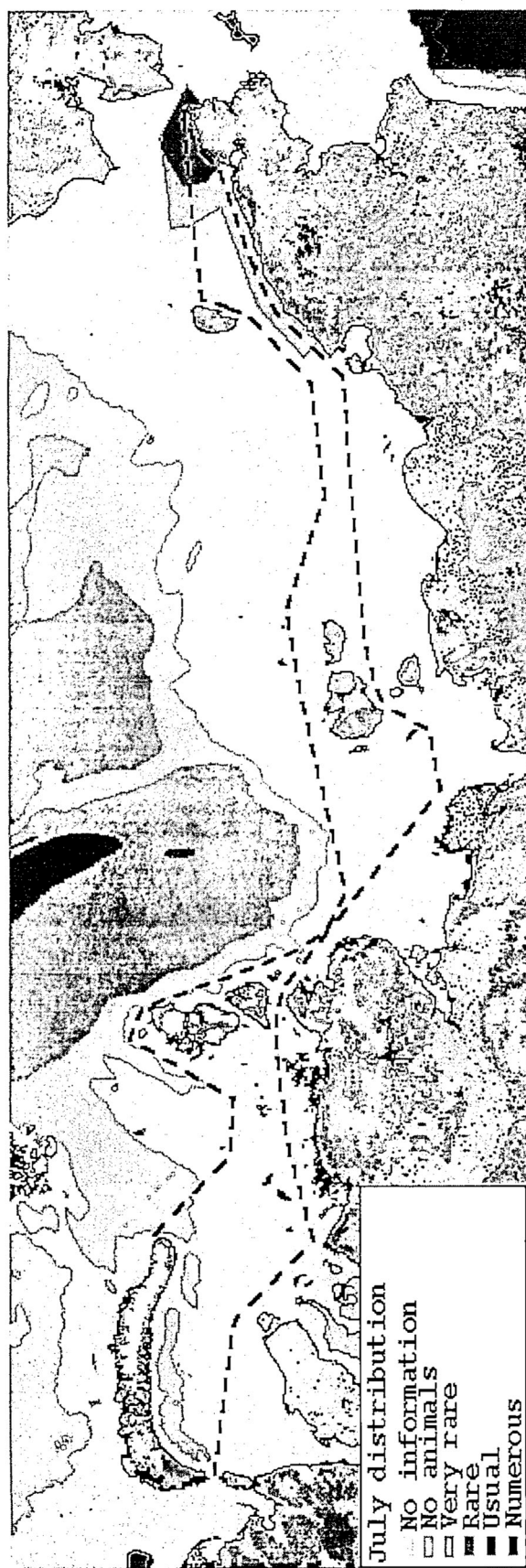




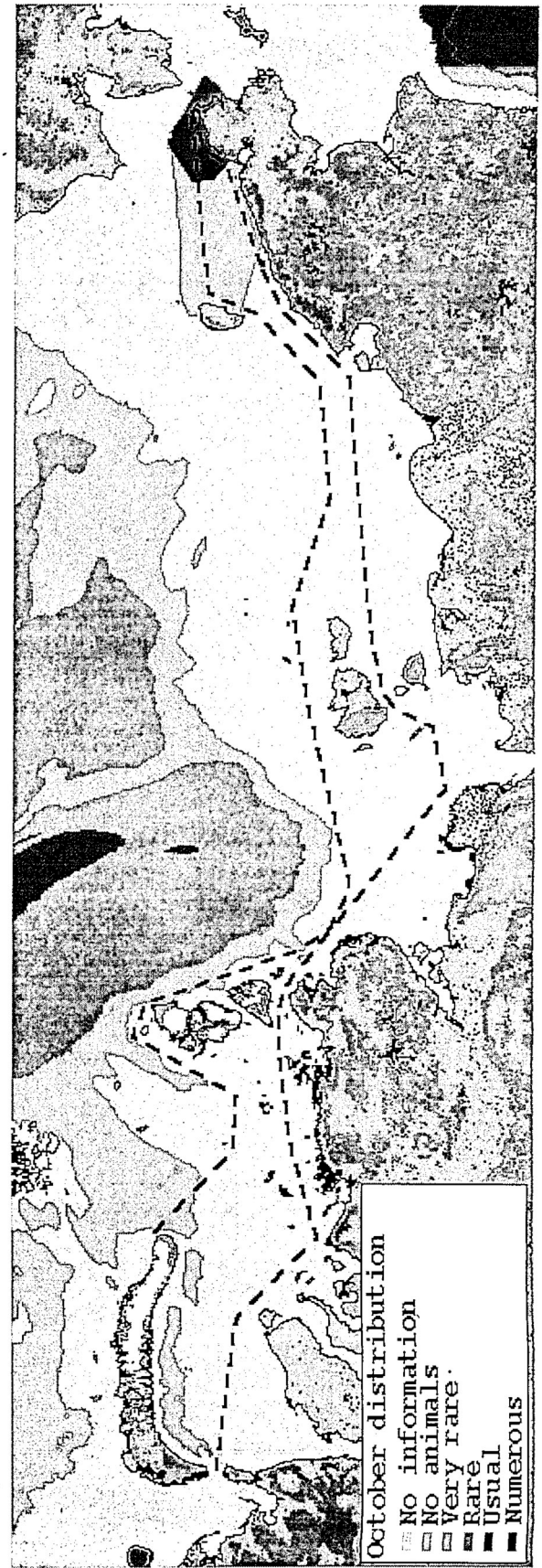
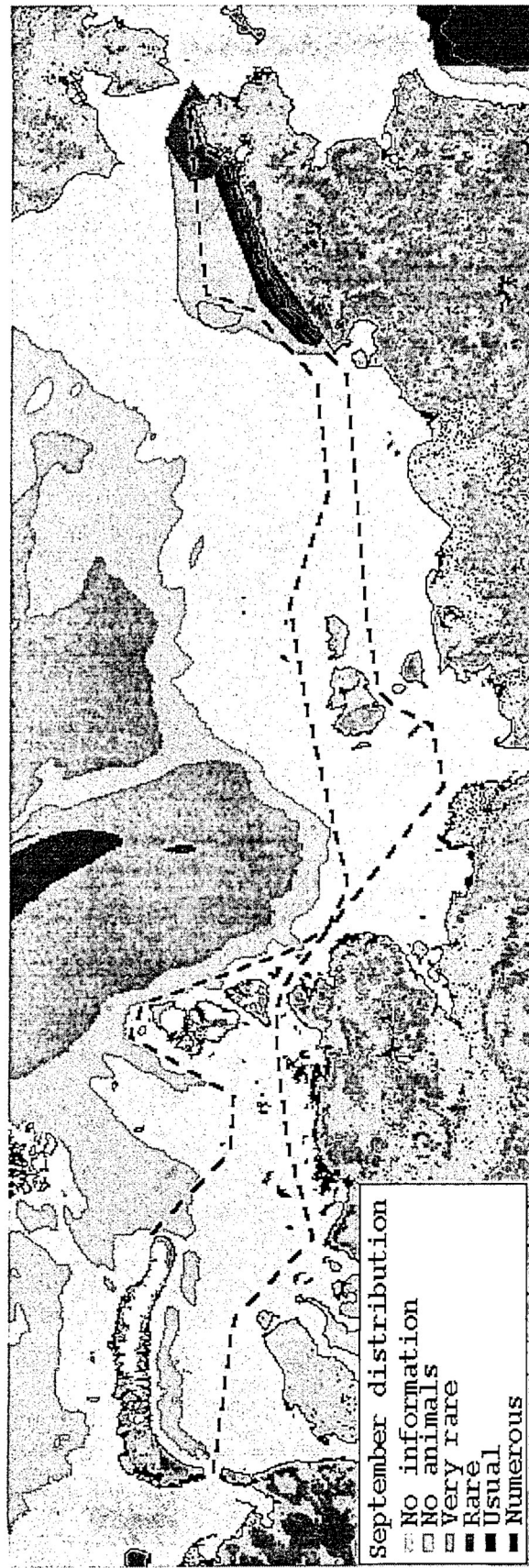
Bearded Seal Distribution



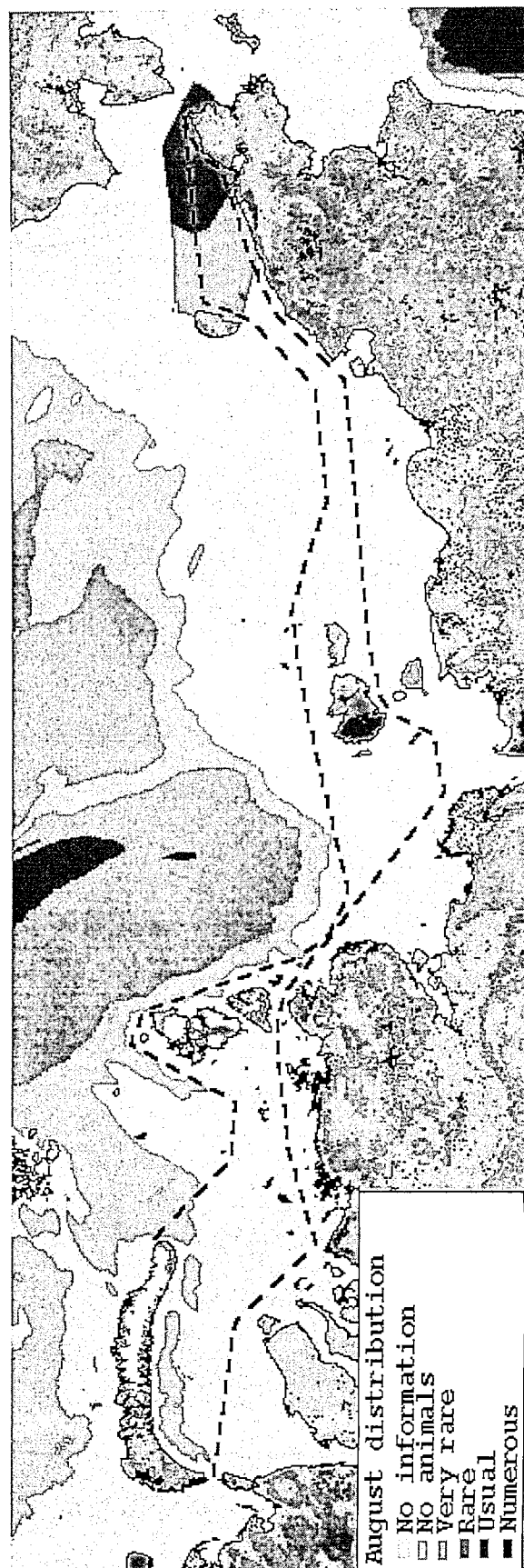
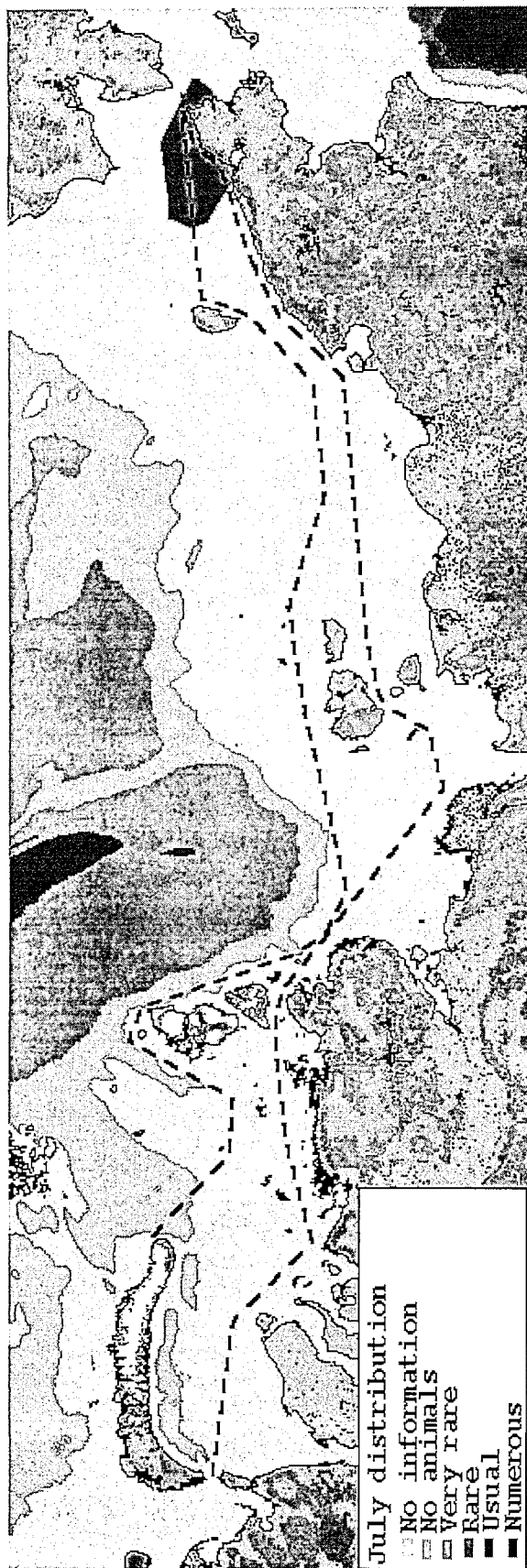
Gray Whale Distribution



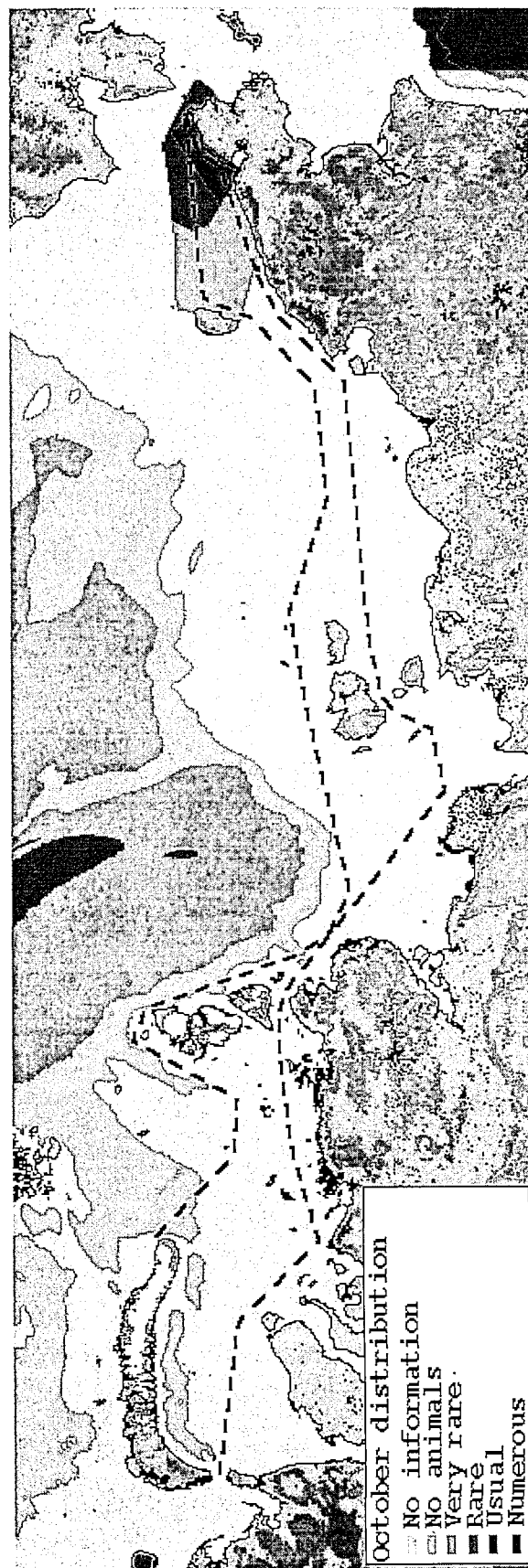
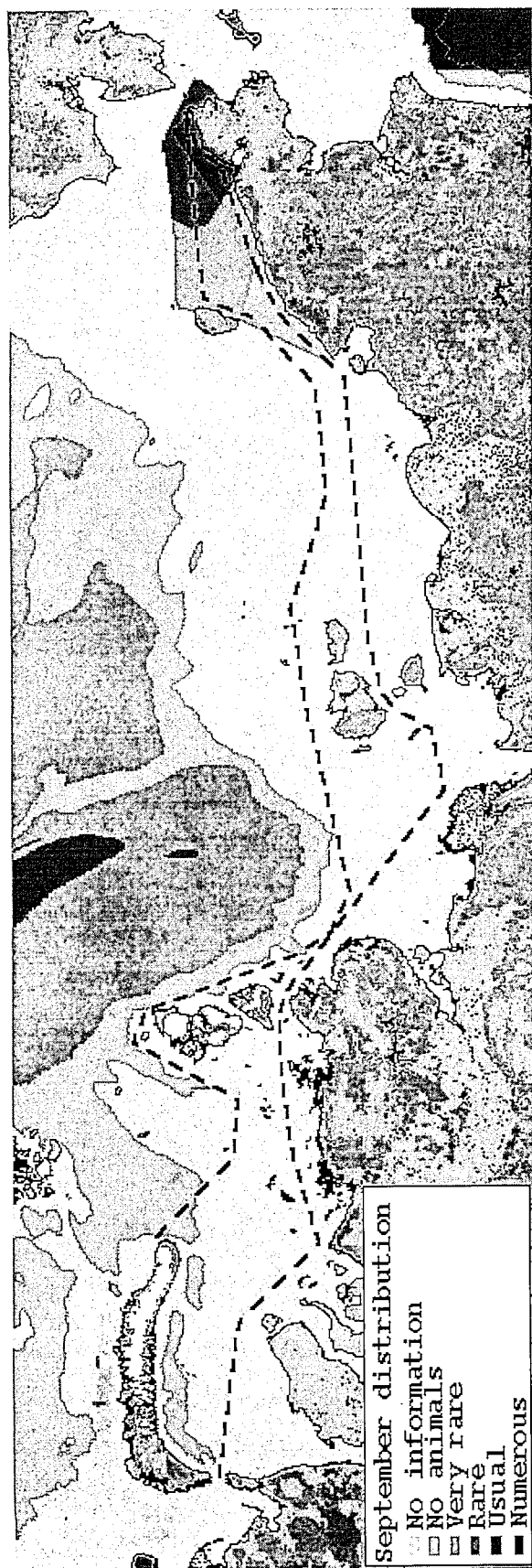
Gray Whale Distribution



Gray Whale Distribution



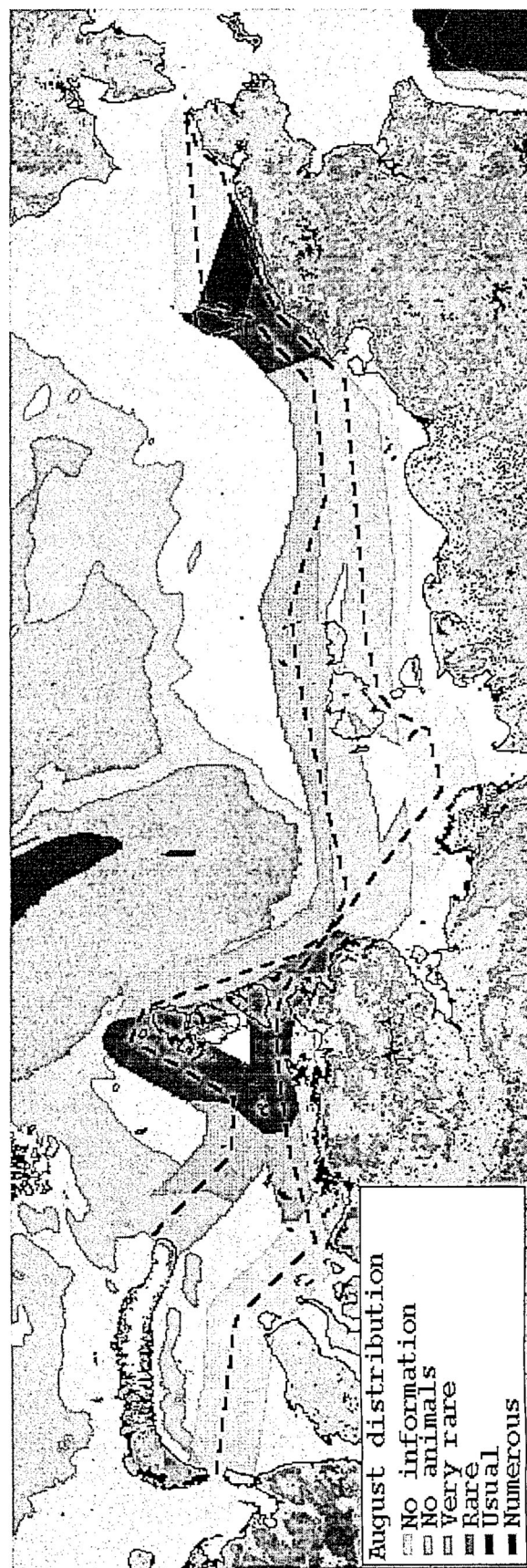
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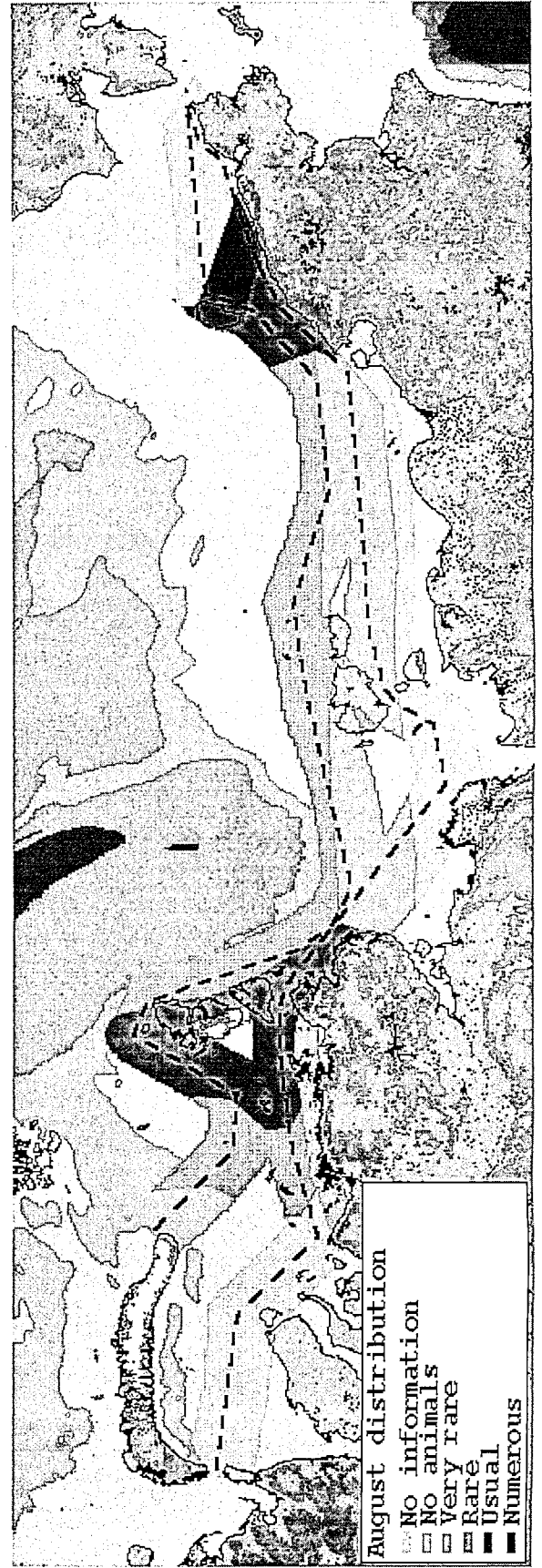
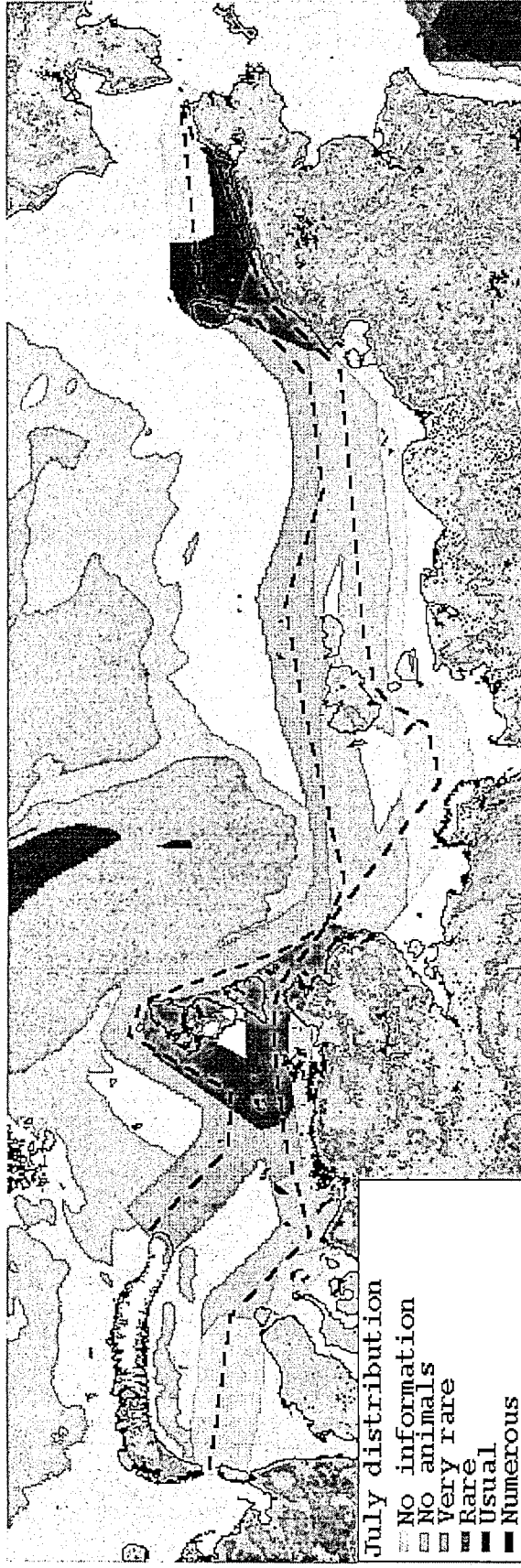
Polar Bear Distribution



Polar Bear Distribution



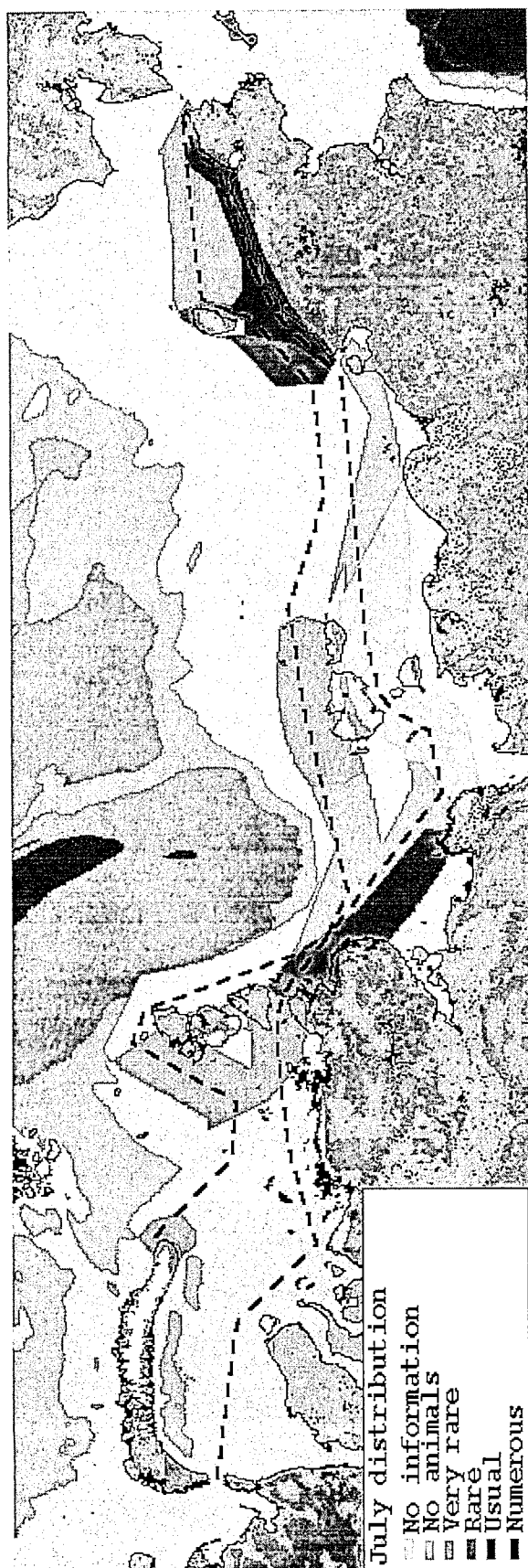
Polar Bear Distribution



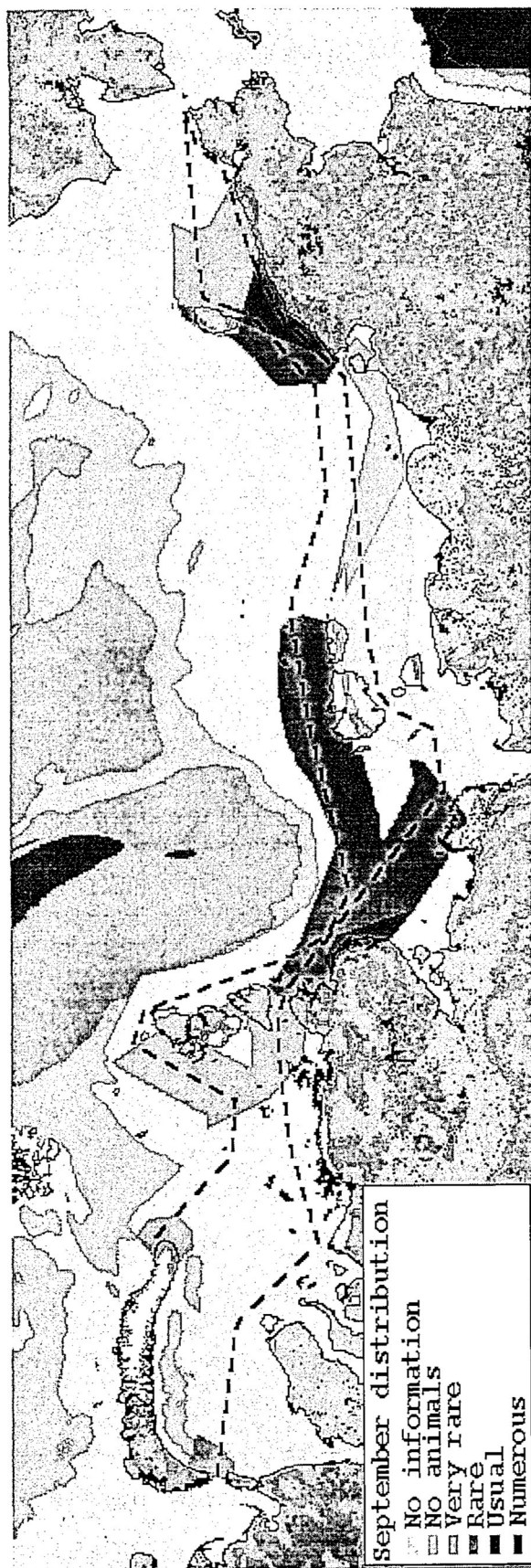
Ringed Seal Distribution



Walrus Distribution



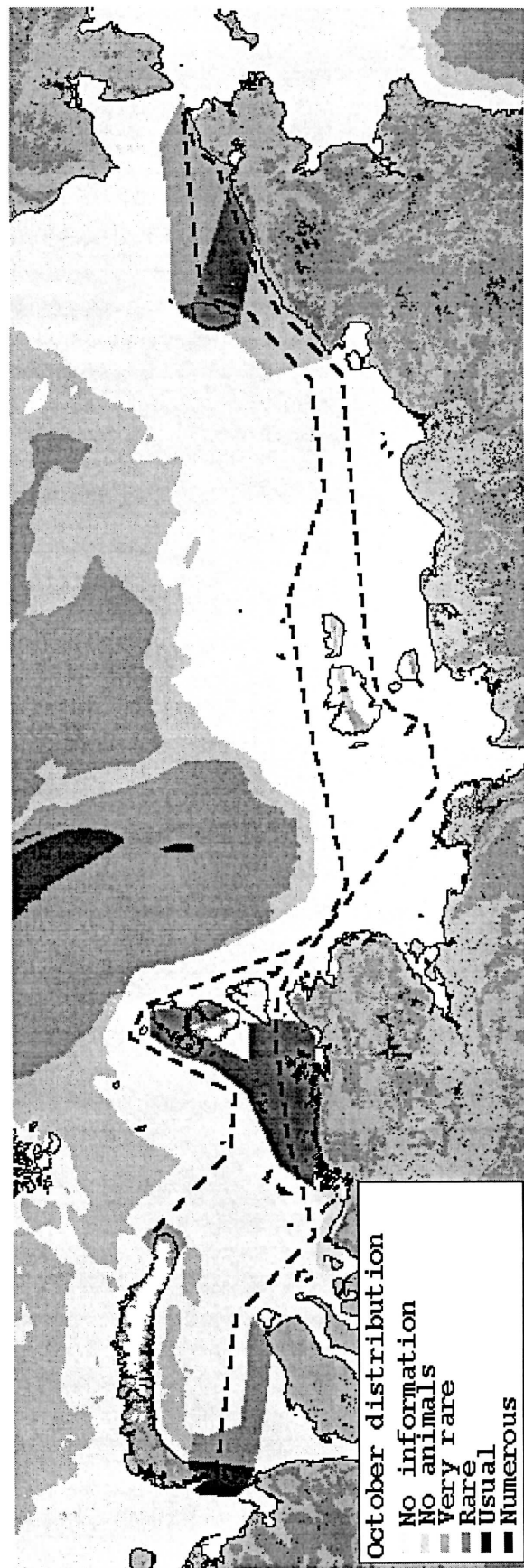
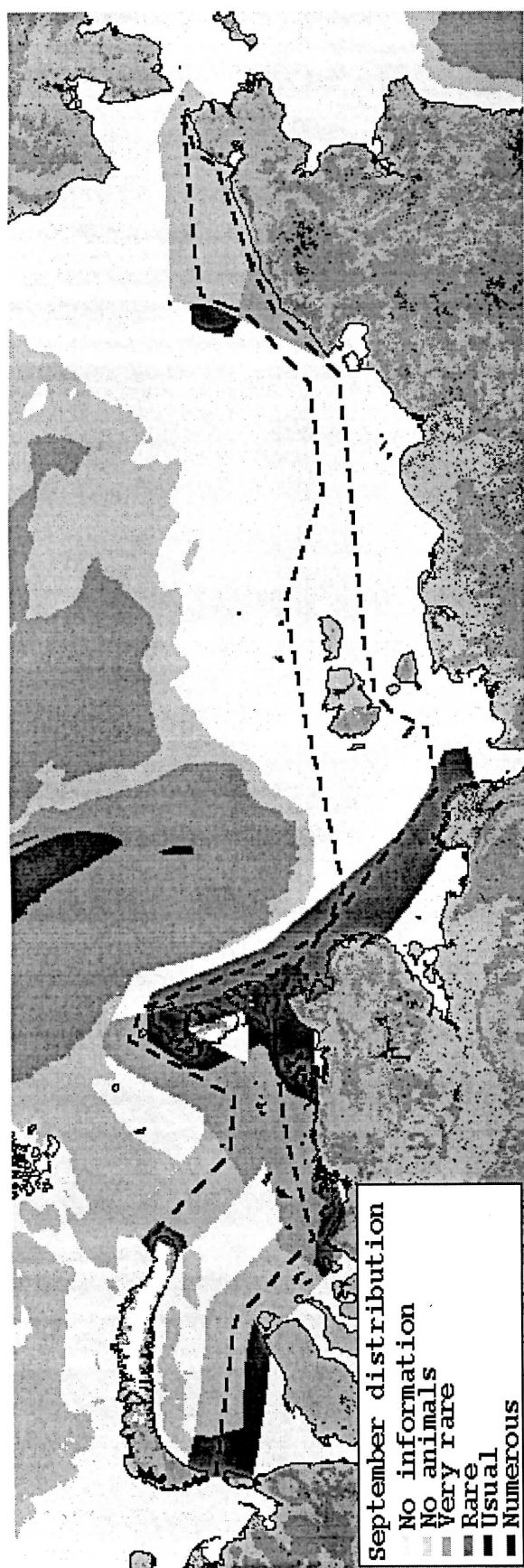
Walrus Distribution



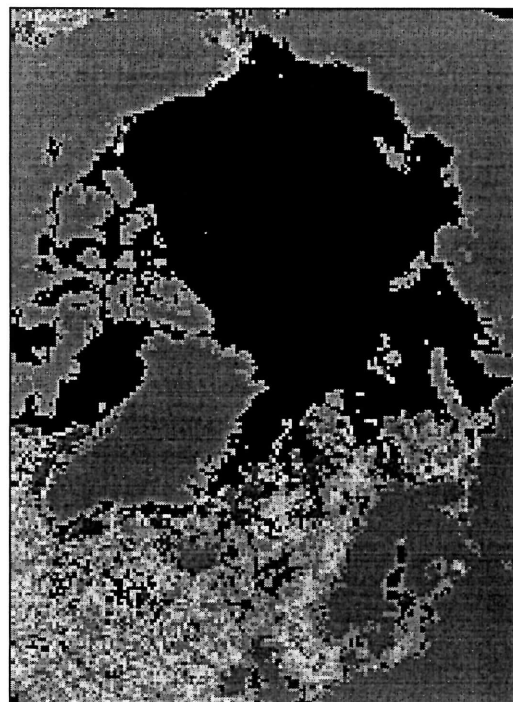
White Whale Distribution



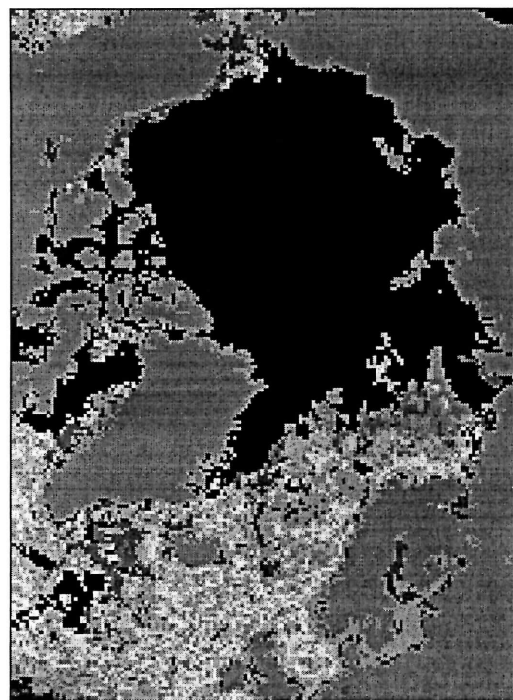
White whale Distribution



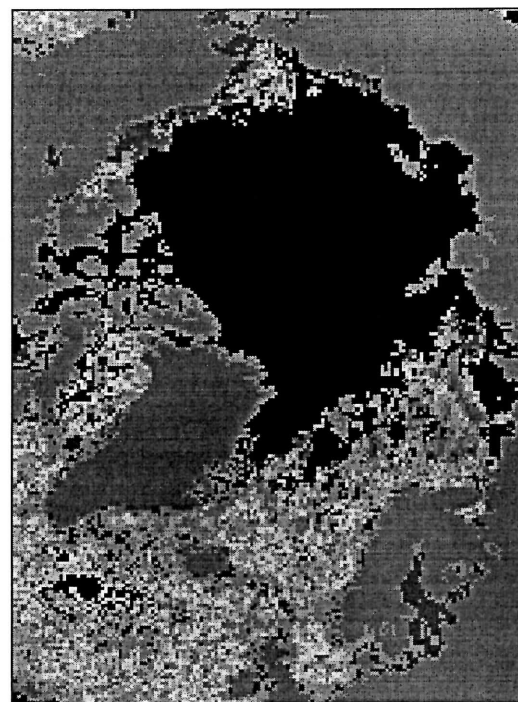
Phytoplankton pigment concentration (mg/m3) Arctic Ocean



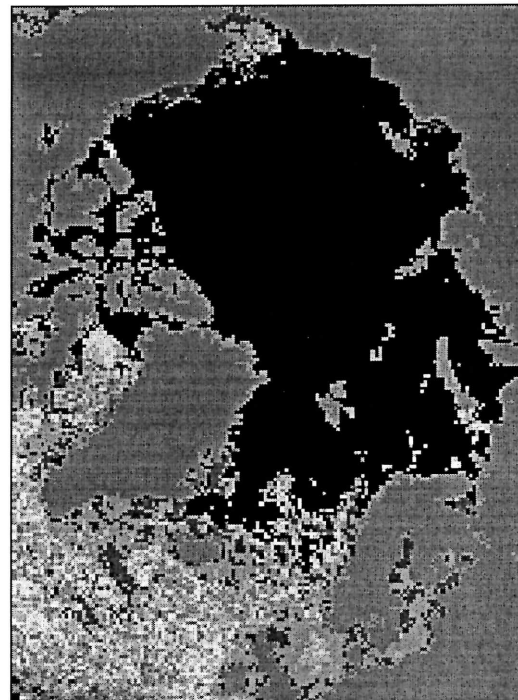
June



July

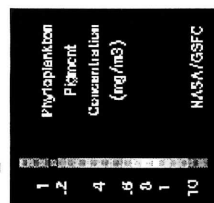


August



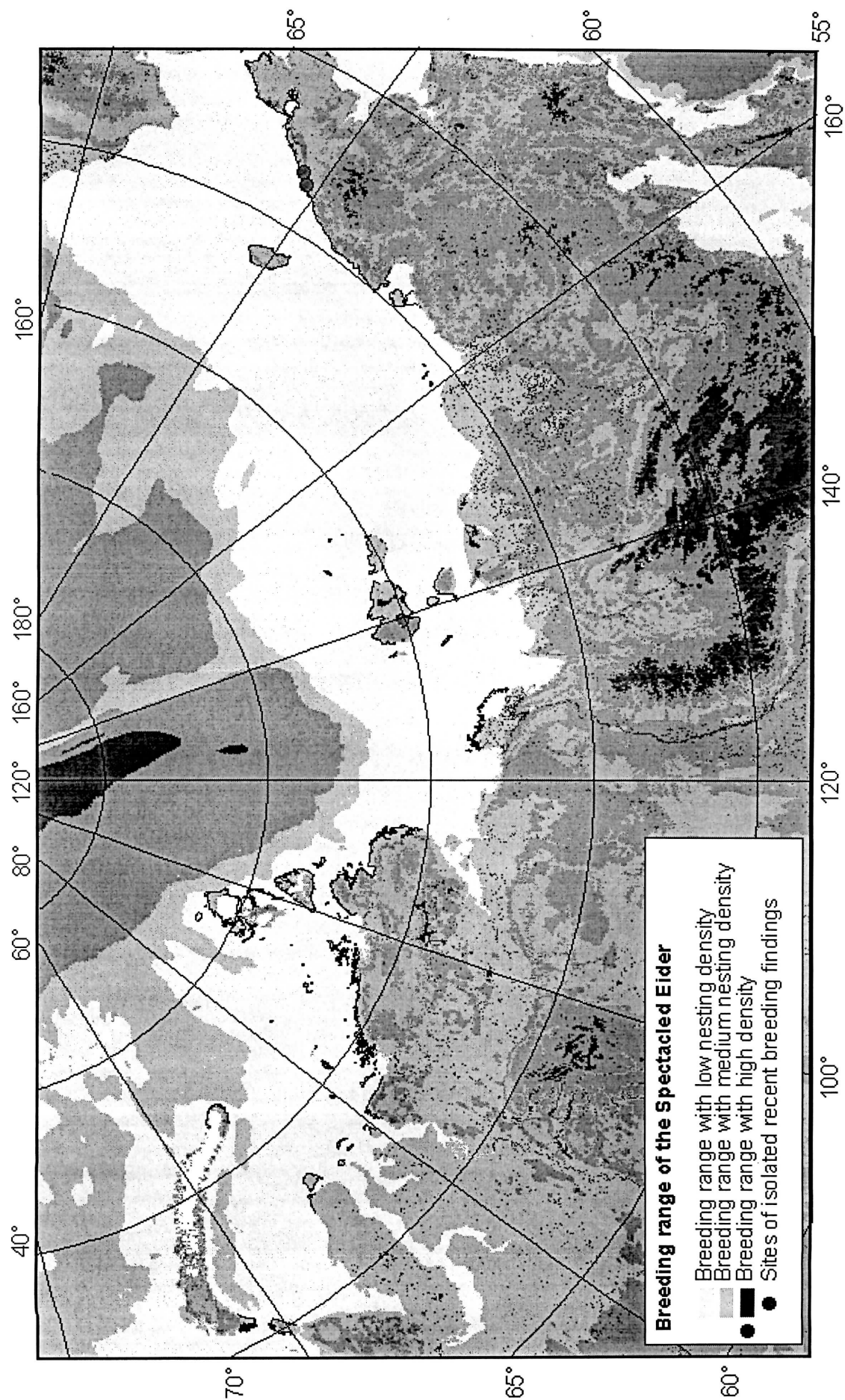
September

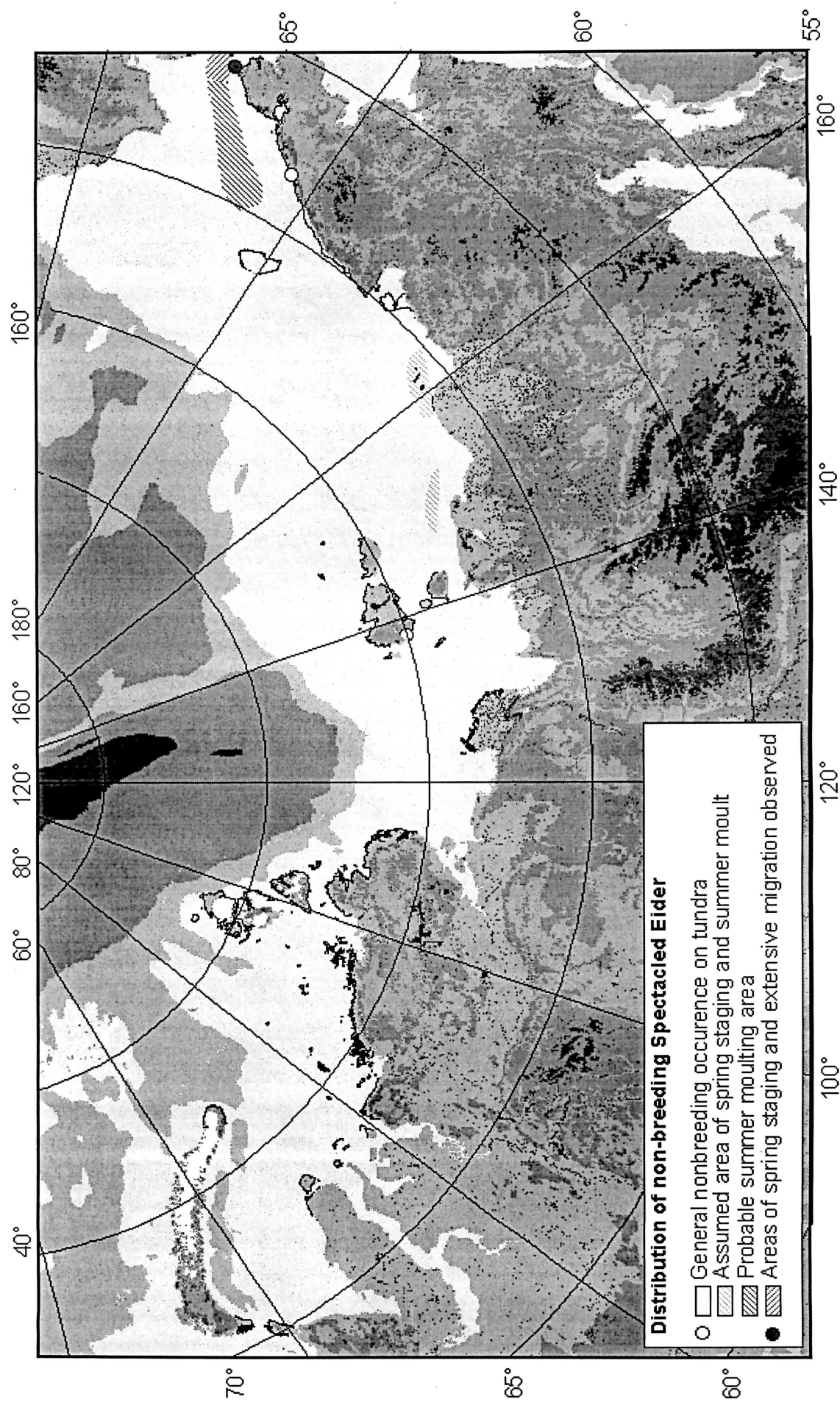
Legend

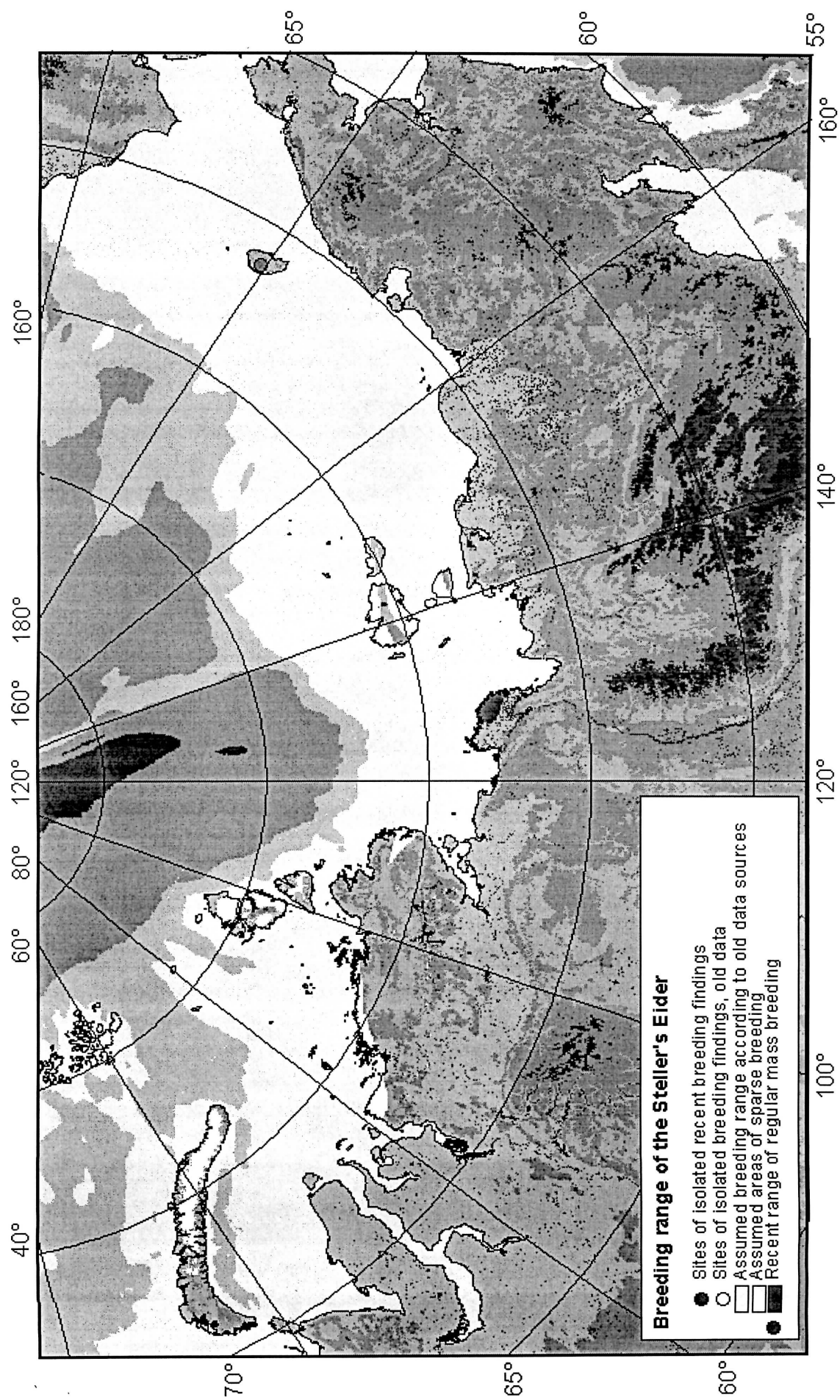


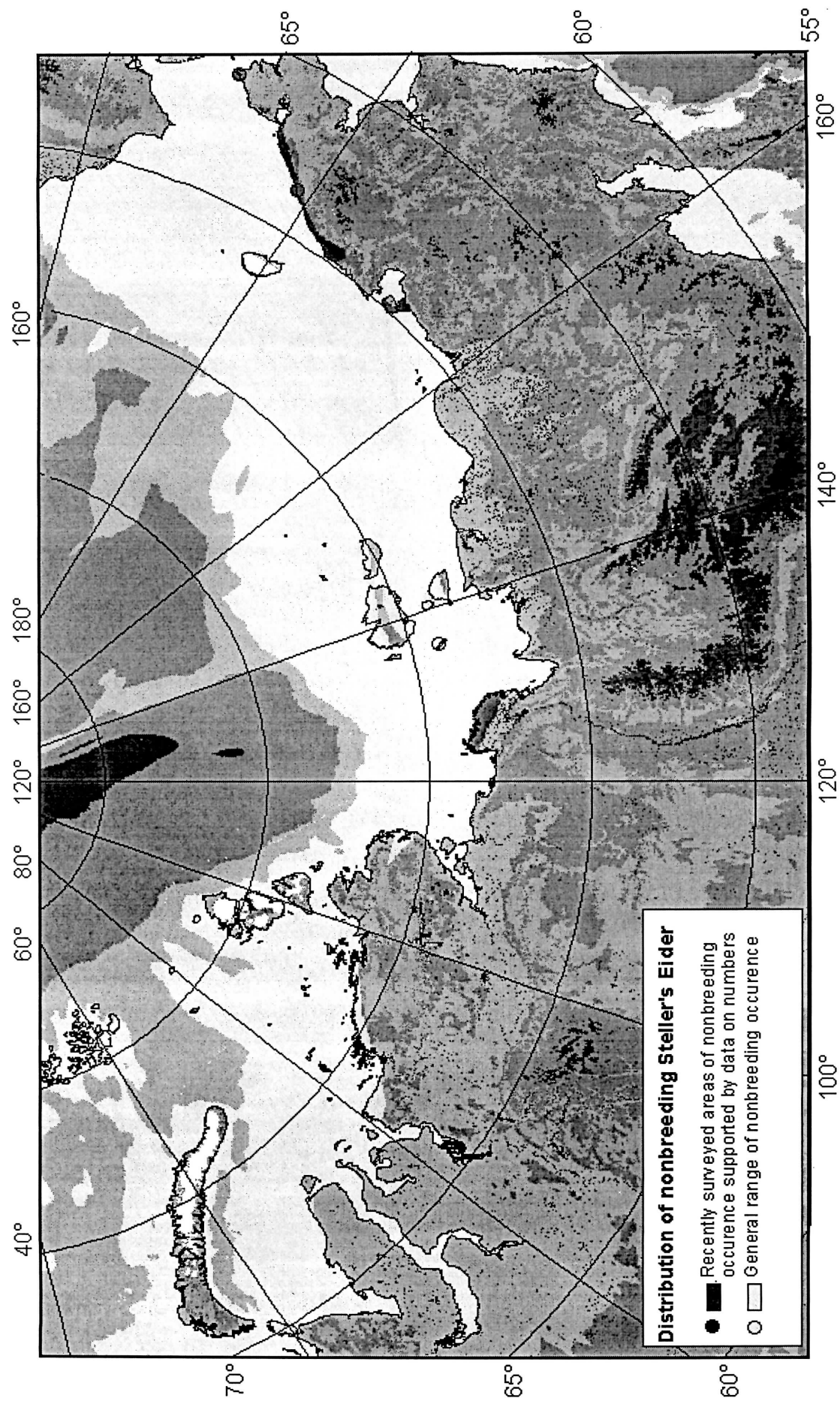
Source data available at
http://seawifs.gsfc.nasa.gov/SEAWIFS/IMAGES/CZCS_DATA.html

The climatologies, for June as an example, are based upon arithmetic averages of pigment for all Junes between 1979 - 1986. Dataset documentation can be found at http://eosdata.gsfc.nasa.gov/DATASET_DOCS/czcs_dataset.html









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REVIEW

INSROP Discussion Paper: " Legal and Environmental Evaluation of the
selected Routes", by Y.Ivanov et al

20 May 1998

This is one of most important papers produced by an INSROP research group, in terms of practical information for actual potential users of the Northern Sea Route. It is only regretted that this information was not available in the early stages of INSROP research.

The paper is produced by a Russian-Norwegian research group and is in two parts: Legal and Environmental. As I am less qualified in the environmental area, I will concentrate on legal aspects, although I will make some comments on the environmental section.

It is interesting to note that although the authors go to some lengths to state that the Russian legal regime is in compliance with the United Nations Convention on the Law of the Sea, 1982 (UNCLOS), in actual fact there are some discrepancies. For example, it is stated that a vessel navigating in the territorial sea for "as long as 3 days" and repeatedly entering territorial waters may be considered as a "threat to the safety of the Russian Federation" and would not be considered engaged in "innocent navigation" (pp.7-11). In many parts of the world vessels spend many days in territorial waters or repeatedly enter and leave territorial waters. This is always considered to be "innocent passage" within the meaning of UNCLOS.

Similarly, the authors are also making some questionable statements regarding passage in straits. (p. 11) UNCLOS provides for a "transit passage" regime for international straits. The assertion by the former USSR that the Arctic straits had never been used for international navigation was only based on the fact that such navigation had been prohibited by the USSR! However, these are public international law problems that should not have a direct bearing on actual passage especially as the paper clearly asserts that such passage is being encouraged. Although there may be some legal objections to the "notification regime" that has been set up, in practice, notification is likely to be quite useful and, in some cases, perhaps essential. Nevertheless, some

states may see this as a legal recognition that these northern straits are not international.

It is not clear if the NSRA regulations relating to financial security and compulsory insurance as set out in the paper (p.12) refer to the IMO CLC 1969/1992 Convention requirements to which Russia is a party. It can be assumed that any vessel with this coverage would be able to meet these requirements. More questionable is the international legal base for the NSRA to carry out inspections of vessels to ensure compliance with the regulations. This may again be more of a legal question than a practical matter. In practice any vessel wishing to use the NSR would probably be quite prepared to ensure that all such requirements are met.

The information on ice breaker charges is most revealing. (pp. 13-15). The charges do not seem to encourage use of ice breakers as they range from USD 109,800 to USD 343,000 for a 20,000 ton vessel. This may be very high for high-value cargoes but would not be in any way cost-effective for low-value bulk cargoes. It seems that Russian authorities will have to decide if they are willing to provide this service on a subsidized basis if they wish to encourage the use of the routes.

The information on Russian insurance coverage availability both for P&I and for H&M coverage is most useful. It is too early to comment on whether the suggested rates are commercially acceptable and/or how they compare with rates available in other markets. However, it is useful to know that coverage is available. Also, the information provided on the availability and costs of nautical charts, publications, meteorological information, as well as port dues and customs and immigration controls, is very helpful. To date this information has not been available even for INSROP researchers.

The following comments relate to Part II on Environmental Evaluation:

In terms of marine pollution, although MARPOL 73/78 is referred to and Russia is a party to this treaty, the paper does not make clear if the Russian regulations are in full compliance with MARPOL or if they differ or even exceed MARPOL standards. In other words, does a foreign vessel that complies fully with present MARPOL standards, have to meet additional requirements in order to make the passage? This needs to be clarified.

The paper provides a significant amount of information on environmentally hazardous impact factors. (p. 51ff) However, for any potential user of the NSR there appear to be a number of serious environmental risk factors that are not sufficiently clearly spelt out. For example, there is some suggestion that liability for "environmental damage" of "valued ecosystems" would be required. At this stage this type of damage is not insurable and has been rejected by liability underwriters. The international marine pollution liability regime under the CLC, FUND and, eventually, HNS conventions is all the coverage presently available. If the NSR requires additional liability limits it has to be stated clearly. The paper actually concedes that the "actual situation.... Remains comparatively obscure". (p. 68) This is not sufficient for those who

plan to actually undertake the risk. Furthermore, environmental damage must be clearly quantifiable.

It should be noted that these comments should in no way detract from what is an excellent, well researched paper. However, it is apparent that the paper was written by researchers for whom English is not their first language. As a result there are numerous grammatical and spelling mistakes. Accordingly, it is suggested that the paper be thoroughly edited by someone with expertise in the English language.



Prof. Dr. Edgar Gold, C.M., Q.C.

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Review of INSROP Report “Environmental Evaluation of the Routes selected for the INSROP Simulation Study”.

“INSROP’s task is to build up a scientifically based knowledge foundation encompassing all relevant aspects of this problem complex to enable public authorities and private interests to make rational decisions based upon scientific insight rather than upon mythology and insufficient knowledge”
(INSROP Information Sheet)

The initiative to incorporate an environmental evaluation into the International Northern Sea Route programme, from an early stage in its investigations, is to be welcomed. The central issue considered in this review is whether the scope, methodology and content of this evaluation are appropriate for this purpose. The conclusion reached is that, in a number of important respects, these should be strengthened. The main suggestions for its improvement are provided below. Additionally, the English language version of the report should be editorially checked for language corrections before publication.

The opening-up and the increased use of the North Sea Route (NSR) creates the potential for “substantial saving of distance from Northern Europe to Northeast Asia and the northern west coast of North America compared to southerly routes.” (INSROP) “The NSR may also prove instrumental in accessing the northern regions of Russia to the rest of the world.” (INSROP) If so, both its economic and environmental consequences will not be confined to the sea routes which are currently being investigated.

Given this, a strategic environmental assessment (SEA) is probably required, i.e. a broader based environmental assessment than is usually conducted at the project level. Coincidentally, two weeks ago, the first Meeting of the Parties to the ECE Convention on Environmental Impact Assessment in a Transboundary Context took place in Oslo under the Presidency of the Norwegian Government. The principles of good international practice in environmental assessment could, with advantage, be applied to INSROP. The Norwegian Ministry of the Environment and its EIA Centre could usefully advise on this, with particular regard to the following:

1. Defining the scope of the assessment to include the environmental consequences of developments in infrastructure (e.g. ports, connecting land-based transport facilities) and in induced economic activity (e.g. mining and mineral extraction). Also it may be appropriate to define the geographic scope of the assessment to include all locations, land and sea-based and under different jurisdictions, where significant environmental impacts may arise.

2. Identifying a range of plausible scenarios for use of the North Sea route and associated developments, rather than a single scenario, as a basis for analysing the range and scale of environmental impacts which may result.
3. Identifying, clearly specifying and applying a methodology for predicting the order of magnitude and significance of impacts which incorporates risk analysis and makes sufficient provision for the handling of uncertainty. Inter alia, the criteria to be used for the determination of significance should be made explicit.
4. Identifying and clearly specifying the data requirements for applying the stated methodology, taking into consideration the scope of the assessment.
5. Identifying and specifying the methodology for determining the mitigation measures, to address potentially significant negative environmental impacts associated with the implementation of INSROP, and the Environmental Management Plan (EMP) through which post-project monitoring will be undertaken and the implementation of mitigation measures will be assured.
6. Identifying the principal environmental authorities and interest groups who should be consulted and whose views should be taken into consideration in carrying out the environmental assessment and in reviewing its findings.

On the basis of a more systematic SEA methodology, data collection and analysis, and consultation it should be possible to reach more pertinent and substantiated findings. To achieve this would necessitate acceptance by the parties to INSROP of wider terms of reference for the environmental evaluation and the commitment of more time and resources to its satisfactory completion on the basis of its strengthened methodology. This, however, is fully consistent with the stated purpose of the Study as contained in the opening paragraph of this Review which is taken from the INSROP Information Sheet.

Dr. Norman Lee
EIA Centre
University of Manchester
8.6.98

AUTHOR'S ANSWERS

5 October 1998

**To: Prof. Dr. Edgar Gold, Oceans Institute of Canada and
Dr. Norman Lee EIA Centre University of Manchester**

Dear Prof. Dr. Edgar Gold and Dr. Norman Lee,

Thank you for your comments of the paper of INSROP Project WP7 "Legal and Environmental Evaluation for Selected Routes".

The comments served the very useful purpose of confirming some of weaknesses of the paper.

Part I

Our replies to Prof. Dr. E. Gold's comments may be summarized as follows:

1. Comment: "*The authors go to some lengths to state that the Russian legal regime is in compliance with the United Convention of the Law of the Sea, 1982 (UNCLOS), in fact there are some discrepancies*".

As regards this comment, a correction regarding "innocent passage" for ships while navigating along the Southern route has been applied to subparagraph 2.2 of the Paper: "Shipping Regime in Territorial Waters".

2. Comment: "*The authors also making some questionable statements regarding passage in straits*".

We do not hold with the assertion "that the Arctic straits had never been used for international navigation was only based on the fact that such navigation had been prohibited by the USSR!" The former USSR had never prohibited shipping along the NSR. It had always kept to the "permissible" order for admission of foreign vessels to the NSR seaways. At the present time, vessels are admitted for navigation along the NSR seaways on the "notification" principle. The above regime for entering the NSR has practically resolved the disputable matter of the "permissible" order for foreign vessels to navigate through the NSR seaways and "transit passage" regime for Arctic straits.

3. Comment: "*More questionable is the international legal for the NSPA to carry out inspection of vessels to ensure compliance with the regulation*".

As regards this comment, the subparagraph 3.5 has been supplemented with the provision of Article 6.1 of the Regulations for Navigation on the Seaways of the NSR: "An inspec-

tion of the vessel may be carried out in cases where unfavourable ice, navigational, hydrographic, weather, and other conditions occur that might endanger a vessel, or where there is a threat of polluting marine environment or the Northern Coast of Russia”.

4. Comment: *“The information on ice-breaker charges is most revealing”.*

We hold with you that the ice-breaker charges are too high. The practice of levying same in 1996-1998 resulted in a situation where the transit and export-import traffic became unprofitable. New “Regulations for Ice-breaker Fees” are currently under development. It is anticipated that a part of the fees will be reimbursed by the Federal budget. As the traffic volume along the NSR increases the amount of the fees will reduce. Operation of the ice-breakers on the NSR seaways will become profitable with an average cargo flow volume of 1 m t (now 0.2 m t) per ice-breaker. The ice-breaker charges will not exceed 5 USD. In this connection, your recommendation to the effect “that Russian authorities will have to decide if they are willing to provide this service on a subsidized basis if they wish to encourage the use of the routes” has been allowed for in the subparagraph 3.2 “Ice-Breaker Fee”.

Part II.

Answers to the comments by Dr. Edgar Gold (Oceans Institute of Canada)

Answer to comment 1

According to the Russian legislation, the international agreements ratified by the Russian Federation take priority over the laws of the Russian Federation. This concerns MARPOL 73/78 as well. In our opinion, the navigation conditions in water belonging to the Russian part of the Arctic regions comply with the navigation conditions in special areas (environment of which is considered as vulnerable) as stipulated by MARPOL 73/78. Navigation in territorial waters (and practically all the protected water areas adjacent to the protected territories are situated in this part of the sea) is to be governed by the Russian laws.

Answer to comment 2

As in the previous event, in international waters international agreements take priorities over others, including the agreements on assessment of damage inflicted to environment. Russian normative acts are valid if do not contradict international ones or develop and specify provisions of those.

Concept of “Valued Ecological Systems”(VEC) is one of the basic methodological provisions, based on which the method of EIA INSROP has been created (see sub-program 5.II.). The risk of inflicting damage to these ecosystem components is especially high in protected natural areas and within the time when those are more vulnerable. The actually inflicted damage value estimation method is depicted in the paper schematically, as well as the procedure of compensa-

tion for the damage. The parties participating in the INSROP development and future participants of navigation along the NSR must be informed of the estimation method and the compensation procedure. It is up to the project management to decide how and when this will be done.

Answers to the comments by Dr. Norman Lee (EIA Centre, University of Manchester)

General deliberation

The author of the review speaks with good reason of the targets and scope of EIA process. However, it seems the author did not pay attention to the fact that the presented paper does not relate to the whole project but concerns a rather small stage of its realisation – only a model transit (without coming into ports) navigation of a small number of dry-cargo ships during summer of 1998. We will be forced to remind of it when giving our replies.

Answer to comment 1

The comment is correct with regard to the environment protection part of INSROP generally. The numerous independent sections and reports are devoted to the raised problems, such as an impact on the branches of economy of the Russian Northern regions, as well as the geographic frames of impact and ports. A concrete model version will have a little effect on those.

Answer to comment 2

Various scenarios of NSR use and circumstances related to those as well as probable consequences are considered in some INSROP reports. As to the presented report, it is devoted to the actual variant (according to the task).

Answers to comments 3, 4, 5

A particular section of sub-project II.5 (Thomassen et al) is devoted to the method of EIA process, in which a methodology of choosing criteria and assessment objects is set forth, as well as a classification of impact hypotheses and requirements to the information to be provided, and approaches when dealing with uncertainties and other issues entered into the commonly used scheme of the EIA process. This groundwork has been used in the reviewed paper as “a default” for any stage of INSROP EIA process. Issues of arranging an after-design monitoring and environment management are to be considered when conducting INSROP EIA as a whole. The paper also contains some proposals on these issues (for instance, pertaining to participation of the hydro-meteorological points in the monitoring which are located on the NSR routes).

Answer to comment 6

The structure and procedure of developing and considering EIA in accordance with the Russian standards have been described in the above mentioned methodical section of the INSROP environment protection sub-project, including issues of public opinion to be taken into account as well as the required approvals by authorities and control bodies. Some aspects of the

EIA legislation provisions being important for this stage have been mentioned when describing the Law for ecological expertise of RF in the reviewed paper.

The aspects of the SEA methodology usage have been considered in the mentioned methodological section of the project. The methodology of SEA conducting is set forth in the reports concerning conditions and a foreseen impact on economic structures, evolution of indigenous people, challenges of development of mining industries (in particular, hydrocarbon resources), etc. Hence, we believe all the main comments by the author of the review have been taken into consideration in various parts of INSROP project, the whole number of which amounts to about 120 working papers. However, this cannot diminish the importance of the comments.

Sincerely yours

G. Semanov, CNIIMF

A. Yakovlev, CNIIMF

Dr. Maria Gavrilov, AARI

Dr. Vladislav Khlebovich, ZIN RAS

Dr. Sergei Zubarev, AARI



**Ship & Ocean Foundation (SOF),
Tokyo, Japan.**

SOF was established in 1975 as a non-profit organization to advance modernization and rationalization of Japan's shipbuilding and related industries, and to give assistance to non-profit organizations associated with these industries. SOF is provided with operation funds by the Nippon Foundation, the world's largest foundation operated with revenue from motorboat racing. An integral part of SOF, the Tsukuba Institute, carries out experimental research into ocean environment protection and ocean development.



**Central Marine Research & Design
Institute (CNIIMF), St. Petersburg, Russia.**

CNIIMF was founded in 1929. The institute's research focus is applied and technological with four main goals: the improvement of merchant fleet efficiency; shipping safety; technical development of the merchant fleet; and design support for future fleet development. CNIIMF was a Russian state institution up to 1993, when it was converted into a stock-holding company.



**The Fridtjof Nansen Institute (FNI),
Lysaker, Norway.**

FNI was founded in 1958 and is based at Polhogda, the home of Fridtjof Nansen, famous Norwegian polar explorer, scientist, humanist and statesman. The institute specializes in applied social science research, with special focus on international resource and environmental management. In addition to INSROP, the research is organized in six integrated programmes. Typical of FNI research is a multi-disciplinary approach, entailing extensive cooperation with other research institutions both at home and abroad. The INSROP Secretariat is located at FNI.

