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Evaluation of the Potential Effects of Major Oil Spills on Grand Banks Commercial Fish Species as a Result of Impacts on Eggs and Larvae

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EVALUATION OF THE POTENTIAL EFFECTS OF MAJOR OIL SPILLS ON GRAND BANKS COMMERCIAL FISH SPECIES AS A RESULT OF IMPACTS ON EGGS AND LARVAE

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Les incidences environnementales possibles de l'exploitation du champ pétrolier Hibernia ont été étudiées de façon intensive au cours des dernières années. Les effets préjudiciables de la pollution par le pétrole dans la zone poissonneuse du Grand Banc de Terre-Neuve suscitent des préoccupations particulières. La ASA Consulting Ltd. quantifie les réductions potentielles des captures provoquées par les importants déversements de pétrole.

Pour estimer les dommages que peuvent causer les déversements de pétrole et d'autres substances dangereuses aux ressources naturelles, le ministère de l'Intérieur (Department of the Interior) des États-Unis a mis au point un modèle. Il s'agit du NRDAM/CME, modèle d'évaluation des dommages aux ressources naturelles dans les milieux côtiers et marins (Natural Resource Damage Assessment Model for Coastal and Marine Environments). Ce rapport examine l'utilisation de ce modèle pour déterminer les réductions potentielles des captures de deux espèces commerciales prisées, la morue du Nord et la plie canadienne.

Le NRDAM/CME englobe en fait deux modèles : un modèle général de l'évolution physique (sort) et un modèle des effets biologiques des contaminants. Le modèle de l'évolution physique calcule la valeur probable moyenne de propagation et de dispersion des concentrations de contaminants toxiques dans l'eau et dans les sédiments. L'autre, celui des effets biologiques, prend alors ces concentrations et la durée d'exposition des oeufs et des larves afin de calculer la mortalité due à ces causes. Une autre composante, celle des pêches, permet ensuite d'estimer les répercussions finales futures sur les populations de poissons adultes et leurs prises.

Bien que sur le plan spatial, ce modèle ait été simplifié (courants, vents et répartitions biologiques uniformes), ce modèle traite de façon assez perfectionnée de l'altération et du sort des hydrocarbures déversés, de leur toxicité pour les larves et des réductions des captures auxquelles aboutissent les déversements. L'emploi de paramètres spatiaux simples permet d'exécuter rapidement le modèle sur un micro-ordinateur. Voici certains renseignements que requiert le modèle :

1. le nombre d'oeufs et de larves,
2. le volume et le type de déversement, ainsi que les caractéristiques chimiques du pétrole brut, notamment des fractions toxiques, et
3. les caractéristiques océanographiques et météorologiques propres au lieu en question (par exemple, profondeur et température de l'eau et direction des vents et des courants dominants).

Les données requises pour exécuter ce modèle proviennent de diverses sources. Les estimations des concentrations d'oeufs et de larves de poisson ont été tirées d'études icthyoplanctoniques réalisées, entre autres, dans le Grand Banc par Pêches et Océans. Les scénarios les plus probables ainsi que le pire (éruption et déversements discontinus à la surface et sous l'eau) proviennent du "Hibernia Environmental Impact Statement", préparé, en 1985, par la Mobil Oil Inc.

Afin d'évaluer la sensibilité des prévisions, de nombreuses simulations ont été faites avec diverses combinaisons précises de paramètres biologiques et physiques. Chacun des scénarios a été caractérisé par les valeurs attribuées aux paramètres suivants : abondance des oeufs et des larves de poisson (qui est maximale au printemps), saison (déterminant les températures de l'air

et de l'eau), vitesse et direction du vent, taille et persistance du déversement et toxicité des hydrocarbures. Les résultats de chaque passage de modèle sont présentés dans l'Annexe du rapport.

Dans tous les cas, les prévisions du nombre d'oeufs et de larves tués et de la réduction totale ultérieure des captures étaient directement proportionnelles à l'abondance théorique des oeufs et des larves. Les répercussions sur la morue étaient trois fois plus importantes que les effets sur la plie. Cependant, les chiffres mêmes révèlent que les incidences sur la pêche commerciale seraient négligeables. Dans le pire scénario (éruption de 90 jours, à un débit quotidien maximal de jaillissement, en été), les réductions totales de morue et de plie seraient respectivement de 21 et de 7 tonnes métriques, ce qui ne représente que 0,02 % des prises annuelles totales des deux espèces dans le Grand Banc, selon les statistiques de l'OPANO. Si l'un des pires déversements possibles d'un pétrolier se produisait au printemps, au moment où l'abondance des larves est à son maximum, les réductions globales des prises de morue et de plie seraient respectivement de 15,7 et de 6,1 tonnes métriques, à savoir 0,01 % des captures annuelles totales.

EXECUTIVE SUMMARY

The possible environmental impacts of development of the Hibernia oil field have been intensively studied in recent years. The detrimental effects of petroleum contamination on the rich fishing grounds of the Grand Banks of Newfoundland are of particular concern. ASA Consulting Ltd. has undertaken the task of quantifying the potential catch loss resulting from large oil spills.

To estimate natural resource damage from spills of oil and other hazardous substances a model has been developed for the United States Department of the Interior. The tool used is the Natural Resource Damage Assessment Model for Coastal and Marine Environments (NRDAM/CME). This report concerns itself with the application of this model to determine potential catch losses of two commercially important species, Northern cod and American plaice.

The model is made up of two components: a generalized physical fates model and a biological effects model. The physical fates model computes the average expectation of spreading, and dispersion of toxic concentrations in water and sediment. The biological effects component uses these concentrations and the duration of exposure of eggs and larvae to determine the resulting mortality. A fisheries component then estimates the ultimate impact on future adult fish populations and their harvesting.

This model, while simplified spatially (uniform currents, uniform winds, uniform biological distributions) is quite sophisticated in its treatment of oil spill weathering and fates and larval toxicity and resulting catch losses. The spatial simplification allows rapid execution on a microcomputer. Among the information supplied to it are the following:

1. Numbers of eggs and larvae;
2. Volume and nature of spill, as well as chemical characteristics of the crude oil, in particular toxic fractions;
3. Oceanographic and meteorological information specific to the locale in question, for instance water depth and temperature, and the direction of prevailing winds and currents.

The required information for this application has come from a variety of sources. Estimates of fish egg and larvae concentrations are available from ichthyoplankton surveys conducted on the Grand Banks by the Department of Fisheries and Oceans, among others. The most probable and also worst-case oil spill scenarios (surface and sub-sea blowouts and batch spills) are contained in the Hibernia Environmental Impact Statement, prepared by Mobil Oil in 1985.

To assess the sensitivity of the predictions many different simulations were carried out, each representing a specific combination of biological and physical conditions. Each scenario was characterized by the values assigned to the following parameters: abundance of fish eggs and

larvae (which is highest in the spring), season (determining air and water temperatures), wind speed and direction, size and time duration of the oil spill, and toxicity of the oil. The results of each model run are contained in the Appendix of this report.

In each case, the number of eggs and larvae killed and the subsequent total lost catch as predicted by the model were directly proportional to the assumed egg and larval abundance. The impact on cod was three times that of plaice. The numbers themselves suggest that the impact on the commercial fishery, however, would be negligible. In the worst-case situation (a 90 day blowout at the maximum daily flow rate, occurring in summer) the totals in lost catch of cod and plaice would be 21 and 7 metric tonnes respectively. These figures represent only 0.02% of the total annual Grand Banks catch for both species, based on NAFO statistics. If a worst-case tanker spill happened to coincide with the spring peak in larvae abundance, the totals in lost catch would be 15.7 and 6.1 MT for cod and plaice respectively, or 0.01% of the total annual catch.

INTRODUCTION

The objective of this study is to evaluate the potential effects of a major oil spill on Grand Banks commercial fish species as a result of hydrocarbon toxicity to eggs and larvae. The study uses background information developed for production and transportation studies for the Hibernia development project but, within the limits of the assumptions, the results are generally applicable.

To meet the objective, the study must answer the following questions. In the event of a major oil spill, can sufficiently high petroleum hydrocarbon concentrations result over a large enough area to cause significant egg and larval mortality? If so, will this increased mortality manifest itself in real problems in commercial fisheries and will these problems be observable against the natural variations in the fishery?

To address these questions, consideration must be given to the following issues:

1. the spatial and temporal distribution of the eggs and larvae of commercially important species;

2. the toxicity of petroleum hydrocarbons to eggs and larvae;

3. the potential spatial/temporal extent of hydrocarbon contamination resulting from a major oil spill; and

4. the effect of larval mortality on the fishery.

Integrating the above factors to estimate potential impacts is a complex problem that has received considerable attention in other geographical locations, particularly Georges Bank (French et al., 1989). On Georges Bank, model development has proceeded in stages and increased in sophistication over a period of 10 years (Reed and Spaulding, 1979; French et al., 1989). The model system which has evolved, and is still evolving, is very detailed in its treatment of the physical oceanography and transport of spilled oil and planktonic eggs and larvae.

The level of detail represented in the Georges Bank model is not required or possible for the present exercise. However, in a parallel effort to the location-specific Georges Bank work, a generalized physical fates and biological effects model has been developed. This model estimates the potential impact of chemical spills, including oil, on fish eggs and larvae and on future fish populations and catch. The model is very simplified spatially, in that it does not simulate detailed current patterns, etc., but is sophisticated in the treatment of oil spill fates and biological interactions. The spatial simplification allows the model to be developed as a general microcomputer application.

The model, which is referred to as the Natural Resource Damage Assessment Model for Coastal and Marine Environments (NRDAM/CME), was developed for the United States Department of the Interior to be used to estimate natural resource damages from spills of oil and hazardous substances under the 1980 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of the U.S. federal government. The components of the model are described in detail by Reed et al. (1989), Reed (1989), French and French (1989) and Feng et al. (1989).

The oil spill fates component of the model requires basic information about the volume and nature of the spill, the water depth, wind and currents at the site of the spill. When combined with database information on chemical characteristics, this is used to provide an average expectation of spreading, dispersion and resulting concentrations in the water and sediments. A summary of the physical parameters required by the model is presented in Table 1.

The biological effects component utilizes the concentration fields estimated by the fates model, toxicity data (from a chemical toxicity database) and an exposure model to estimate average concentration and time of exposure of eggs and larvae to oil fractions and the resulting mortality. The egg and larval mortality methodology is the same as that in the Georges Bank model (French et al., 1989) and considers the effect of variations in temperature, concentration and exposure time on mortality. The biological effects model then utilizes standard fisheries models to estimate impacts on future adult fish year classes and catch.

As designed, the NRDAM/CME uses a database of average values for biological and other environmental parameters, which are representative of large areas of the continental shelf. For the present project, the database is modified to represent estimates of the distribution of commercially important fish eggs and larvae on the Grand Banks and fisheries parameters for those species. The oil characteristic database is also modified to represent Hibernia crude oil. The model is run with input parameters representing various times and spill sizes and to determine the range of possible impacts. An attempt is made to represent worst-case spill scenarios and the uncertainty represented by the parameterizations.

The report is roughly divided into two parts. The first part consists of a review of relevant data, specific to the Grand Banks and Hibernia, resulting in a synthesis of appropriate scenarios and parameterizations for model runs. The second part is the results of the model runs and impact analysis.

Table 1 Physical Parameters for Fates Model

Water depth (m)

Is there a pycnocline? If so, depth of pycnocline.

Mean ocean (residual) current (m/sec).

Tidal velocity (maximum amplitude) parallel and perpendicular to mean ocean current axis (m.sec).

Mean wind speed (m/sec).

Mean wind direction (degrees, counter-clockwise from the ocean current that the wind blows toward).

Air temperature.

Density of water: upper water column (above pycnocline)
lower water column (below pycnocline)

Distances to land or study area boundaries from spill site in +x, -x, +y and -y directions. (Mean ocean currents in +x direction).

METHODS

Fish Egg and Larvae Concentrations

Between 1980 and 1981, a comprehensive ichthyoplankton survey was conducted on the Grand Banks as part of the Hibernia offshore oil and gas development project (Bonnyman, 1981). Stations throughout the Banks were sampled twice a month for an entire year.

The Bonnyman study provides the only complete data set of ichthyoplankton for the Grand Banks. The Department of Fisheries and Oceans (DFO) has concentrated efforts on the Flemish Cap, east of the Grand Banks. The ichthyoplankton assemblages are different in the two areas.

DFO has conducted some sampling on the Grand Banks, but the surveys were limited in duration. In June-July, 1983, ichthyoplankton was collected in the southern Banks, however, that information has not been published. Small yellowtail flounder larvae dominated at that time of the year. On the southeast shoal, larval studies directed at capelin have been conducted in September or November for the period, 1986-1989 (J. Anderson, DFO, St. John's, Nfld., pers. comm.).

Surveys for the Hibernia study (Bonnyman, 1981) were conducted between March 1980 and February 1981 using bongo, ring and neuston nets. Both bongo and ring nets yielded information on egg and larval concentrations in the water column (Bonnyman, 1981). Natural variability in ichthyoplankton composition was high, both temporally and spatially. Subsamples of the original tows were analyzed for the report and subsample selection may have contributed to this variability. The study documented the ichthyoplankton community during a one year period and, therefore, does not describe variations from year to year.

Fish Eggs

Both eggs and larvae were found throughout the year although neither were abundant during the winter. Eggs were abundant before larval levels peaked. Eggs of flatfish (yellowtail flounder, *Limanda ferruginea* and American plaice, *Hippoglossoides platessoides*) accounted for greater than 65% of all eggs collected (Table 2). Plaice eggs were abundant from April to July, with peak abundance in late May, when survey mean concentrations were approximately 90/1,000 m^3. Yellowtail flounder eggs became common later in the year, between June and August (Figure 1).

Cod (*Gadus morhua*) eggs were third most abundant, accounting for 5-6% of the total collected. Cod eggs were abundant between April and July, with a peak in late May of 12/1,000 m^3. The spatial distribution of cod and American plaice eggs at the time of their peak abundance is shown in Figures 2 and 3, respectively (for legend, see Figure 4). Capelin (*Mallotus villosus*) and sand lance (*Ammodytes* spp.) lay demersal eggs and, therefore, none were found in the planktonic tows.

Table 2 Fish Eggs on the Grand Banks

Species	*Mean # / 1000 m^3*	*Per Cent of Total*
Yellowtail flounder	10 - 708	35 - 46 %
American Plaice	11 - 35	31 - 39
Atlantic cod	2 - 6	5 - 6
Witch flounder	0.6 - 2	1 - 2
Hake (*Urophycis*)	0.5	0.4 - 2
Atlantic cod or witch flounder	4 - 19	14 - 15
Other species	------	2

(Combined data from bongo and ring net samples)

Source: Bonnyman, S. 1981. Ichthyoplankton of the Grand Banks of Newfoundland. Consultant's report. Prepared by MacLaren Plansearch for Mobil Oil Canada.

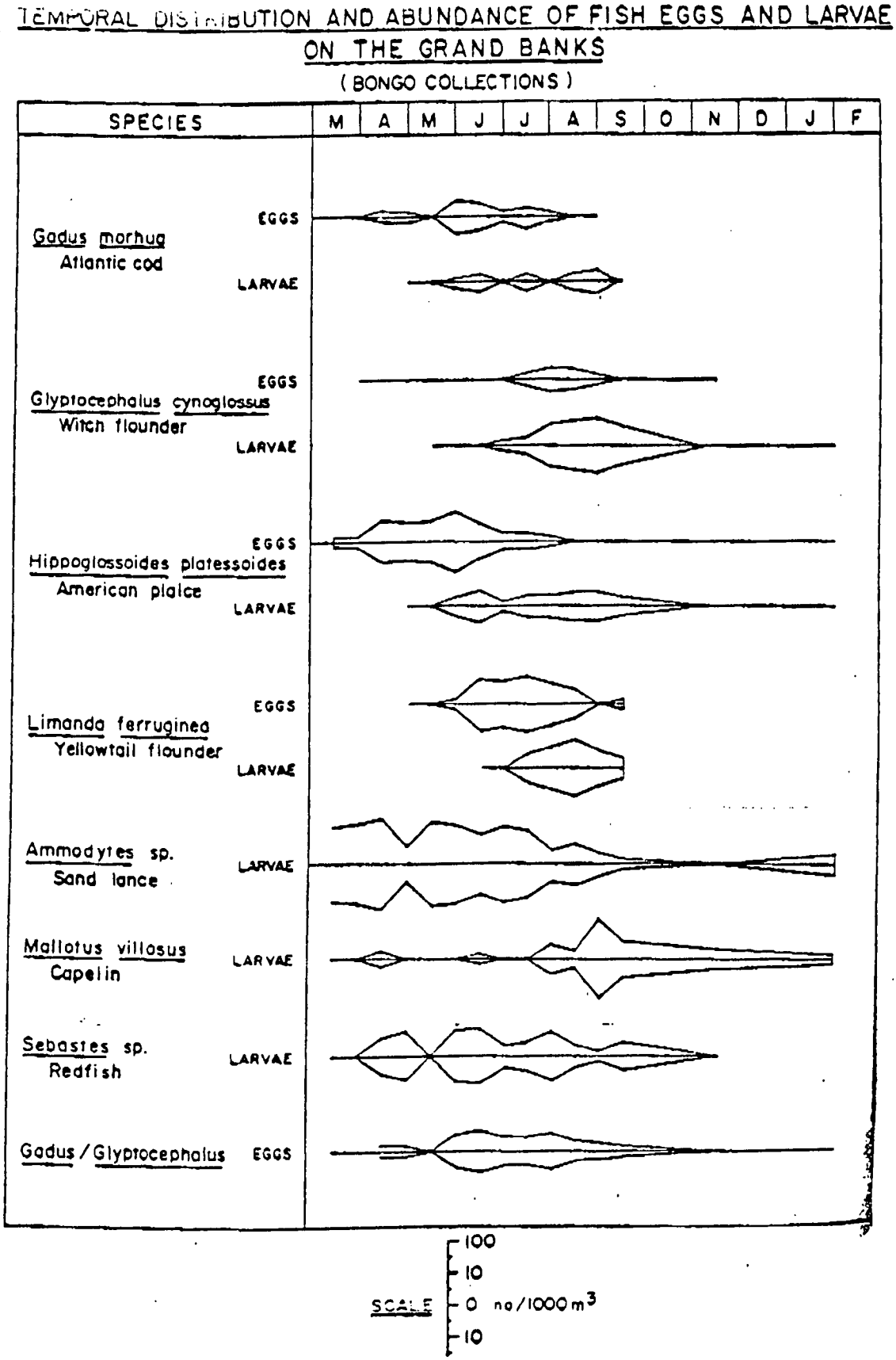
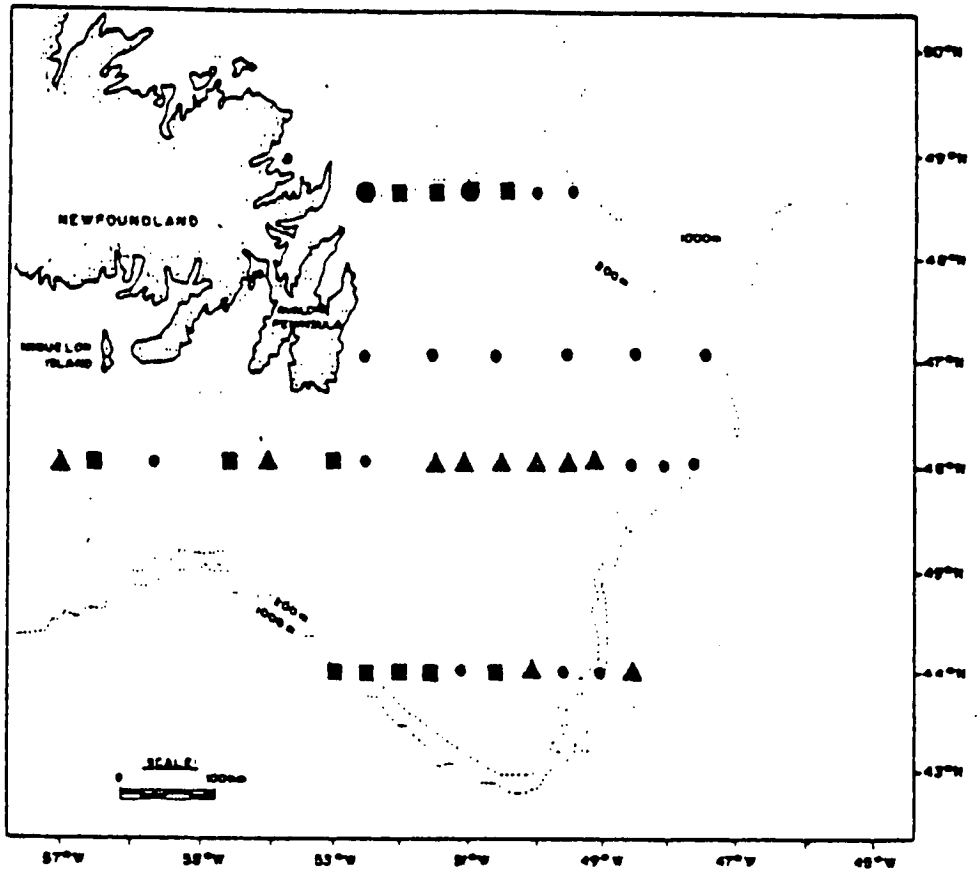
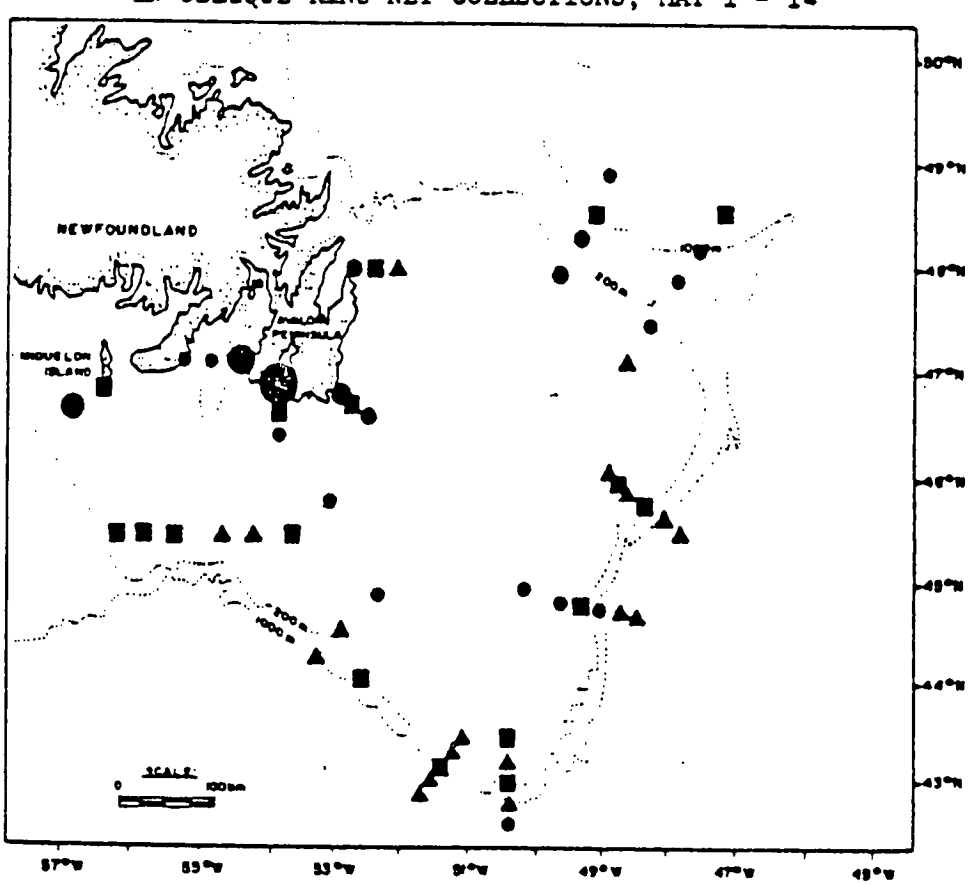


Figure 1 Temporal Distribution and Abundance of Fish Eggs and Larvae on the Grand Banks (Bonnyman, 1981)

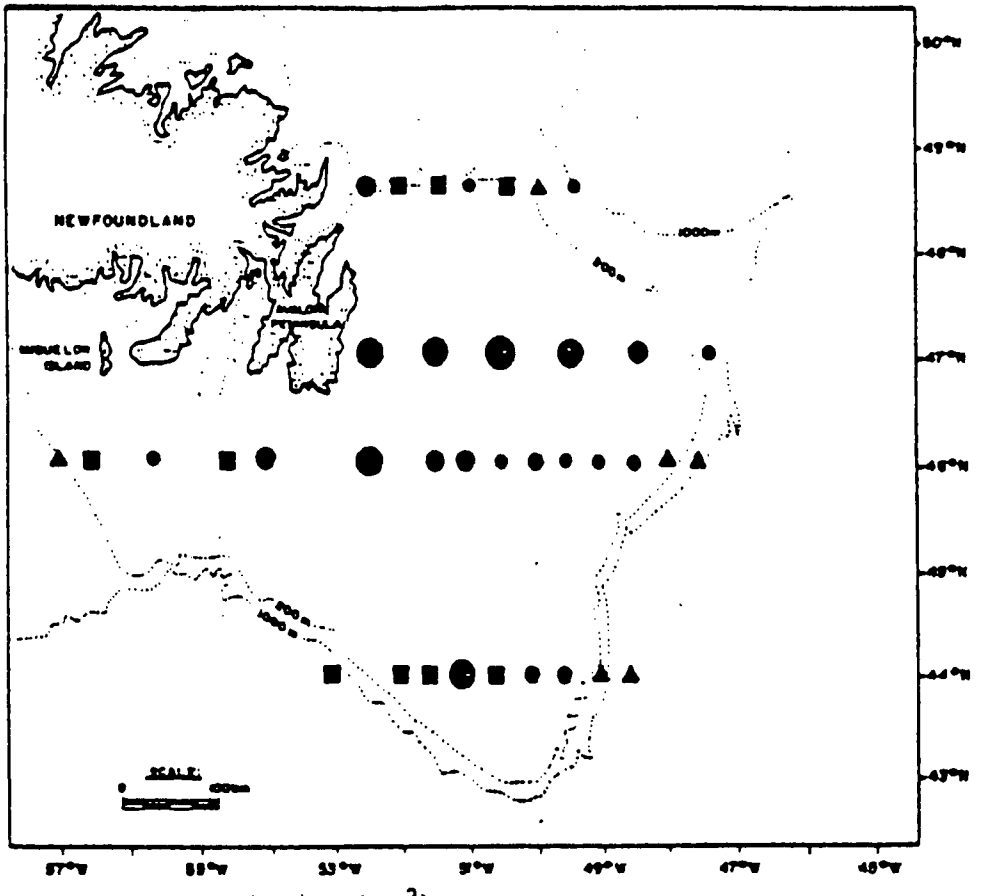


ABUNDANCE (NO/1000 m^3) OF ATLANTIC COD EGGS
IN OBLIQUE RING NET COLLECTIONS, MAY 1 - 14

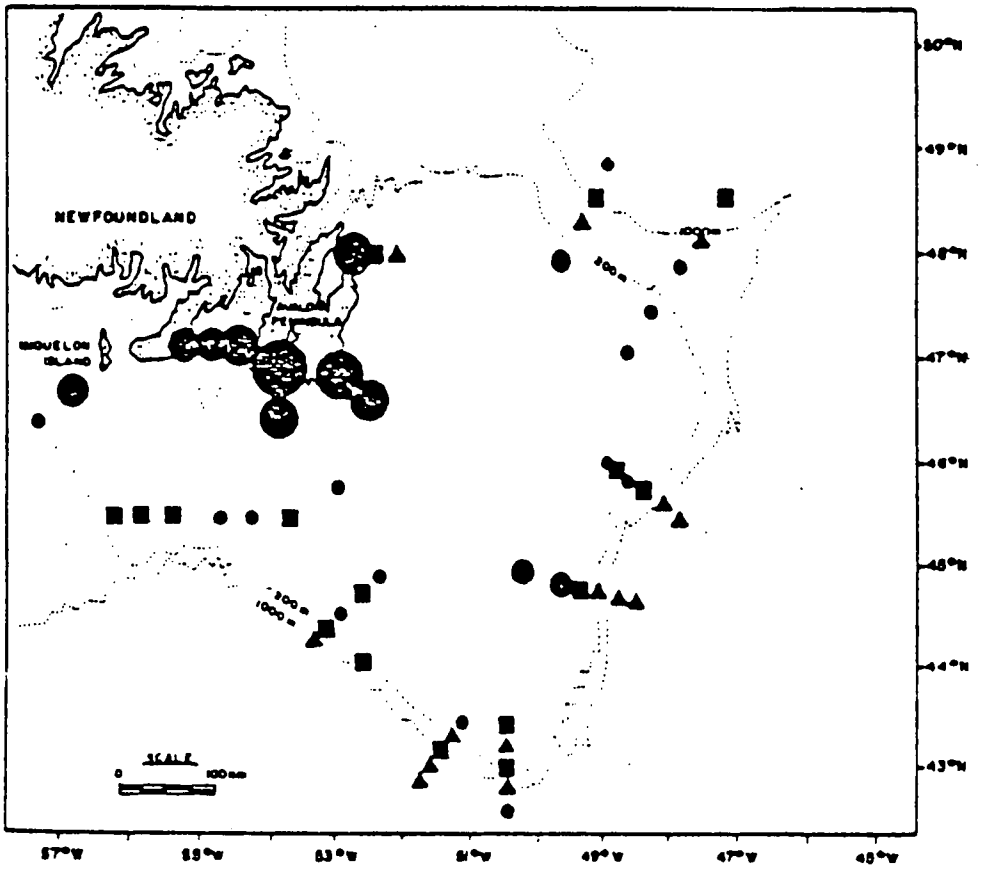


ABUNDANCE (NO/1000 m^3) OF ATLANTIC COD EGGS
IN BONGO A COLLECTIONS, MAY 15 - 30

Figure 2 Spatial Distribution of Cod Eggs at Peak Abundance



ABUNDANCE (NO/1000 m^3) OF AMERICAN PLAICE EGGS
IN OBLIQUE RING NET COLLECTIONS, MAY 1 - 14



ABUNDANCE (NO/1000 m^3) OF AMERICAN PLAICE EGGS
IN BONGO A COLLECTIONS, MAY 15 - 31

Figure 3 Spatial Distribution of American Plaice Eggs at Peak Abundance

Figure 4 Legend for Interpretation of Egg and Larval Maps

	BONGO A (NO/1000 m^3)	RINGNET (NO/1000 m^3)	NEUSTON (NO/TOW)
■	NOT SORTED	NOT SORTED	NOT SORTED
▲	NO EGGS FOUND	NO EGGS FOUND	NO EGGS FOUND
•	1-124	1-499	1-99
•	125-249	500-999	100-199
•	250-474	1000-2099	200-349
•	475-949	2100-4199	350-699
•	950-1899	4200-8499	700-1449
•	1900-3799	8500-18999	1450-2899
•	3800-7599	19000-37999	2900-4799
•	> 7600	> 38000	> 5800

LEGEND TO BE USED FOR INTERPRETATION OF LARVAL ABUNDANCE MAPS

	BONGO A (NO/1000 m^3)	RINGNET (NO/1000 m^3)	NEUSTON (NO/TOW)
■	NOT SORTED	NOT SORTED	NOT SORTED
▲	NO LARVAE FOUND	NO LARVAE FOUND	NO LARVAE FOUND
•	1-324	1-49	1-169
•	325-649	50-99	170-334
•	650-1299	100-249	335-669
•	1300-2524	250-499	670-1339
•	2500-5249	500-999	1340-2674
•	5250-10499	1000-2049	2675-5349
•	10500-20999	2050-4099	5350-10699
•	> 21000	> 4100	> 10700

Fish Larvae

Sand lance dominated the fish larvae, accounting for over 60% of what was collected (Table 3). Cod, while commercially important, constituted only 1-2% of the ichthyoplankton averaged throughout the year. Based on ring net collections, cod larval abundance peaked in June and July but the mean of all stations did not exceed eight per 1,000 m^3 .

American plaice and yellowtail flounder were both common during the summer. Abundance of American plaice larvae peaks in May and June with survey-averaged values of approximately 17/1,000m^3 . The spatial distribution of larval cod and American plaice at the time of their peak abundance is given in Figures 5 and 6, respectively.

Stock Assessments

The latest assessments for Northern cod (2J3KL), Grand Banks cod (3NO), and Grand Banks American plaice (3LNO) are presented in Tables 4, 5 and 6, respectively. Stock assessment is an imprecise science, so values of natural (M) and fishing mortality (F) are at best rough estimates.

The mortality estimates, ages at full recruitment and life spans given in Tables 5 and 6 were assumed for the cod and plaice population models for the sensitivity runs which will be discussed in a later section.

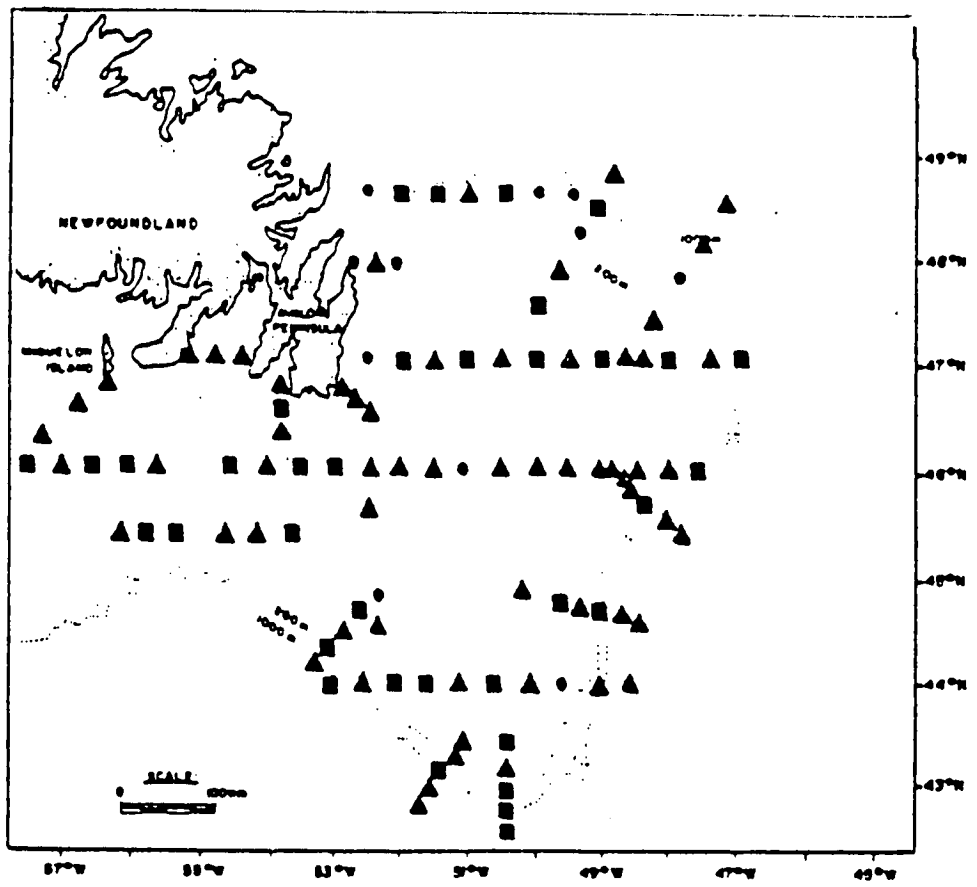
The weight versus length relationship has the form $w_t = aL_t^b$ where w_t and L_t are weight and length respectively at time t and parameters a and b as reported in Table 5 were assumed for cod. For plaice, data provided by Brodie (1985) were used to estimate the weight versus length parameters. For length versus age, the parameters already present in the NRDAM/CME database for cod and for flatfish (sole) were assumed.

Table 3 Fish Larvae on the Grand Banks

Species	*Mean # / 1000 m^3*	*Per Cent of Total*
Sand lance	154 - 188	61 - 65 %
Redfish	12 - 39	6 - 12
Capelin	3 - 21	1 - 9
American Plaice	4 - 17	1 - 6
Yellowtail flounder	6 - 11	2 - 4
Witch flounder	5 - 8	1 - 3
Atlantic cod	2 - 8	1 - 2
Other species	-----	12 - 13

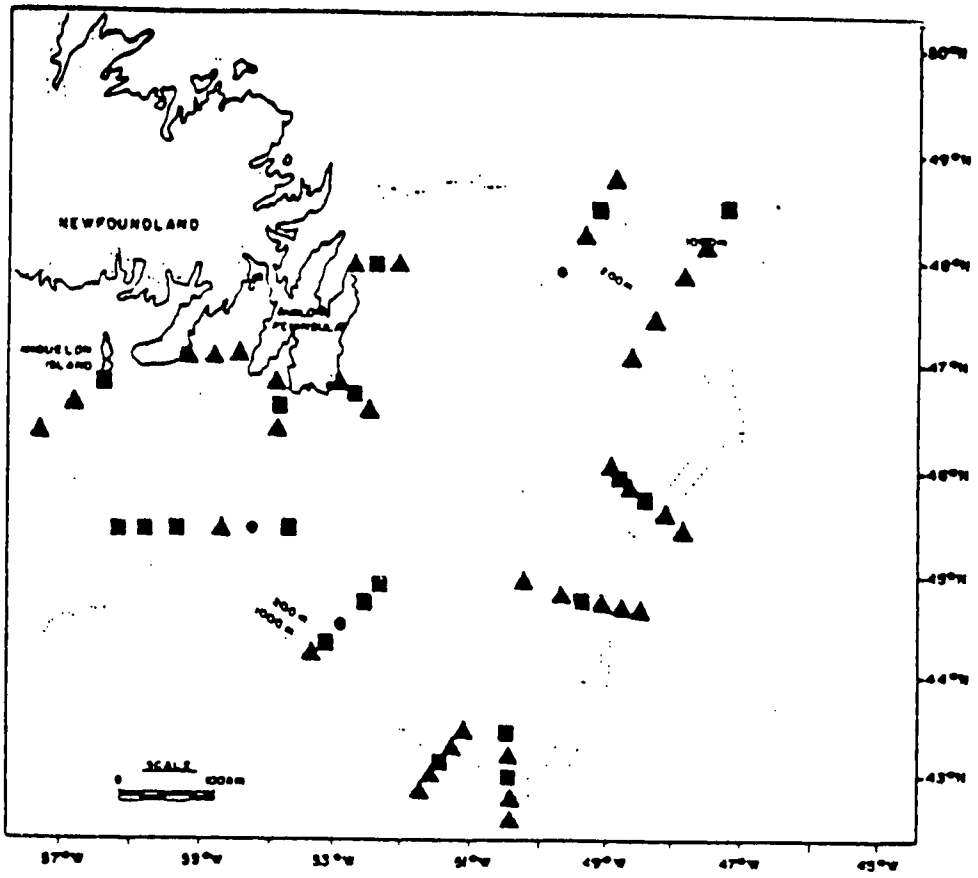
(Combined data from bongo and ring net samples)

Source: Bonnyman, S. 1981. Ichthyoplankton of the Grand Banks of Newfoundland. Consultant's report. Prepared by MacLaren Plansearch for Mobil Oil Canada.



ABUNDANCE (NO/1000 m^3) OF ATLANTIC COD LARVAE
IN BONGO A COLLECTIONS, JULY

Figure 5 Spatial Distribution of Larval Cod at Peak Abundance



ABUNDANCE (NO/1000 m^3) OF AMERICAN PLAICE LARVAE
IN BONGO A COLLECTIONS, MAY 15-31

Figure 6 Spatial Distribution of Larval American Plaice at Peak Abundance

Table 4 Parameter Estimates for Northern Cod (NAFO Divisions 2J and 3KL)

Parameter	*Value*	*Reference*
Adult natural mortality	0.20/yr (assumed)	Baird and Bishop (1989 a)
Adult fishing mortality	0.436[1]/yr	Baird and Bishop (1989 a)
Age at recruitment		
partial	3 years	Baird and Bishop (1989 a)
full	8 - 10 years	Baird and Bishop (1989 a)
Life span	23 years	Baird and Bishop (1989 a)

[1] Fishing mortality was averaged. Terminal fishing mortality may range from 0.10 / year (full commercial catch series) to 0.57 / year (research vessel series).

Table 5 Parameter Estimates for Cod on the Grand Banks (NAFO Division 3NO)

Parameter	*Value*	*Reference*
Adult natural mortality	0.20/yr (assumed)	Baird and Bishop (1989 b)
Adult fishing mortality	0.36/yr	Baird and Bishop (1989 b)
Age at recruitment		
partial	3 years	Baird and Bishop (1989 b)
full	7 years	Baird and Bishop (1989 b)
Life span	19 years	Baird and Bishop (1989 b)
Weight versus length		
a	0.0055	Baird and Bishop (1989 b)
b	3.09	Baird and Bishop (1989 b)

Table 6 **Parameter Estimates for American Plaice on the Grand Banks (NAFO Divisions 3LNO).**

Parameter	*Value*	*Reference*
Adult natural mortality	0.20/yr (assumed)	Brodie and Bowering (1989)
Adult fishing mortality	0.5[1]/yr	Brodie and Bowering (1989)
Age at recruitment		
partial	5 years	Brodie and Bowering (1989)
full	12 years	Brodie and Bowering (1989)
Life span	19 years	Brodie and Bowering (1989)

[1] Based on commercial data for age 12+ plaice. Trends in residuals were not acceptable using younger fish. Using research vessel data, the calculated terminal fishing mortality (0.9) was unrealistically high.

Petroleum Hydrocarbon Toxicity to Fish Eggs and Larvae

The toxicity algorithms used by the model are fully described in French and French (1989) and French et al., (1989, Section 5). The toxicity model accounts for the direct effects of acute toxicity, i.e. mortality resulting from exposure of up to a few days or a week. The toxicity model does not account for chronic (long-term, sub-lethal) effects which would result from continuous releases of oil over long periods of time.

The acute toxicity model calculates the fraction of individuals, in this case eggs and larvae, which would be expected to die based on concentration, time of exposure and temperature. At a given temperature and time of exposure, the mortality percentage is a log-normal function of concentration. The concentration at which 50% would be expected to die is the standard acute criteria, the LC_{50} . Based on observations, the fraction dying at 1% of the LC_{50} is about 1% of the individuals exposed (French and French, 1989).

The LC_{50} and, hence, the entire curve of mortality versus concentration, changes with both temperature and time of exposure. An empirical relationship where LC_{50} is a log-linear relationship to temperature, is assumed in the model. The relationship was developed by U.S. Environmental Protection Agency researchers (French and French, 1989).

LC_{50} decreases with increasing time of exposure; i.e., an individual can withstand certain concentrations for a short period of time but will eventually be affected as exposure time increases. The bulk of the observed data indicates that the relationship is a log-log one (French and French, 1989). However, for most organisms and chemicals, mortality occurs within the first four days of exposure. Thus, if an individual can withstand the exposure for 96 hours, it tends to be able to withstand it indefinitely, with respect to mortality at least. Therefore, the worst case exposure, in terms of concentration, over any consecutive four-day period determines mortality in the model (French and French, 1989).

The model also accounts for the fact that the various components of oil have varying solubilities, evaporative rates and toxicities. The toxic component of petroleum products is considered to consist primarily of the aromatic fraction, sometimes quantified as the monoaromatic fraction (benzenes, toluenes, xylenes). A number of researchers have observed that the aromatics are the most toxic component (NRC, 1985; Rice et al., 1983; Rice, 1985). While the diaromatic hydrocarbons (napthalenes) are more toxic on a concentration-specific basis (mg/l), they are much less soluble than the monoaromatics and, thus, typically represent a smaller proportion of the toxic impact on exposed animals (Anderson, 1985; Anderson et al., 1987; NRC, 1985; Neff and Anderson, 1981).

The concentrations predicted by the oil spill fates model must be for the same fraction of oil as was measured in producing LC_{50}s used by the toxicity model. Most LC_{50}s are reported either for

the water soluble fraction of oil as total hydrocarbons or for total aromatic hydrocarbons (TAH). Therefore, it is clear that the best indicator of toxic concentration of oil would be the aromatic hydrocarbon concentration. Thus, the oil spill fates model output generates TAH concentrations which are used by the toxicity model. Although this fraction varies with the type of oil, the toxicity of the oil and its water soluble fraction is functionally related to TAH concentration (Rice et al., 1979; Anderson et al., 1987).

This approach, however, does not eliminate an appreciable inter-experimental variability. There are a variety of approaches for measuring TAH concentrations in water and many variations in experimental protocol which make it difficult to compare experimental results from different laboratories (Anderson et al., 1987; Capuzzo, 1987; Rice et al., 1979). Nevertheless, using TAH concentrations should give significantly more repeatable results than work which assumes that the entire water soluble fraction is toxic.

The toxicity model requires as input LC_{50} (the lethal concentration for 50% of an experimental population) data for known times and temperatures of exposure. The time-dependence of the bioassay is quite variable between species and life stages (Rice et al., 1986). Bioassay temperature, unfortunately, is frequently ignored in some experimental literature, but is also an important variable. It is widely cited that larvae are appreciably more sensitive than adults by as much as an order of magnitude (Rice et al., 1986; Kuhnhold, 1978; Hyland and Schneider, 1976).

However, the variation in an organism's sensitivity is not a simple function of age. Eggs may be highly sensitive at certain stages becoming less sensitive prior to hatching (Kuhnhold, 1978; Rice, 1985), while larval sensitivity varies with yolk sac and feeding conditions (Rice et al., 1986).

The available data for LC_{50}s upon exposure to oil hydrocarbons (the water soluble fraction) for eggs, larvae and adult fish have been reviewed by the National Research Council (1985), Hardie et al. (1986) and by Seakem Oceanography Ltd. (1987). These reviews indicate LC_{50}s as total aromatic hydrocarbons or as water soluble fractions ranging over three orders of magnitude. Rice et al. (1979, 1983) tested several Alaskan fish species (adults) and reported LC_{50}s for 96 hours of exposure ranging from approximately one to 12 ppm total aromatic hydrocarbons at 4-8° C. Pelagic fish (adults and juveniles) were most sensitive, with LC_{50}s at 1-3 ppm total aromatic hydrocarbons.

These data were averaged and standardized to 25° C, and corrected for the static conditions of the bioassay, to be used in the NRDAM/CME toxicity model (Economic Analysis and Applied Science Associates, 1987; French and French, 1989). The 25° C mean LC_{50}, corrected as noted, for adult fish is 130 ppb total aromatic hydrocarbons. Based on larval data, French and French (1989) estimated a 25° C, 96 hour LC_{50} for eggs and larvae of 14.3 ppb TAH.

This estimate seems conservative by comparison with other data such as the reviews mentioned previously. It may seem especially conservative considering the results of recent studies on cod

eggs and larvae which suggest that they may tolerate (survive) much longer periods than 96 hours at higher levels of TAH (Goksoyr et al., 1988; Scrigstad and Adoff, 1985; Tilseth et al., 1984). However, these same studies show that sub-lethal effects, not quantified by the model, are detectable in these eggs and larvae at significantly lower levels.

Paine et al. (1988) observed lethal effects on capelin eggs and larvae at a threshold of about 2.5 ppm as water soluble total hydrocarbons and concluded that sub-lethal effects would be expected at much lower concentrations. It also should be noted that the hydrocarbon concentrations measured in all these studies are not directly comparable. Thus, the 14.3 ppb criterion seems reasonable as a conservative estimate and will be used in this model.

It should be noted that the 14.3 ppb LC_{50} value is for 25° C. At the temperatures on the Grand Banks, which are one tenth that value, the LC_{50} is approximately 10 times higher (about 140 ppb as total dissolved aromatic hydrocarbons). Sensitivity of the results to the value assumed for the LC_{50} will be examined with the model.

Potential Oil Spill Scenarios

The environmental impact of an oil spill depends on the oil type, the environmental conditions and colocation of the spilled oil in space and time with sensitive species. A significant amount of work on the development of likely scenarios has been done by Mobil Oil Canada Ltd. and is reported in the Hibernia Environmental Impact Statement (EIS) and supporting documents. This and other relevant work is reviewed here.

Background

Environment

The site of the proposed Hibernia development is located on the northeast corner of the Grand Banks, latitude 47-48° N, longitude 48-49° W. The water depth is, on average, less than 80 m, increasing rapidly to more than 1,000 m to the north and east. The Labrador Current is diverted into two current streams by the shape of banks and channels. By comparison with the Labrador current, the current flow over the Hibernia area is weaker and has more variable mean velocity; the prevailing currents are to the south and south-west with speeds of 2-15 cm/s. The Labrador Current has a greater effect on Hibernia during the winter than other seasons (see Figures 7 and 8 for maps depicting the area in question and the principal currents).

The tides at the Hibernia site are dominated by the lunar semi-diurnal constituent (M_2) and show only weak depth dependence. A representative tidal current ellipse for the whole water column (Petrie, 1982) can be described by a major axis amplitude of 0.10 m/s oriented at 100° T, approximately across the isobath, and a minor axis amplitude of 0.06 m/s. This is typical of tidal

Location of the Study Area

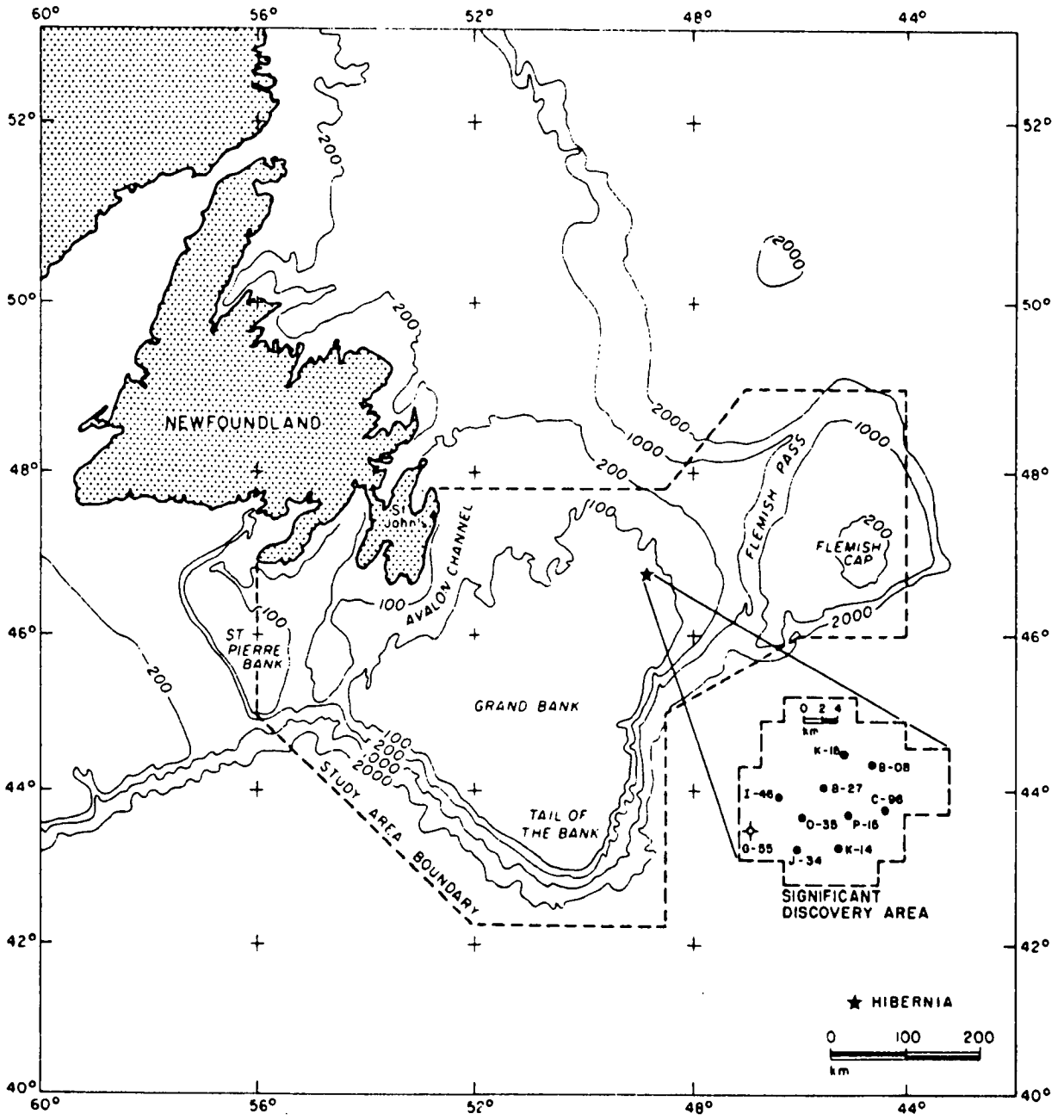
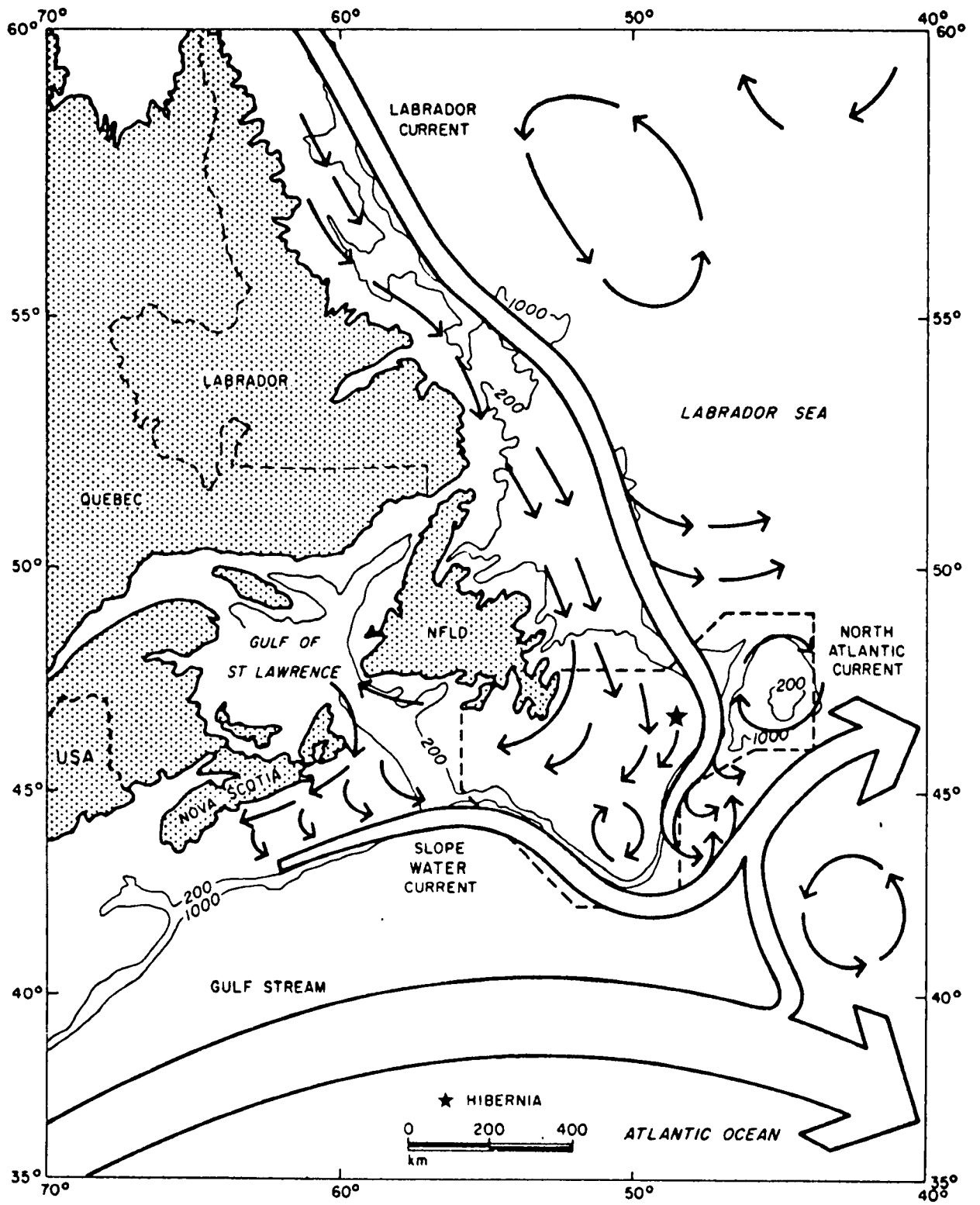


Figure 7 Hibernia and Grand Banks Area (Mobil Oil Canada Ltd., EIS Vol IIIb, 1985)

Surface Currents; Offshore Newfoundland



Source: Petrie and Anderson (1983).

Figure 8 Surface Currents; Offshore Newfoundland (Mobil Oil Canada Ltd., EIS Vol IIIb, 1985)

currents along the edge of the bank, with maximum currents oriented approximately across the isobath.

The winds during the winter are predominantly from the west with speeds in excess of 10 m/s, 50% of the time. In the summer, the winds are, on average, from the southwest and are of lesser speed. Figures 9 and 10 show seasonal wind speed and direction, statistics obtained from the AES Marine Statistics system and reports in Mobil, 1985. Surface water temperature varies from a maximum of 12 to 14° C in August to a winter minimum of -1 to 0° C.

The water column on the Grand Banks is seasonally stratified. The mean monthly density profiles (Figure 11) indicate that there is little stratification for six months of the year (January to June), for which a representative density is σ_t = 26.5. Stratification is most intense in September when the difference in density from top to bottom can be 2.5 σ_t units. These seasonal density changes occur principally in the upper water column, with water below 60 m depth having a relatively constant and uniform density.

Hibernia Project

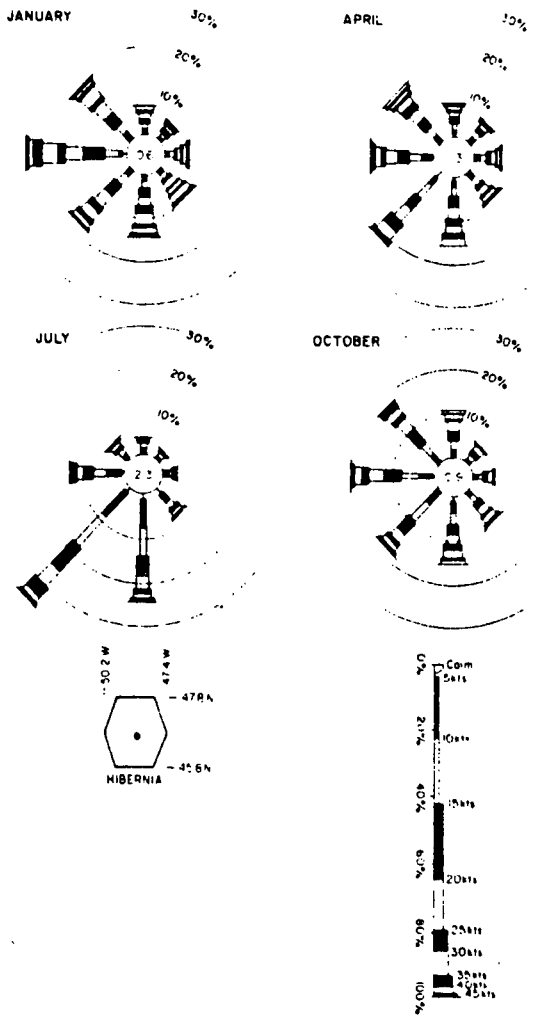
In the Hibernia Environmental Impact Statement, prepared by Mobil Oil in 1985, it is implied that drilling and production will be carried out throughout the year once production systems are in place. Installation of some subsea equipment will be confined to appropriate weather windows.

Mobil estimates that three shuttle tankers with a dead weight of 120,000 dwt and a cargo capacity of 135,000 m^3 will be used to transport crude oil from the Hibernia drilling sites. These tankers will operate year-round, making approximately 2-3 trips per week. The intended delivery points are Quebec City, Saint John, N.B., Halifax/Dartmouth, N.S., and Portland, Me. Also under consideration are Come-By-Chance, Nfld., and Point Tupper, N.S.. It is assumed that the crude being transported to refineries in Eastern Canada will displace foreign imports, resulting in no net increase in the amount of crude shipped to these ports.

The tankers to be built will be similar in size to those currently being used on the east coast, but will be specially designed to withstand the harsh environmental conditions of the Hibernia site. The tankers will have increased structural strength which should allow them to withstand collisions with iceberg pieces of 1,000 tons in size, while sustaining little or no structural damage. The tankers will also have separate ballast and internal cargo tanks which will effectively act as a double hull.

Mobil states in the EIS that shuttle tankers will use the regular shipping lanes but, in order to reach them, must traverse the Grand Banks. The proposed tanker routes are shown in Figure 12. According to Coast Guard records, up to 250,000 tons of crude per month, on average, passed over the Grand Banks in 1984, and some of it near the Hibernia location. It should be noted, however, that existing traffic is often diverted farther south of the Grand Banks during the winter months.

Seasonal Wind Roses for Hibernia MAST Region



Source: Canada, Department of Environment, AES (1975).

Figure 9 Seasonal Wind Velocity and Direction (Mobil Oil Canada Ltd., EIS Vol IIIa, 1985)

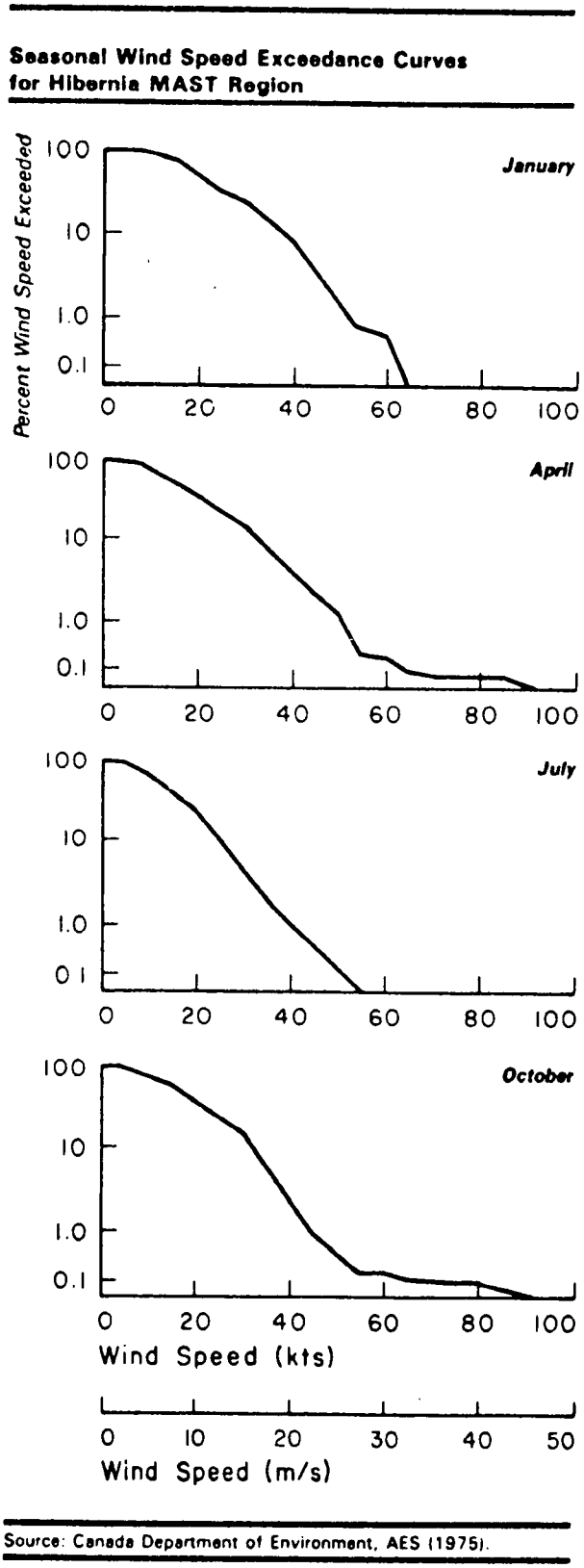


Figure 10 Seasonal Wind Speed Exceedence Curves (Mobil Oil Canada Ltd., EIS Vol IIIa, 1985)

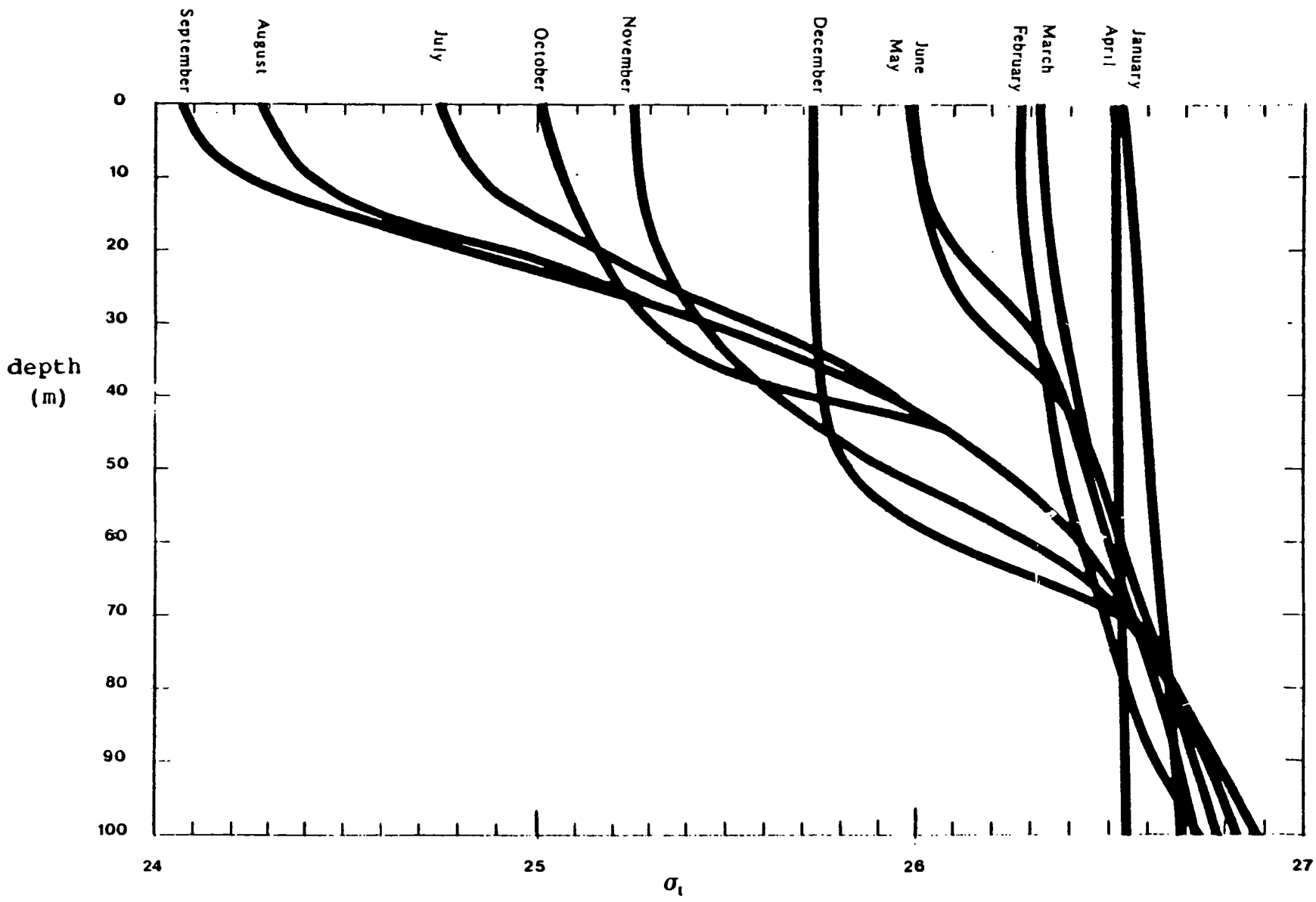


Figure 11 Mean Monthly Density Stratification near Hibernia , Interpreted from Keeley (1981)

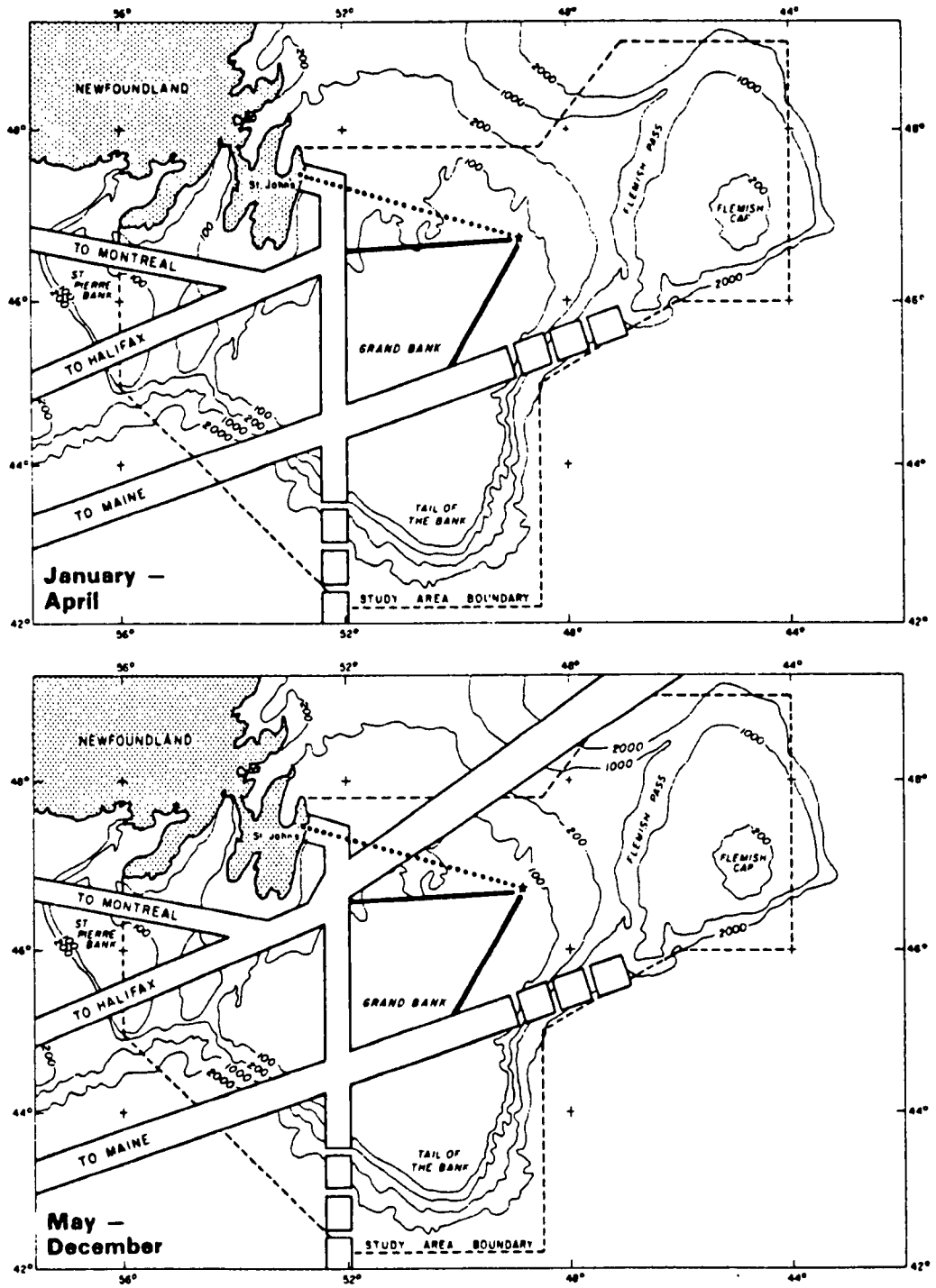


Figure 12 East Coast Shipping Routes (Mobil Oil Canada Ltd., EIS Vol IIIb, 1985)

Characteristics of Hibernia Crude Oil

Hibernia crude is comparable to Bunker C in that it becomes very viscous at a temperature of 0° C. A discussion on the chemical composition of the crude can be found in S.L. Ross and D. Mackay (1988). Hibernia crude has the unusual characteristics of low density, high pour point and high wax content. The report also contends that Hibernia crude oil displays unusually slow weathering characteristics, including slow evaporation in cold water. Laboratory studies have shown that the crude forms a stable emulsion (mousse) with a water content of up to 80% within a few hours of the spill, particularly in rough seas. This leads to a five- to 10-fold increase in slick volume and alters the rates at which it disperses and evaporates. The mousse has a density range of from 980 to 1,010 kg/m^3 which is lower than that of seawater, making it unlikely that the slick would migrate as a coherent sub-surface mass. The emulsion is, however, resistant to natural dispersion.

In terms of quantifying the physical properties of a typical Hibernia oil, the picture is somewhat confused, presumably due to the variations in properties of oils from different formations in the Hibernia area. S.L. Ross (1984) lists properties of an Avalon and a Hibernia crude, with the Avalon being the heavier, more viscous oil. The most recent available information (Bobra, 1989) lists an Avalon crude apparently identical to the Hibernia crude from the S.L. Ross (1984) report and a heavier, much more viscous crude for Hibernia crude. This latter crude would meet the description in S.L. Ross (1984), exhibiting very high viscosity at low temperatures and weathering very slowly. The slow weathering would also minimize impacts on fish. In the interest of providing a worst case impact analysis represented by the most oil dispersed into the water column, the properties of the Avalon crude from Bobra (1989) have been assumed for all simulations. The resulting input information is presented in Table 7.

Table 7 Characteristics of Crude Assumed for Model Runs

AVALON CRUDE	as light crude	
SRFTEN	26.0	surface tension (dynes/cm)
AR2FRC	0.04	aromatic fraction of oil, mol. wt > 100
AR1FRC	0.045	aromatic fraction of oil, mol. wt < 100
THKMIN	1×10^{-5}	minimum slick thickness (m)
VOLFRC	0.265	fraction of oil which is volatile
VISCUS	1.05	viscosity, centipoise
VISA	-68.92	factors for computing change in
VISB	20,551	viscosity with temperature
MOLWT	160	molecular weight (grams/mole)
DENSTY	0.844	density (g/cm^3)
SLBLTY	17.0	solubility (µg/l)
VAPPRS	0.005	vapour pressure (atm)
DEGRDW	0.001	degradation rate in water (per day)
DEGRDS	0.0001	degradation rate in sediments (per day)
KOC	860.2	adsorbed-dissolved partition coefficient
THRSLD	0.08099	toxic effects threshold at 30° C (ppb)
LC50(4)	14.3	ppb
	143.0	
	1,430.0	

Spill Volumes and Rates of Discharge

Blowouts

Based on knowledge of the Hibernia reservoir and on experiences from operations elsewhere in the world, Mobil estimates that a subsea blowout would discharge 318 m^3 /day for a duration of five days. This is the "average" or most probable case. A worst case, or least likely, scenario is 4,800 m^3 /day over 90 days. These figures are based on the length of time required to effect control procedures, for instance, drilling a relief well.

Mobil has considered only single well blowouts in the EIS because of planned safety control mechanisms which would be activated to prevent multiple-well problems in the event of an emergency. A blowout could occur either at the surface or at the seabed. The estimated volumes and durations are the same in either case. These spill parameters have been criticized as being optimistic, however, no alternative values were proposed.

Batch Spills

Batch spills can occur in a number of different ways during storage and transfer of the crude oil. They are considered by many to be a more likely occurrence than blowouts due to severe climatic conditions. Based on historical spill reports for tankers of the size range to be used at Hibernia, S.L. Ross (1984) gives the average and worst-case representative spill sizes as 9,000 m^3 and 30,000 m^3 , respectively. The average case flow is assumed to occur over 24 hours.

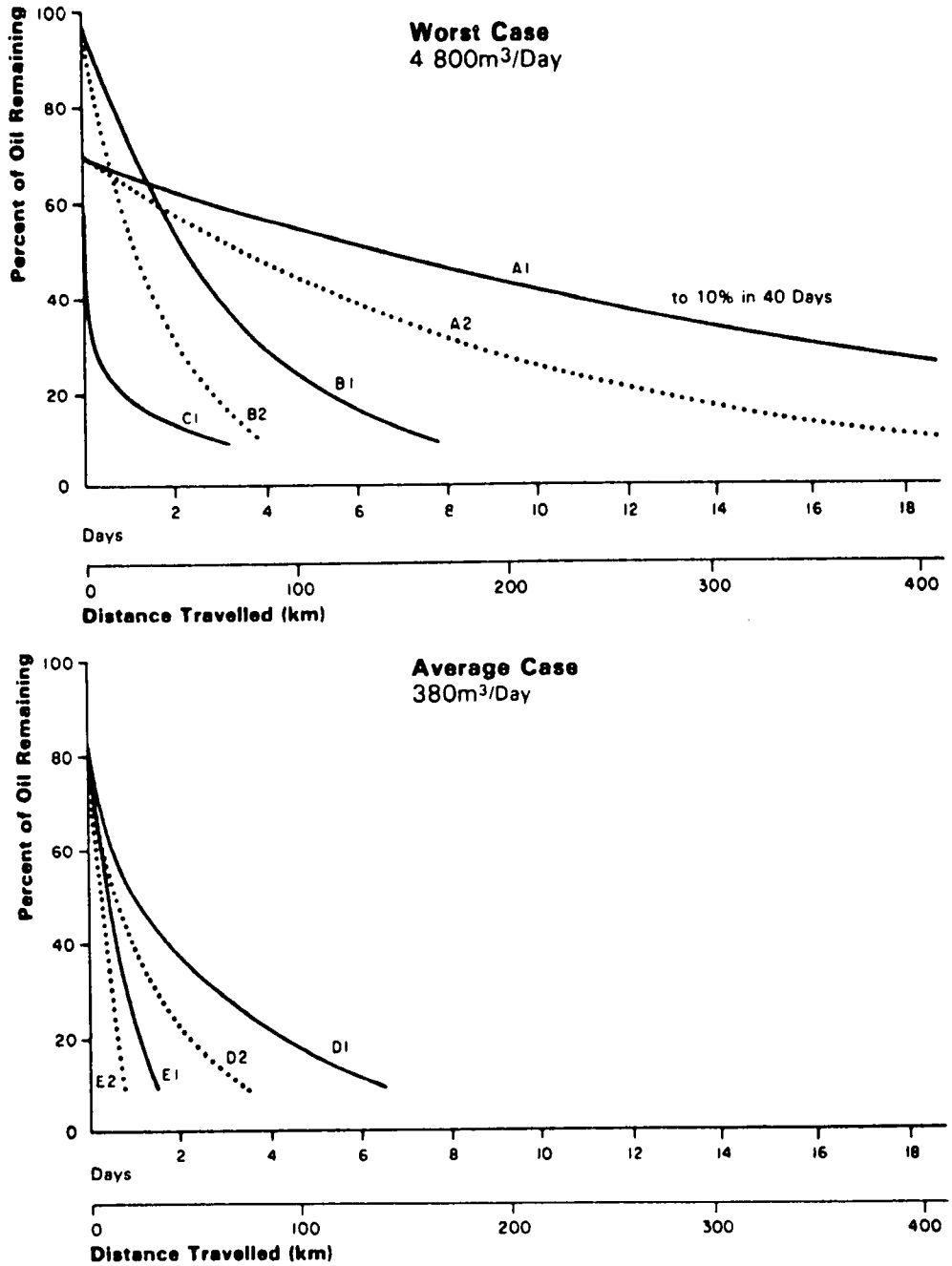
The worst-case event, with an estimated probability of one-in-30, would result from a severe collision or grounding and the rupture of at least two storage tanks with no damage control measures in place. It can be argued that the worst "worst-case" scenario would be the loss of the entire contents of the tanker, i.e., a volume of 135,000 m^3. However, it is stated (Mobil, 1985) that the proposed design of the tanker makes this highly unlikely.

Oil Spill Fates and Trajectories

While the NRDAM/CME computes the advection and weathering of the spilled oil to estimate water column hydrocarbon concentrations, it is instructive to review previous oil spill analyses to provide background for scenario development. This is particularly true due to the spatial simplification in the NRDAM/CME. Information about the slick trajectories can be used with larval density information to guide model parameter choice and to aid interpretation of the simplified trajectory information in the NRDAM/CME.

S.L. Ross (1984) has modelled the survival time of oil slicks under average physical conditions, such as sea state, temperature and winds, taking into account progressive changes in the characteristics of the oil brought about by emulsification, evaporation and dispersion. Figures 13 and 14 show the predicted survival time of blowout and batch spill slicks for the average and

Survival Time of Hibernia Blowout Slicks

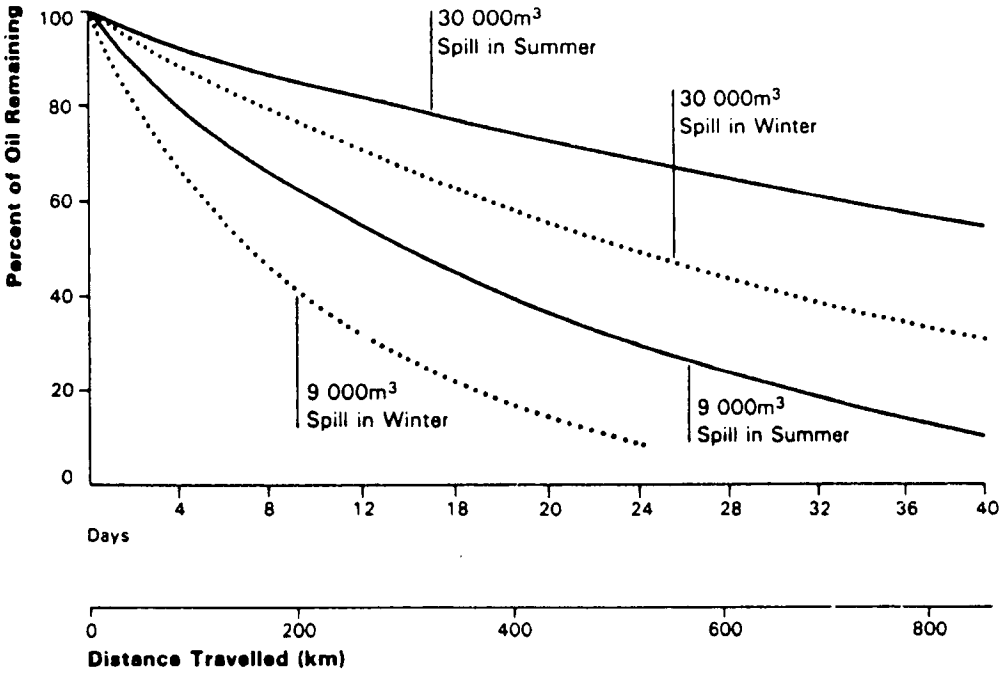


Legend	
A1 = Surface Blowout/Summer	D1 = Surface Blowout/Summer
A2 = Surface Blowout/Winter	D2 = Surface Blowout/Winter
B1 = Sub-sea Blowout/Summer	E1 = Sub-sea Blowout/Summer
B2 = Sub-sea Blowout/Winter	E2 = Sub-sea Blowout/Winter
C1 = Sub-sea Blowout/Summer; Oil Unemulsified until 4 hours	

Source: Ross (1984).

Figure 13 Persistence Time of Hibernia Blowout Slicks (Mobil Oil Canada Ltd., EIS Vol IIIb, 1985)

Survival Time of Hibernia Batch Spill Slicks



Source: Ross (1984).

Figure 14 Persistence Time of Hibernia Batch Spill Slicks (Mobil Oil Canada Ltd., EIS Vol IIIb, 1985)

worst cases. The greater thickness of slicks from surface blowouts, compared with subsurface blowouts, accounts for their greater life span. It bears mentioning that, in a worst case batch spill, 60% of the oil remains after 40 days, which is enough time for the slick to pass over the Southeastern Shoals and Flemish Cap areas.

In a surface blowout, a plume of oil and gases would spray up to an estimated height of roughly 50 m. The oil droplets are deposited on the sea surface within one kilometre of the blowout site. S. L. Ross (1984) estimates that 30% of the oil (mostly light aromatics) would be lost by evaporation.

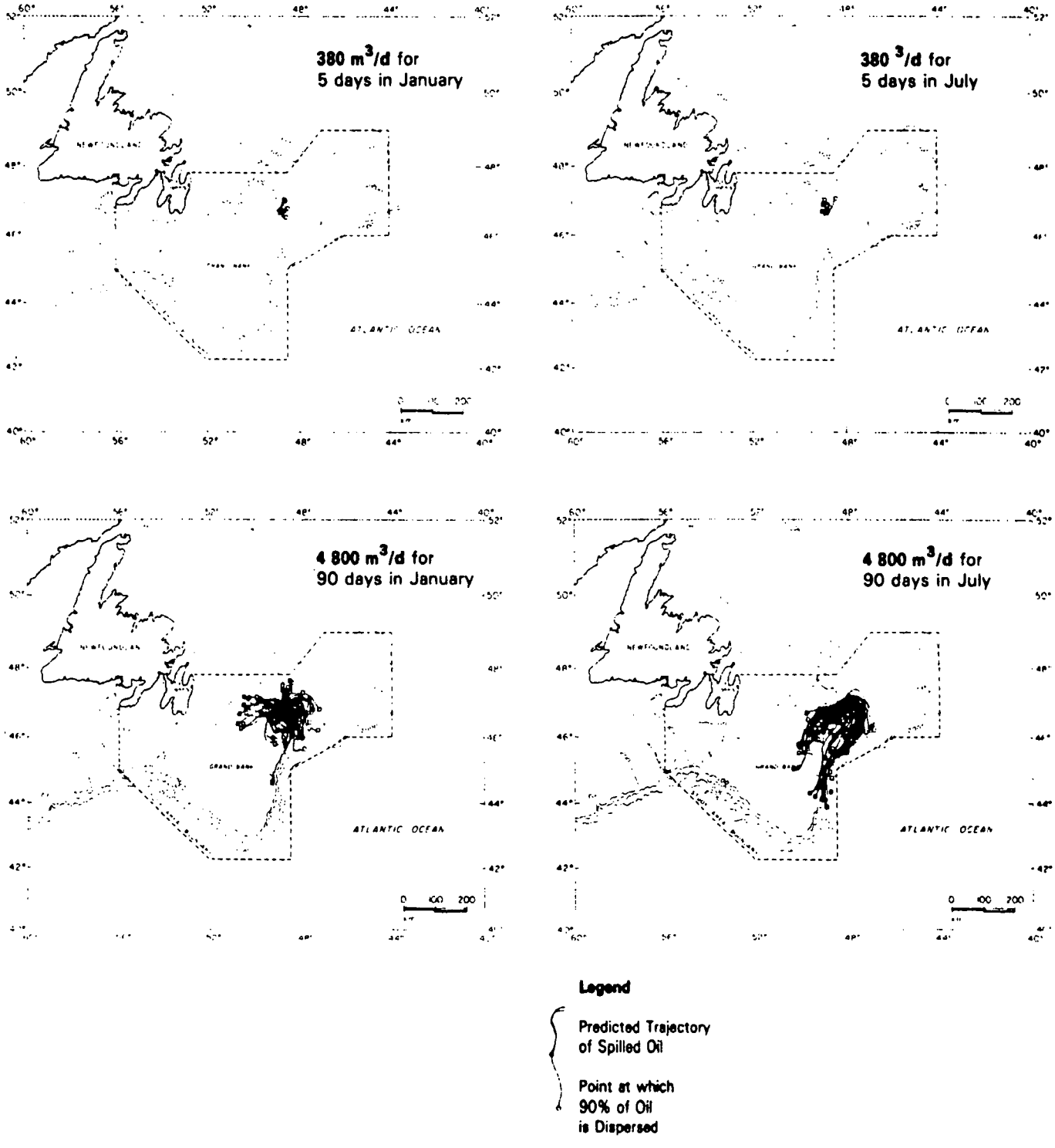
In a simulation conducted by Seaconsult in 1984, possible oil slick trajectories were modelled, using the oil dispersion rates from S.L. Ross (1984). Information about the meteorological and oceanographic data sets used can be found in the report. The predicted slick movement is illustrated in Figures 15, 16 and 17, from which it may be concluded that a large surface blowout could produce a slick that would move over large portions of the Grand Banks before its volume was reduced to less than 90%.

During preparation of the EIS, Seaconsult Ltd. was commissioned by Environment Canada to simulate a 30,000 m^3 batch spill at a site where shuttle tankers would merge with a heavily travelled shipping lane (46° 30' N, 52° 20' W). This was done because the EIS considered spills limited to the immediate Hibernia area. The same type of deterministic trajectory model was used as in the Hibernia spill simulation with wind and current data obtained from AES and the International Ice Patrol, respectively. The simulation was carried out for every day in the months January, April, July and September from 1946-1975, with the result that, in a worst case scenario, up to 31% of the oil could reach Newfoundland shoreline in less than 30 hours.

Definition of Impact Scenarios

To assess the potential impact of oil spills on the Grand Banks, a series of spill scenarios were run using the NRDAM/CME, as summarized in Table 8. Each scenario required a run of the model. The scenarios include sensitivity to season, wind speed and direction, amount spilled and toxicity of the oil (LC_{50}). For each run, nine abundances of eggs and larvae were used to represent two species, cod and American plaice. Cod is the most important fishery for the Grand Banks. Plaice is both an important fishery and a species where pelagic eggs and larvae are abundant over the bank.

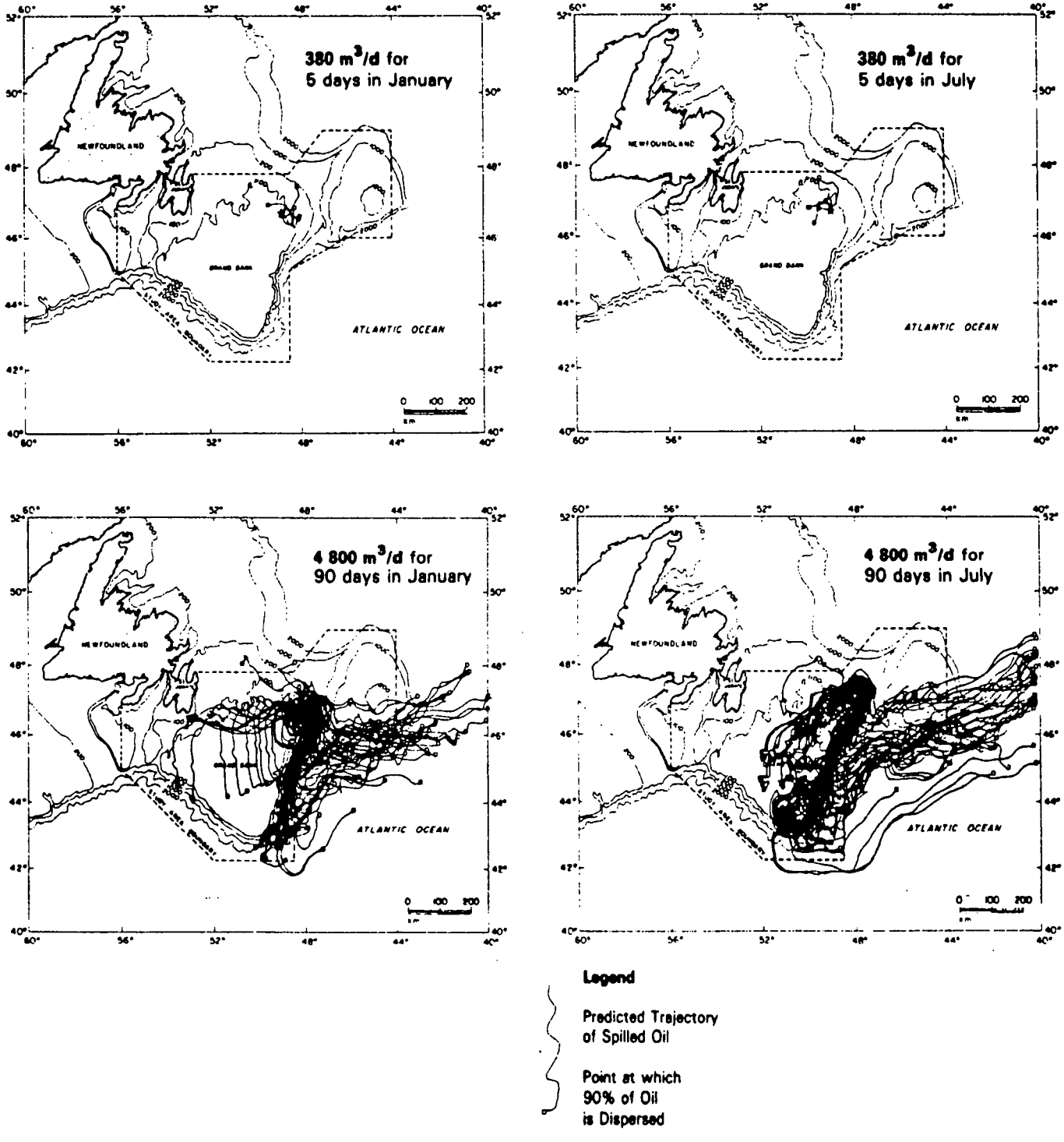
Trajectories from Average and Worst-Case Subsea Blowouts; Summer and Winter



Source: Seaconsult (1984).

Figure 15 Trajectories from Average and Worst Case Subsea Blowouts; Summer and Winter (Mobil Oil Canada Ltd., EIS Vol IIIb, 1985)

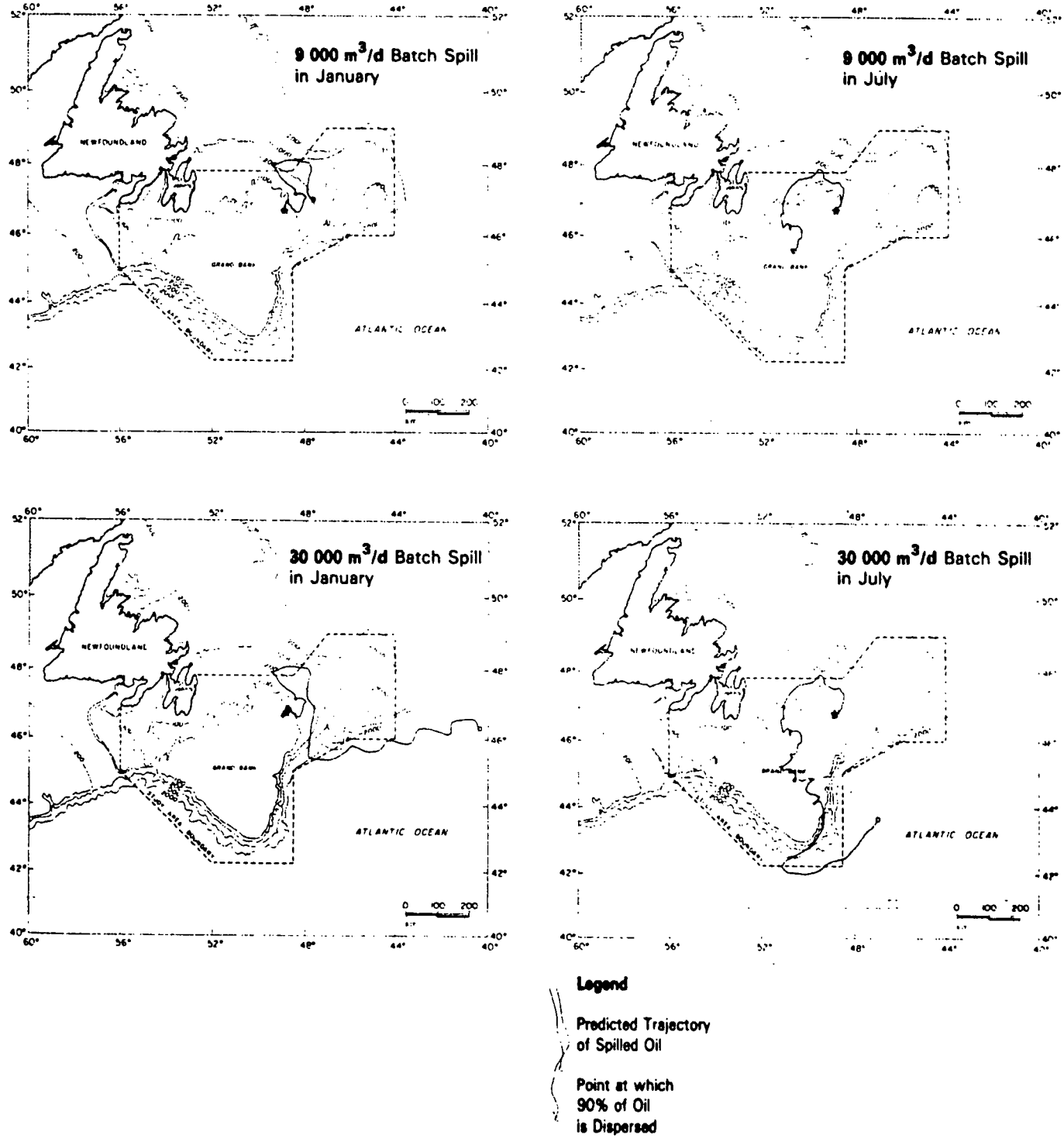
Trajectories from Average and Worst-Case Surface Blowouts; Summer and Winter



Source: Seaconsult (1984).

Figure 16 Trajectories from Average and Worst Case Surface Blowouts; Summer and Winter (Mobil Oil Canada Ltd., EIS Vol IIIb, 1985)

Trajectories from Average and Worst-Case Batch Spills: Summer and Winter



Source: Seaconsult (1984).

Figure 17 Trajectories from Average and Worst Case Batch Spills; Summer and Winter (Mobil Oil Canada Ltd., EIS Vol IIIb, 1985)

Table 8 Summary of Scenarios and Abundances

SCENARIOS

3 Seasons (density distribution and temperature combinations)
- Spring
- Summer
- Fall

2 Wind Directions
- NE
- Mode

3 Wind Speeds
- Seasonal median
- Seasonal median × 2
- Seasonal median × 0.4

4 Amounts Spilled
- Tanker - worst-case 30,000 m^3
- Blowout - worst-case, rate 4,800 m^3/day
- Batch spills - 1 day 4,800 m^3 (4,051 MT)
  5 days 24,000 m^3 (20,256 MT)
  10 days 48,000 m^3 (40,512 MT)

3 LC_{50} Concentrations
- 14.3 ppb @ 25° C (about 150 ppb @ 2° C)
- 143 ppb @ 25° C
- 1.43 ppm @ 25° C

ABUNDANCES

2 Species
- Atlantic Cod
- American Plaice

4-5 Larval Concentrations
- Seasonal minimum, average over bank
- Seasonal mean, average over bank
- Seasonal maximum, average over bank
- Seasonal maximum, vicinity of Hibernia
- 10 × seasonal maximum, vicinity of Hibernia (cod only)

The model domain is a 300 x 500 km rectangle, with the long axis oriented northeast - southwest. The domain is shown relative to the Grand Banks in Figure 18. The three seasons, spring, summer and fall, where cod and plaice eggs and larvae are present were included in the simulations. Wind statistics for the area suggest that, during these seasons, the most commonly occurring winds are from the west and south. A continuous wind from these directions results in spills leaving the assumed model domain relatively rapidly under most conditions.

For this reason, in each season, two wind directions were assumed: the most probable, as represented by the mode of the direction distribution and a worst-case northeast wind. A wind from this direction ensures that the spill remains in the model domain for the maximum time. This is, in a sense, consistent with a worst case interpretation of Seaconsult's trajectory results (Figures 15 - 17).

For each season, the baseline wind speed was taken to be the median or 50% exceedence value; i.e., 50% of the time the winds are greater than this and 50% of the time they are less. To investigate the sensitivity of the predicted impacts to wind speed, cases were run with wind speeds both twice and half the baseline values.

Toxicity was varied from the most conservative (Section 3), 14.3 ppb at 25° C (about 150 ppb at 2° C) to 10 and 100 times that value. Four spill amounts were run, each assumed to be an instantaneous spill by the NRDAM/CME. A worst case tanker spill (30,000 m^3) and worst case blowout rate (4,800 m^3/day) were selected. For the blowout, it is assumed that the worst-case rate lasts for one day, for five days and for 10 days, for total spill volumes of 4,800 m^3 , 24,000 m^3 and 48,000 m^3, respectively.

The fact that the model will only explicitly simulate instantaneous spills makes interpreting the results for blowouts somewhat more difficult. If it is assumed that each allotment of oil affects entirely different water and larvae, then smaller instantaneous spill impacts may be linearly scaled up to estimate impacts of longer-lasting blowouts. Alternately, the entire blowout spill volume can be assumed to affect essentially the same water and larvae, as is the case for an instantaneous spill. For example, 10 times the one-day blowout impact might be compared with the impact from the instantaneous 10-day blowout volume spill. The predicted impact due to an explicitly considered 10-day blowout, were it possible, would be expected to be between these two cases.

Thus, 90 times the one-day blowout impact, 45 times the two-day blowout impact and nine times the 10-day blowout impact would all be estimates of the 90-day blowout scenario, with increasing amounts of recirculation of contaminated water past the blowout site; i.e., greater contamination of already dead larvae. So, 90 times the one-day spill impacts would be the worst-case estimate of impacts.

A summary of all external input parameters for the NRDAM/CME are tabulated by season in Table 9. The model's internal biological databases were modified to represent the Grand Banks. Most of the data for these parameters were given in Tables 4 - 6. The NRDAM/CME considers

Table 9 User Inputs to the NRDAM/CME

Parameter		*Spring*	*Summer*	*Fall*
Spill date		4/1/90	7/1/90	10/1/90
Water Depth (m)		80	80	80
Pycnocline?		yes	yes	yes
Mean Ocean Current (m/sec)		0.08	0.08	0.08
Tidal Velocity (m/sec):				
Parallel to Current		0.06	0.06	0.06
Perpendicular to Current		0.10	0.10	0.10
Wind Speed (m/sec)	(1) Median	7.3	6.0	7.0
	(2) High	15.0	10.0	15.0
	(3) Low	3.7	3.0	3.5
Wind Direction	(1) Mode	180° (SW)	203.5° (SSW)	135° (W)
	(2) NE	0° (NE)	0° (NE)	0° (NE)
Air Temperature		-1.0° C	8.0° C	6.0° C
Pycnocline Depth (m)		50	30	50
Density (kg/l)				
Upper Water Column		1.0263	1.0250	1.0257
Lower Water Column		1.0266	1.0263	1.0264
Study Area for Grand Banks (km)				
+x = water		100	100	100
-x = water		400	400	400
+y = land		250	250	250
-y = land		50	50	50

nine independent classes of fish. For the present study, we are considering only two species and the additional seven classes can be used to simulate different larval abundances for the same species; i.e., all biological parameters are the same except for larval density. The nine assumed abundances of eggs and larvae are listed by season in Table 10.

Table 10 Egg and larvae abundances assumed for each model run (numbers / 1000 m^3). Number times 80 m gives number/m^2 for the Grand Banks.

Species	*Seasonal Concentration*	*Spring*	*Summer*	*Fall*
Cod	Bank minimum	4	3	3
	Bank mean	8	7	7
	Bank maximum	13	11	11
	Hibernia maximum	200	75	75
	10 × Hibernia maximum	2,000	750	750
Plaice	Bank maximum	16	2	0.1
	Bank mean	44	10	0.3
	Bank maximum	92	14	1.0
	Hibernia maximum	1,400	200	10.0

As with other parameters, larval abundances are assumed uniform over the model domain as represented in Figure 18. Six of these values represent seasonal minima, means and maxima averaged over the bank for each of the two species. Also included are seasonal maxima in the vicinity of Hibernia and 10 times this value in the case of cod. These peak abundances were assumed to occur over the entire bank for the purposes of a worst-case analysis.

The actual matrix of runs involves 12 "cases" of 12 runs each, as shown in Table 11. All wind speeds and directions were run for an LC_{50} = 14.3 ppb, but not for other higher LC_{50}s where selected cases were run out of the possible six combinations for each LC_{50}.

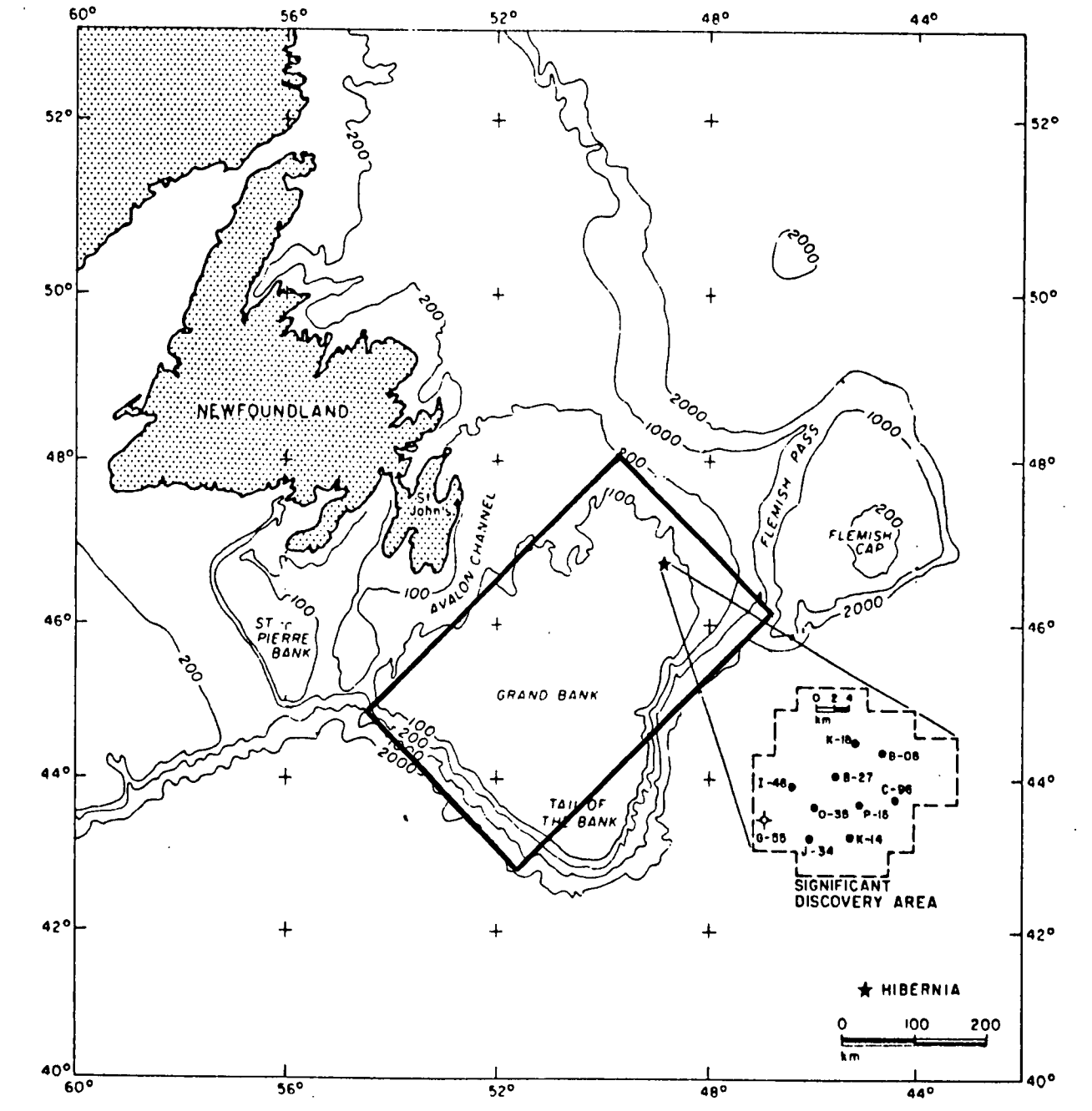


Figure 18 Model Domain - Grand Banks

Table 11 **Matrix of runs for the sensitivity analysis. There are 12 cases, each requiring 12 runs (144 total runs)**

Case code	*LC_{50}*	*Wind Speed*	*Wind Direction*
C111	(1) 14.3	(1) Median	(1) Mode
C121	(1) 14.3	(2) High	(1) Mode
C131	(1) 14.3	(3) Low	(1) Mode
C112	(1) 14.3	(1) Median	(2) NE
C122	(1) 14.3	(2) High	(2) NE
C132	(1) 14.3	(3) Low	(2) NE
C211	(2) 143.0	(1) Median	(1) Mode
C311	(3) 1430.0	(1) Median	(1) Mode
C221	(2) 143.0	(2) High	(1) Mode
C231	(2) 143.0	(3) Low	(1) Mode
C212	(2) 143.0	(1) Median	(2) NE
C222	(2) 143.0	(2) High	(2) NE

Spill Amounts (MT)	Run Codes		
	Spring	Summer	Fall
40,512	A1S1	A1S2	A1S3
25,320	A2S1	A2S2	A2S3
20,256	A3S1	A3S2	A3S3
4,051	A4S1	A4S2	A4S3

RESULTS

Results for the 144 model runs (12 cases times four spill volumes times three seasons) are provided in Appendix A. The case code numbers refer to Table 11. For each run, the fate of the oil, the numbers of eggs and larvae killed and the projected lost catch are tabulated. For all runs, the slick moved downwind until it left the study area; i.e., moved off the bank or, it moved out to sea or weathered out of existence. No shoreline was impacted by the scenarios tested.

For spills which did not leave the model domain, over the first few days of the simulation 35% of the mass spilled evaporated to the atmosphere. Most of the rest eventually ended up dispersed in the water column. The surface slick persisted from approximately five to greater than 40 days primarily as a function of wind speed. These persistences are generally lower than those represented in Figures 13 and 14. This is due to the heavier oil assumed in that report (Mobil EIS, 1985).

All else being equal, the lower the surface slick persistence, the greater the impact due to higher water column concentrations. Insignificant amounts decayed or reached the sediments in the time the slick was over the Grand Banks. The slick spreads through time such that if the slick leaves the domain, its final area is a function of the time it took to reach the boundary.

In all cases, the number of eggs and larvae killed and the total lost catch resulting from that kill are directly proportional to the egg and larval abundance. Thus, we will examine the results for cod at its seasonal mean abundance averaged over the bank: $0.64/m^2$ in spring and $0.56/m^2$ in summer and fall. Other abundances for cod and plaice scale proportionately in terms of eggs and larvae killed. Catch losses per larvae killed are much higher for cod (17.15 kg/106 larvae) than for plaice (0.95 kg/106 larvae), i.e., by a factor of 18.

However, the higher abundance of plaice reduces the differences in lost catch to a partial degree. Plaice eggs and larvae are, on average, 5.5 times as abundant. So, the average impact for cod is about three times that for plaice.

Tables 12 to 14 contain the simulated total catch losses for cod, assuming the seasonal mean abundance, averaged over the bank. The estimated impacts from the NRDAM/CME are, in general, quite low for the average Grand Banks abundance of cod. The highest impact in Tables 12 to 14 is for just under two metric tonnes (MT), or 1,779 kg, of lost catch assuming a 10-day worst-case blowout, spilled instantaneously in the model. If it is assumed that each daylot affects entirely separate eggs and larvae (the worst-case), a 10-day blowout would result in a catch loss of 2,370 kg (Table 13, 10 times 4,800 m^3 spill loss). As discussed previously, the expected loss for a 10-day continuous release would be somewhere between the 1,779 kg and 2,370 kg estimate. Thus, the daylot approximation scaled up is not a bad estimation of losses.

Similarly, scaling up daylot impacts, a worst-case 90-day blowout loss would be 21,330 kg (21 MT). So, the worst case which can be hypothesized results in 21 MT of lost catch, assuming

Table 12 **Total lost catch (kg) of cod assuming the seasonal mean abundance averaged over the Grand Banks and a spring spill**

Case			Amount Spilled (Instantaneously)			
LC_{50} (ppb)	*Wind Speed*	*Wind Direction*	*4,800 4,051*	*24,000 20,256*	*30,000 25,320*	*48,000 m^3 40,512 MT*
14.3	High	Mode	76	276	335	466
	Median	Mode	84	336	426	626
	Low	Mode	82	307	377	552
14.3	High	NE	89	518	626	1,021
	Median	NE	87	381	449	714
	Low	NE	98	329	390	568
143.	High	Mode	106	418	493	757
	Median	Mode	58	232	280	425
	Low	Mode	28	122	149	236
143.	High	NE	97	398	481	709
	Median	NE	60	250	302	450
1430.	Median	Mode	(0.3)	1	1	2

Table 13 **Total lost catch (kg) of cod assuming the seasonal mean abundance averaged over the Grand Banks and a summer spill**

Case			Amount Spilled (Instantaneously)			
LC_{50} (ppb)	*Wind Speed*	*Wind Direction*	*4,800 4,051*	*24,000 20,256*	*30,000 25,320*	*48,000 m^3 40,512 MT*
14.3	High	Mode	228	902	1,021	1,470
	Median	Mode	189	745	918	1,361
	Low	Mode	235	846	998	1,454
14.3	High	NE	237	998	1,178	1,779
	Median	NE	235	847	1,016	1,431
	Low	NE	235	844	998	1,454
143.	High	Mode	150	578	696	1,043
	Median	Mode	106	429	518	780
	Low	Mode	68	271	272	485
143.	High	NE	149	595	724	1,085
	Median	NE	106	421	427	759
1430.	Median	Mode	2	6	7	10

Table 14 **Total lost catch (kg) of cod assuming the seasonal mean abundance averaged over the Grand Banks and a fall spill**

Case			Amount Spilled (Instantaneously)			
LC_{50}	*Wind*	*Wind*	*4,800*	*24,000*	*30,000*	*48,000 m^3*
(ppb)	*Speed*	*Direction*	*4,051*	*20,256*	*25,320*	*40,512 MT*
14.3	High	Mode	22	77	92	135
	Median	Mode	41	148	172	242
	Low	Mode	39	76	209	333
14.3	High	NE	65	300	399	613
	Median	NE	64	233	271	412
	Low	NE	64	221	261	383
143.	High	Mode	68	279	334	492
	Median	Mode	30	143	269	257
	Low	Mode	14	65	78	122
143.	High	NE	61	264	318	475
	Median	NE	36	154	185	279
1430.	Median	Mode	(0.1)	(0.3)	(0.3)	(0.4)

average cod abundances. Assuming higher abundances for 90 days over the entire bank would simply not be realistic, although catch losses for those abundances would be proportionately higher. The equivalent worst-case impact for plaice would be about 1/3 of 21 MT (seven MT) of catch loss.

The seasonal differences in impact (Tables 12 to 14) are largely due to the increasing toxicity of oil at higher temperatures. Thus, the highest impacts are for summer spills, when abundances are equivalent.

The resulting losses are not very sensitive to the assumed LC_{50} within the range of 14.3 - 143 ppb. If the LC_{50} were as high as 1,430 ppb (1.4 ppm, at 25° C for four days of exposure), very little loss would be expected (Tables 12 to 14).

The estimated losses are only slightly sensitive to wind speed and direction (Tables 12 to 14), varying at most by a factor of three over the range of wind speeds for a single direction and a factor of six for all possibilities. Higher wind speeds tend to increase the impact since entrainment rates are higher, resulting in higher concentrations. Also, a NE wind aligned with a SW directed current yields the most impact, particularly at higher wind speeds. This result is partially caused by the model boundary selection but represents the case where the oil stays over the Grand Banks.

In a worst-case analysis using the NRDAM/CME, the highest impact that can be expected would be 21 MT of cod and seven MT of plaice in total catch loss. This is assuming a 90-day blowout, at the maximum daily release rate, and where each daylot affects entirely different eggs and larvae.

DISCUSSION

In a worst-case analysis using the NRDAM/CME, the highest impact that can be expected would be 21 MT of cod and 7 MT of plaice in total catch loss. This is assuming a 90 day blowout, at the maximum daily release rate, and where each daylot affects entirely different eggs and larvae.

For smaller spills and less conservative assumptions, the projected impacts are considerably smaller, with the worst-case impact from a tanker spill being approximately 1.1 MT for cod, in summer, and 0.2 MT for plaice, in spring. These impacts assume that the larval densities during the spill are the mean of surveys conducted over the whole bank. If higher larval densities are assumed at the time of the spill, the impacts are commensurately greater. While an assumption of higher than average larval densities may not be reasonable for blowouts which occur over a long period of time, it may become more reasonable for a relatively instantaneous tanker spill.

With the extreme assumption that the larval abundance throughout the spill is equal to the seasonal maximum larval abundance observed at Hibernia, the predicted impact for the worst-case tanker spill becomes considerably larger; i.e., 15.7 MT for cod and 6.1 MT for plaice. Both of these cases are in spring, where the higher observed larval abundances at Hibernia (Table 10) outweigh the higher toxicity in the summer.

These losses may be compared with the total annual catch from the Grand Banks, ICNAF divisions 3L, 3N and 3O. Catch statistics for these regions for a period of nine years (1979 - 1987) are presented in Tables 15 and 16. The average catch totalled over the three areas for this period is approximately 132,000 MT for cod and 49,000 MT for plaice. The worst-case projected 90-day blowout impact is, therefore, something less than 0.02% of the average annual catch for both cod and plaice, while an estimated worst-case tanker spill impact represents just over 0.01% of the annual catch for both cod and plaice.

Table 15 Grand Banks Cod Landings 1979 - 1987

Cod Landings by NAFO Area (metric tonnes)

Year	*3L*	*3N*	*3O*	*Grand Banks Total*
1979	77,233	18,601	9,339	105,173
1980	71,782	9,672	10,318	91,772
1981	79,651	21,574	2,770	103,995
1982	92,942	20,686	10,919	124,547
1983	105,042	17,780	11,038	133,860
1984	107,345	26,932	9,967	144,244
1985	107,345	26,932	9,389	144,244
1986	143,953	41,256	9,389	194,598
1987	107,271	33,579	8,040	148,890
Average	99,174	24,112	9,083	132,369

Table 16 Grand Banks American Plaice Landings 1979 - 1987

American Plaice Landings by NAFO Area (metric tonnes)

Year	*3L*	*3N*	*3O*	*Grand Banks Total*
1979	28,708	14,712	5,149	48,569
1980	31,717	15,119	2,250	49,086
1981	37,269	10,628	2,261	50,158
1982	32,761	12,457	5,119	50,337
1983	22,964	10,373	4,383	37,720
1984	23,320	20,146	3,653	47,119
1985	23,320	20,146	4,615	48,081
1986	25,745	27,324	4,380	57,449
1987	32,735	14,989	5,733	53,457
Average	28,727	16,210	4,171	49,108

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APPENDIX A: SUMMARIES OF MODEL RUNS

Matrix of runs for the sensitivity analysis.
There are 12 cases, each requiring 12 runs (144 total runs).

Case Code	LC_{50} (ppb)	Wind Speed	Wind Direction
C111	(1) 14.3	(1) Median	(1) Mode
C121	(1) 14.3	(2) High	(1) Mode
C131	(1) 14.3	(3) Low	(1) Mode
C112	(1) 14.3	(1) Median	(2) NE
C122	(1) 14.3	(2) High	(2) NE
C132	(1) 14.3	(3) Low	(2) NE
C211	(2) 143.0	(1) Median	(1) Mode
C311	(3) 1430.0	(1) Median	(1) Mode
C221	(2) 143.0	(2) High	(1) Mode
C231	(2) 143.0	(3) Low	(1) Mode
C212	(2) 143.0	(1) Median	(2) NE
C222	(2) 143.0	(2) High	(2) NE

Amounts	Run Codes		
	Spring	Summer	Fall
40,512	A1S1	A1S2	A1S3
25,320	A2S1	A2S2	A2S3
20,256	A3S1	A3S2	A3S3
4,051	A4S1	A4S2	A4S3

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 245.59

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
38.35	26.14	.00	34.94	.58

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	18240840.00	312.80
2	Cod	.64	36481680.00	625.59
3	Cod	1.04	59282730.00	1016.59
4	Cod	16.00	912042100.00	15639.81
5	Cod	160.00	9120421000.00	156398.10
6	Plaice	1.28	72963370.00	69.37
7	Plaice	3.52	200649300.00	190.76
8	Plaice	7.36	419539400.00	398.86
9	Plaice	112.00	6384294000.00	6069.56

Seabird abundance: 19.10

# of seabirds killed: 7911.73

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A1S2
Season: Summer
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 252.37

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.42	.00	34.99	2.60

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	34003170.00	583.09
2	Cod	.56	79340740.00	1360.55
3	Cod	.88	124678300.00	2138.00
4	Cod	6.00	850079400.00	14577.27
5	Cod	60.00	8500794000.00	145772.70
6	Plaice	.16	22668780.00	21.55
7	Plaice	.80	113343900.00	107.76
8	Plaice	1.12	158681500.00	150.86
9	Plaice	16.00	2266878000.00	2155.13

Seabird abundance: 25.90

# of seabirds killed: 38313.66

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A1S3
Season: Fall
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 188.37

Days slick lasted: 4.41

Final position of slick from spill site (km):
X = -25.28 Y = 55.88 Dist. = 61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
55.57	9.18	.00	34.96	.30

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	6057354.00	103.87
2	Cod	.56	14133830.00	242.37
3	Cod	.88	22210300.00	380.86
4	Cod	6.00	151433800.00	2596.81
5	Cod	60.00	1514338000.00	25968.06
6	Plaice	.01	201911.80	.19
7	Plaice	.02	605735.40	.58
8	Plaice	.08	2019118.00	1.92
9	Plaice	.80	20191180.00	19.20

Seabird abundance: 27.60

# of seabirds killed: 3517.77

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A2S1
Season: Spring
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 176.27

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
34.19	30.29	.00	34.95	.57

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	12417260.00	212.93
2	Cod	.64	24834510.00	425.87
3	Cod	1.04	40356080.00	692.03
4	Cod	16.00	620862800.00	10646.64
5	Cod	160.00	6208628000.00	106466.30
6	Plaice	1.28	49669020.00	47.22
7	Plaice	3.52	136589800.00	129.86
8	Plaice	7.36	285596900.00	271.52
9	Plaice	112.00	4346040000.00	4131.79

Seabird abundance: 19.10

# of seabirds killed: 6762.83

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 178.72

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.41	.00	34.99	2.59

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	22942180.00	393.42
2	Cod	.56	53531760.00	917.97
3	Cod	.88	84121340.00	1442.52
4	Cod	6.00	573554600.00	9835.39
5	Cod	60.00	5735545000.00	98353.85
6	Plaice	.16	15294790.00	14.54
7	Plaice	.80	76473940.00	72.70
8	Plaice	1.12	107063500.00	101.79
9	Plaice	16.00	1529479000.00	1454.08

Seabird abundance: 25.90

# of seabirds killed: 32370.50

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 137.33

Days slick lasted: 4.41

Final position of slick from spill site (km):
X = -25.28 Y = 55.88 Dist. = 61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
54.02	10.73	.00	34.96	.29

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	4309491.00	73.90
2	Cod	.56	10055480.00	172.43
3	Cod	.88	15801470.00	270.97
4	Cod	6.00	107737300.00	1847.49
5	Cod	60.00	1077373000.00	18474.92
6	Plaice	.01	143649.70	.14
7	Plaice	.02	430949.10	.41
8	Plaice	.08	1436497.00	1.37
9	Plaice	.80	14364970.00	13.66

Seabird abundance: 27.60

# of seabirds killed: 3033.90

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 150.38

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
32.03	32.45	.00	34.95	.57

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	9786175.00	167.81
2	Cod	.64	19572350.00	335.63
3	Cod	1.04	31805070.00	545.40
4	Cod	16.00	489308800.00	8390.73
5	Cod	160.00	4893088000.00	83907.29
6	Plaice	1.28	39144700.00	37.21
7	Plaice	3.52	107647900.00	102.34
8	Plaice	7.36	225082000.00	213.99
9	Plaice	112.00	3425161000.00	3256.31

Seabird abundance: 19.10

# of seabirds killed: 6273.55

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A3S2
Season: Summer
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 151.36

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.41	.00	34.99	2.59

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	18621690.00	319.33
2	Cod	.56	43450600.00	745.10
3	Cod	.88	68279520.00	1170.87
4	Cod	6.00	465542200.00	7983.18
5	Cod	60.00	4655422000.00	79831.76
6	Plaice	.16	12414460.00	11.80
7	Plaice	.80	62072290.00	59.01
8	Plaice	1.12	86901210.00	82.62
9	Plaice	16.00	1241446000.00	1180.24

Seabird abundance: 25.90

# of seabirds killed: 29849.73

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 118.12

Days slick lasted: 4.41

Final position of slick from spill site (km):
X = -25.28 Y = 55.88 Dist. = 61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
53.20	11.55	.00	34.96	.29

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	3697450.00	63.40
2	Cod	.56	8627383.00	147.94
3	Cod	.88	13557320.00	232.48
4	Cod	6.00	92436240.00	1585.11
5	Cod	60.00	924362400.00	15851.08
6	Plaice	.01	123248.30	.12
7	Plaice	.02	369745.00	.35
8	Plaice	.08	1232483.00	1.17
9	Plaice	.80	12324830.00	11.72

Seabird abundance: 27.60

# of seabirds killed: 2825.92

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 46.19

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
11.67	52.81	.00	34.95	.57

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	2444918.00	41.93
2	Cod	.64	4889837.00	83.85
3	Cod	1.04	7945984.00	136.26
4	Cod	16.00	122245900.00	2096.29
5	Cod	160.00	1222459000.00	20962.89
6	Plaice	1.28	9779673.00	9.30
7	Plaice	3.52	26894100.00	25.57
8	Plaice	7.36	56233120.00	53.46
9	Plaice	112.00	855721400.00	813.54

Seabird abundance: 19.10

# of seabirds killed: 3616.33

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 43.72

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.41	.00	34.99	2.59

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	4728387.00	81.08
2	Cod	.56	11032900.00	189.19
3	Cod	.88	17337420.00	297.30
4	Cod	6.00	118209700.00	2027.07
5	Cod	60.00	1182097000.00	20270.74
6	Plaice	.16	3152258.00	3.00
7	Plaice	.80	15761290.00	14.98
8	Plaice	1.12	22065800.00	20.98
9	Plaice	16.00	315225800.00	299.69

Seabird abundance: 25.90

# of seabirds killed: 8890.39

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C111A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 39.32

Days slick lasted: 4.41

Final position of slick from spill site (km):
X = -25.28 Y = 55.88 Dist. = 61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
45.15	19.61	.00	34.96	.29

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1025327.00	17.58
2	Cod	.56	2392430.00	41.03
3	Cod	.88	3759533.00	64.47
4	Cod	6.00	25633180.00	439.56
5	Cod	60.00	256331800.00	4395.61
6	Plaice	.01	34177.57	.03
7	Plaice	.02	102532.70	.10
8	Plaice	.08	341775.70	.32
9	Plaice	.80	3417758.00	3.25

Seabird abundance: 27.60

# of seabirds killed: 1682.92

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 155.56

Days slick lasted: 3.56

Final position of slick from spill site (km):
X = -114.09 Y = -.27 Dist. = 114.09

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
39.10	25.76	.00	34.90	.24

==========

Toxicity lasted for 3.05 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	13601050.00	233.23
2	Cod	.64	27202110.00	466.47
3	Cod	1.04	44203420.00	758.01
4	Cod	16.00	680052700.00	11661.63
5	Cod	160.00	6800527000.00	116616.30
6	Plaice	1.28	54404220.00	51.72
7	Plaice	3.52	149611600.00	142.24
8	Plaice	7.36	312824300.00	297.40
9	Plaice	112.00	4760369000.00	4525.69

Seabird abundance: 19.10

# of seabirds killed: 4443.25

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A1S2
Season: Summer
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 189.27

Days slick lasted: 6.34

Final position of slick from spill site (km):
X = -106.10 Y = -65.04 Dist. = 124.45

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
20.26	44.39	.00	34.93	.42

==========

Toxicity lasted for 6.34 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	36743870.00	630.09
2	Cod	.56	85735700.00	1470.21
3	Cod	.88	134727500.00	2310.32
4	Cod	6.00	918596800.00	15752.21
5	Cod	60.00	9185968000.00	157522.10
6	Plaice	.16	24495910.00	23.29
7	Plaice	.80	122479600.00	116.44
8	Plaice	1.12	171471400.00	163.02
9	Plaice	16.00	2449592000.00	2328.83

Seabird abundance: 25.90

# of seabirds killed: 8569.46

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A1S3
Season: Fall
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 130.12

Days slick lasted: 2.26

Final position of slick from spill site (km):
X = -45.51 Y = 62.45 Dist. = 77.28

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
51.84	13.07	.00	34.93	.15

==========

Toxicity lasted for 1.77 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	3378823.00	57.94
2	Cod	.56	7883920.00	135.19
3	Cod	.88	12389020.00	212.45
4	Cod	6.00	84470580.00	1448.51
5	Cod	60.00	844705700.00	14485.12
6	Plaice	.01	112627.40	.11
7	Plaice	.02	337882.30	.32
8	Plaice	.08	1126274.00	1.07
9	Plaice	.80	11262740.00	10.71

Seabird abundance: 27.60

# of seabirds killed: 4153.96

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A2S1
Season: Spring
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 112.02

Days slick lasted: 3.56

Final position of slick from spill site (km):
X = -114.09 Y = -.27 Dist. = 114.09

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
34.96	29.90	.00	34.90	.24

==========

Toxicity lasted for 3.05 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	9761251.00	167.39
2	Cod	.64	19522500.00	334.77
3	Cod	1.04	31724070.00	544.01
4	Cod	16.00	488062600.00	8369.36
5	Cod	160.00	4880626000.00	83693.59
6	Plaice	1.28	39045000.00	37.12
7	Plaice	3.52	107373800.00	102.08
8	Plaice	7.36	224508800.00	213.44
9	Plaice	112.00	3416438000.00	3248.01

Seabird abundance: 19.10

# of seabirds killed: 3843.54

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 133.55

Days slick lasted: 6.34

Final position of slick from spill site (km):
X = -106.10 Y = -65.04 Dist. = 124.45

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
13.49	51.16	.00	34.94	.42

==========

Toxicity lasted for 6.34 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	25509870.00	437.45
2	Cod	.56	59523030.00	1020.71
3	Cod	.88	93536190.00	1603.97
4	Cod	6.00	637746800.00	10936.16
5	Cod	60.00	6377467000.00	109361.60
6	Plaice	.16	17006580.00	16.17
7	Plaice	.80	85032900.00	80.84
8	Plaice	1.12	119046100.00	113.18
9	Plaice	16.00	1700658000.00	1616.82

Seabird abundance: 25.90

# of seabirds killed: 7328.81

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 94.94

Days slick lasted: 2.26

Final position of slick from spill site (km):
X = -45.51 Y = 62.45 Dist. = 77.28

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
49.62	15.30	.00	34.93	.15

==========

Toxicity lasted for 1.77 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	2309658.00	39.61
2	Cod	.56	5389203.00	92.41
3	Cod	.88	8468747.00	145.22
4	Cod	6.00	57741460.00	990.16
5	Cod	60.00	577414600.00	9901.58
6	Plaice	.01	76988.62	.07
7	Plaice	.02	230965.80	.22
8	Plaice	.08	769886.10	.73
9	Plaice	.80	7698861.00	7.32

Seabird abundance: 27.60

# of seabirds killed: 3623.37

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 95.72

Days slick lasted: 3.56

Final position of slick from spill site (km):
X = -114.09 Y = -.27 Dist. = 114.09

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
32.78	32.08	.00	34.90	.24

==========

Toxicity lasted for 3.05 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	8048981.00	138.02
2	Cod	.64	16097960.00	276.05
3	Cod	1.04	26159190.00	448.58
4	Cod	16.00	402449100.00	6901.25
5	Cod	160.00	4024490000.00	69012.48
6	Plaice	1.28	32195920.00	30.61
7	Plaice	3.52	88538790.00	84.17
8	Plaice	7.36	185126600.00	176.00
9	Plaice	112.00	2817144000.00	2678.26

Seabird abundance: 19.10

# of seabirds killed: 3586.11

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A3S2
Season: Summer
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 112.89

Days slick lasted: 6.34

Final position of slick from spill site (km):
X = -106.10 Y = -65.04 Dist. = 124.45

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
9.94	54.71	.00	34.94	.42

==========

Toxicity lasted for 6.34 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	22534330.00	386.42
2	Cod	.56	52580100.00	901.65
3	Cod	.88	82625870.00	1416.88
4	Cod	6.00	563358200.00	9660.54
5	Cod	60.00	5633582000.00	96605.38
6	Plaice	.16	15022890.00	14.28
7	Plaice	.80	75114430.00	71.41
8	Plaice	1.12	105160200.00	99.98
9	Plaice	16.00	1502289000.00	1428.23

Seabird abundance: 25.90

# of seabirds killed: 6802.15

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 81.66

Days slick lasted: 2.26

Final position of slick from spill site (km):
X = -45.51 Y = 62.45 Dist. = 77.28

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
48.43	16.48	.00	34.93	.15

==========

Toxicity lasted for 1.77 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1927062.00	33.05
2	Cod	.56	4496479.00	77.11
3	Cod	.88	7065895.00	121.17
4	Cod	6.00	48176560.00	826.14
5	Cod	60.00	481765500.00	8261.38
6	Plaice	.01	64235.41	.06
7	Plaice	.02	192706.20	.18
8	Plaice	.08	642354.10	.61
9	Plaice	.80	6423541.00	6.11

Seabird abundance: 27.60

# of seabirds killed: 3392.04

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 29.69

Days slick lasted: 3.56

Final position of slick from spill site (km):
X = -114.09 Y = -.27 Dist. = 114.09

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
12.53	52.32	.00	34.91	.24

==========

Toxicity lasted for 3.05 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	2209713.00	37.89
2	Cod	.64	4419426.00	75.78
3	Cod	1.04	7181566.00	123.15
4	Cod	16.00	110485600.00	1894.62
5	Cod	160.00	1104856000.00	18946.22
6	Plaice	1.28	8838851.00	8.40
7	Plaice	3.52	24306840.00	23.11
8	Plaice	7.36	50823390.00	48.32
9	Plaice	112.00	773399400.00	735.27

Seabird abundance: 19.10

# of seabirds killed: 2136.46

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 32.50

Days slick lasted: 6.34

Final position of slick from spill site (km):
X = -106.10 Y = -65.04 Dist. = 124.45

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.09	64.55	.00	34.95	.41

==========

Toxicity lasted for 6.34 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	5709046.00	97.90
2	Cod	.56	13321110.00	228.43
3	Cod	.88	20933170.00	358.96
4	Cod	6.00	142726100.00	2447.49
5	Cod	60.00	1427261000.00	24474.86
6	Plaice	.16	3806030.00	3.62
7	Plaice	.80	19030150.00	18.09
8	Plaice	1.12	26642210.00	25.33
9	Plaice	16.00	380603000.00	361.84

Seabird abundance: 25.90

# of seabirds killed: 3315.33

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C121A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 26.98

Days slick lasted: 2.26

Final position of slick from spill site (km):
X = -45.51 Y = 62.45 Dist. = 77.28

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
37.02	27.89	.00	34.94	.15

==========

Toxicity lasted for 1.77 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	547273.50	9.38
2	Cod	.56	1276972.00	21.90
3	Cod	.88	2006670.00	34.41
4	Cod	6.00	13681840.00	234.62
5	Cod	60.00	136818400.00	2346.18
6	Plaice	.01	18242.45	.02
7	Plaice	.02	54727.35	.05
8	Plaice	.08	182424.50	.17
9	Plaice	.80	1824245.00	1.73

Seabird abundance: 27.60

# of seabirds killed: 2073.05

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 402.62

Days slick lasted: 37.52

Final position of slick from spill site (km):
X = -98.67 Y = -.73 Dist. = 98.67

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.76	.00	34.98	4.26

==========

Toxicity lasted for 67.52 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	16080880.00	275.76
2	Cod	.64	32161760.00	551.51
3	Cod	1.04	52262860.00	896.21
4	Cod	16.00	804044100.00	13787.85
5	Cod	160.00	8040441000.00	137878.50
6	Plaice	1.28	64323520.00	61.15
7	Plaice	3.52	176889700.00	168.17
8	Plaice	7.36	369860300.00	351.63
9	Plaice	112.00	5628308000.00	5350.84

Seabird abundance: 19.10

# of seabirds killed: 32709.72

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A1S2
Season: Summer
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 378.47

Days slick lasted: 34.92

Final position of slick from spill site (km):
X = -7.46 Y = -106.05 Dist. = 106.31

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.91	.00	34.99	4.10

==========

Toxicity lasted for 64.92 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	36332890.00	623.04
2	Cod	.56	84776740.00	1453.76
3	Cod	.88	133220600.00	2284.48
4	Cod	6.00	908322200.00	15576.02
5	Cod	60.00	9083223000.00	155760.20
6	Plaice	.16	24221930.00	23.03
7	Plaice	.80	121109600.00	115.14
8	Plaice	1.12	169553500.00	161.19
9	Plaice	16.00	2422193000.00	2302.78

Seabird abundance: 25.90

# of seabirds killed: 38240.88

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A1S3
Season: Fall
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 260.54

Days slick lasted: 8.23

Final position of slick from spill site (km):
X = 3.81 Y = 52.70 Dist. = 52.84

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
56.88	7.62	.00	34.96	.54

==========

Toxicity lasted for 7.28 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	8332854.00	142.89
2	Cod	.56	19443330.00	333.42
3	Cod	.88	30553800.00	523.94
4	Cod	6.00	208321400.00	3572.32
5	Cod	60.00	2083214000.00	35723.21
6	Plaice	.01	277761.80	.26
7	Plaice	.02	833285.40	.79
8	Plaice	.08	2777618.00	2.64
9	Plaice	.80	27776180.00	26.41

Seabird abundance: 27.60

# of seabirds killed: 5419.12

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A2S1
Season: Spring
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 279.37

Days slick lasted: 37.52

Final position of slick from spill site (km):
X = -98.67 Y = -.73 Dist. = 98.67

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.76	.00	34.98	4.26

==========

Toxicity lasted for 67.52 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	10984870.00	188.37
2	Cod	.64	21969740.00	376.74
3	Cod	1.04	35700830.00	612.20
4	Cod	16.00	549243500.00	9418.50
5	Cod	160.00	5492435000.00	94184.97
6	Plaice	1.28	43939480.00	41.77
7	Plaice	3.52	120833600.00	114.88
8	Plaice	7.36	252652000.00	240.20
9	Plaice	112.00	3844705000.00	3655.17

Seabird abundance: 19.10

# of seabirds killed: 21840.03

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 262.44

Days slick lasted: 34.92

Final position of slick from spill site (km):
X = -7.46 Y = -106.05 Dist. = 106.31

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.91	.00	34.99	4.10

==========

Toxicity lasted for 64.92 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	24941830.00	427.71
2	Cod	.56	58197600.00	997.98
3	Cod	.88	91453380.00	1568.25
4	Cod	6.00	623545700.00	10692.64
5	Cod	60.00	6235458000.00	106926.40
6	Plaice	.16	16627890.00	15.81
7	Plaice	.80	83139430.00	79.04
8	Plaice	1.12	116395200.00	110.66
9	Plaice	16.00	1662789000.00	1580.82

Seabird abundance: 25.90

# of seabirds killed: 25415.24

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 189.78

Days slick lasted: 8.23

Final position of slick from spill site (km):
X = 3.81 Y = 52.70 Dist. = 52.84

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
55.60	8.90	.00	34.96	.54

==========

Toxicity lasted for 7.28 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	5211137.00	89.36
2	Cod	.56	12159320.00	208.51
3	Cod	.88	19107500.00	327.66
4	Cod	6.00	130278400.00	2234.03
5	Cod	60.00	1302784000.00	22340.31
6	Plaice	.01	173704.60	.16
7	Plaice	.02	521113.80	.50
8	Plaice	.08	1737046.00	1.65
9	Plaice	.80	17370460.00	16.51

Seabird abundance: 27.60

# of seabirds killed: 4652.63

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 234.87

Days slick lasted: 37.52

Final position of slick from spill site (km):
X = -98.67 Y = -.73 Dist. = 98.67

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.76	.00	34.98	4.26

==========

Toxicity lasted for 67.52 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	8953678.00	153.54
2	Cod	.64	17907360.00	307.08
3	Cod	1.04	29099450.00	499.00
4	Cod	16.00	447683900.00	7676.94
5	Cod	160.00	4476839000.00	76769.39
6	Plaice	1.28	35814710.00	34.05
7	Plaice	3.52	98490460.00	93.64
8	Plaice	7.36	205934600.00	195.78
9	Plaice	112.00	3133787000.00	2979.30

Seabird abundance: 19.10

# of seabirds killed: 18318.57

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A3S2
Season: Summer
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 220.58

Days slick lasted: 34.92

Final position of slick from spill site (km):
X = -7.46 Y = -106.05 Dist. = 106.31

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.91	.00	34.99	4.09

==========

Toxicity lasted for 64.92 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	21152150.00	362.72
2	Cod	.56	49355030.00	846.35
3	Cod	.88	77557900.00	1329.97
4	Cod	6.00	528803900.00	9068.00
5	Cod	60.00	5288039000.00	90679.95
6	Plaice	.16	14101440.00	13.41
7	Plaice	.80	70507180.00	67.03
8	Plaice	1.12	98710060.00	93.84
9	Plaice	16.00	1410144000.00	1340.63

Seabird abundance: 25.90

# of seabirds killed: 21260.29

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 163.17

Days slick lasted: 8.23

Final position of slick from spill site (km):
X = 3.81 Y = 52.70 Dist. = 52.84

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
54.93	9.57	.00	34.96	.54

==========

Toxicity lasted for 7.28 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	4460676.00	76.49
2	Cod	.56	10408240.00	178.48
3	Cod	.88	16355810.00	280.47
4	Cod	6.00	111516900.00	1912.31
5	Cod	60.00	1115169000.00	19123.06
6	Plaice	.01	148689.20	.14
7	Plaice	.02	446067.60	.42
8	Plaice	.08	1486892.00	1.41
9	Plaice	.80	14868920.00	14.14

Seabird abundance: 27.60

# of seabirds killed: 4323.63

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 66.85

Days slick lasted: 37.52

Final position of slick from spill site (km):
X = -98.67 Y = -.73 Dist. = 98.68

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.75	.00	34.99	4.25

==========

Toxicity lasted for 67.52 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	2385528.00	40.91
2	Cod	.64	4771057.00	81.81
3	Cod	1.04	7752967.00	132.95
4	Cod	16.00	119276400.00	2045.37
5	Cod	160.00	1192764000.00	20453.67
6	Plaice	1.28	9542113.00	9.07
7	Plaice	3.52	26240810.00	24.95
8	Plaice	7.36	54867150.00	52.16
9	Plaice	112.00	834934900.00	793.77

Seabird abundance: 19.10

# of seabirds killed: 6073.75

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 62.73

Days slick lasted: 34.92

Final position of slick from spill site (km):
X = -7.46 Y = -106.05 Dist. = 106.31

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.90	.00	34.99	4.09

==========

Toxicity lasted for 64.92 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	5877776.00	100.79
2	Cod	.56	13714810.00	235.18
3	Cod	.88	21551850.00	369.57
4	Cod	6.00	146944400.00	2519.82
5	Cod	60.00	1469444000.00	25198.22
6	Plaice	.16	3918518.00	3.73
7	Plaice	.80	19592590.00	18.63
8	Plaice	1.12	27429620.00	26.08
9	Plaice	16.00	391851700.00	372.53

Seabird abundance: 25.90

# of seabirds killed: 6740.65

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C131A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 54.43

Days slick lasted: 8.23

Final position of slick from spill site (km):
X = 3.81 Y = 52.70 Dist. = 52.84

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
48.32	16.18	.00	34.96	.54

==========

Toxicity lasted for 7.28 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	963051.80	16.51
2	Cod	.56	2247121.00	38.53
3	Cod	.88	3531190.00	60.55
4	Cod	6.00	24076300.00	412.86
5	Cod	60.00	240762900.00	4128.63
6	Plaice	.01	32101.73	.03
7	Plaice	.02	96305.18	.09
8	Plaice	.08	321017.30	.31
9	Plaice	.80	3210173.00	3.05

Seabird abundance: 27.60

# of seabirds killed: 2542.97

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 260.75

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 258.38 Y = -.69 Dist. = 258.38

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.98	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	20805780.00	356.78
2	Cod	.64	41611560.00	713.56
3	Cod	1.04	67618780.00	1159.54
4	Cod	16.00	1040289000.00	17839.01
5	Cod	160.00	10402890000.00	178390.00
6	Plaice	1.28	83223120.00	79.12
7	Plaice	3.52	228863600.00	217.58
8	Plaice	7.36	478532900.00	454.94
9	Plaice	112.00	7282023000.00	6923.03

Seabird abundance: 19.10

# of seabirds killed: 50363.78

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A1S2
Season: Summer
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 252.09

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 224.80 Y = -.78 Dist. = 224.80

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	35757650.00	613.18
2	Cod	.56	83434520.00	1430.75
3	Cod	.88	131111400.00	2248.31
4	Cod	6.00	893941200.00	15329.42
5	Cod	60.00	8939412000.00	153294.20
6	Plaice	.16	23838430.00	22.66
7	Plaice	.80	119192200.00	113.32
8	Plaice	1.12	166869000.00	158.64
9	Plaice	16.00	2383843000.00	2266.32

Seabird abundance: 25.90

# of seabirds killed: 56887.83

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A1S3
Season: Fall
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 263.05

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 251.16 Y = .41 Dist. = 251.16

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	10287280.00	176.41
2	Cod	.56	24003650.00	411.62
3	Cod	.88	37720020.00	646.83
4	Cod	6.00	257182000.00	4410.19
5	Cod	60.00	2571820000.00	44101.89
6	Plaice	.01	342909.30	.33
7	Plaice	.02	1028728.00	.98
8	Plaice	.08	3429093.00	3.26
9	Plaice	.80	34290930.00	32.60

Seabird abundance: 27.60

# of seabirds killed: 69280.98

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A2S1
Season: Spring
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 186.59

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 258.38 Y = -.69 Dist. = 258.38

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	13080950.00	224.31
2	Cod	.64	26161900.00	448.63
3	Cod	1.04	42513090.00	729.02
4	Cod	16.00	654047600.00	11215.69
5	Cod	160.00	6540475000.00	112156.90
6	Plaice	1.28	52323800.00	49.74
7	Plaice	3.52	143890500.00	136.80
8	Plaice	7.36	300861900.00	286.03
9	Plaice	112.00	4578333000.00	4352.63

Seabird abundance: 19.10

# of seabirds killed: 42798.27

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 179.35

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 224.80 Y = -.78 Dist. = 224.80

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	25393950.00	435.46
2	Cod	.56	59252550.00	1016.07
3	Cod	.88	93111150.00	1596.68
4	Cod	6.00	634848800.00	10886.47
5	Cod	60.00	6348488000.00	108864.70
6	Plaice	.16	16929300.00	16.09
7	Plaice	.80	84646500.00	80.47
8	Plaice	1.12	118505100.00	112.66
9	Plaice	16.00	1692930000.00	1609.47

Seabird abundance: 25.90

# of seabirds killed: 48224.30

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 188.61

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 251.16 Y = .41 Dist. = 251.16

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	6767815.00	116.06
2	Cod	.56	15791570.00	270.80
3	Cod	.88	24815320.00	425.54
4	Cod	6.00	169195400.00	2901.38
5	Cod	60.00	1691954000.00	29013.84
6	Plaice	.01	225593.80	.21
7	Plaice	.02	676781.40	.64
8	Plaice	.08	2255938.00	2.14
9	Plaice	.80	22559380.00	21.45

Seabird abundance: 27.60

# of seabirds killed: 58924.57

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 158.89

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 258.38 Y = -.69 Dist. = 258.38

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	11122730.00	190.73
2	Cod	.64	22245450.00	381.47
3	Cod	1.04	36148860.00	619.89
4	Cod	16.00	556136300.00	9536.70
5	Cod	160.00	5561362000.00	95366.95
6	Plaice	1.28	44490900.00	42.30
7	Plaice	3.52	122350000.00	116.32
8	Plaice	7.36	255822700.00	243.21
9	Plaice	112.00	3892954000.00	3701.04

Seabird abundance: 19.10

# of seabirds killed: 39581.21

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A3S2
Season: Summer
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 152.21

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 224.80 Y = -.78 Dist. = 224.80

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	35.00	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	21170840.00	363.04
2	Cod	.56	49398630.00	847.09
3	Cod	.88	77626410.00	1331.15
4	Cod	6.00	529271000.00	9076.01
5	Cod	60.00	5292710000.00	90760.05
6	Plaice	.16	14113890.00	13.42
7	Plaice	.80	70569460.00	67.09
8	Plaice	1.12	98797260.00	93.93
9	Plaice	16.00	1411389000.00	1341.81

Seabird abundance: 25.90

# of seabirds killed: 44528.96

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 160.76

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 251.16 Y = .41 Dist. = 251.16

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	5821355.00	99.83
2	Cod	.56	13583160.00	232.93
3	Cod	.88	21344970.00	366.03
4	Cod	6.00	145533900.00	2495.63
5	Cod	60.00	1455339000.00	24956.33
6	Plaice	.01	194045.20	.18
7	Plaice	.02	582135.50	.55
8	Plaice	.08	1940452.00	1.84
9	Plaice	.80	19404520.00	18.45

Seabird abundance: 27.60

# of seabirds killed: 54500.20

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 47.22

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 258.38 Y = -.69 Dist. = 258.38

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.55

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	2585173.00	44.33
2	Cod	.64	5170346.00	88.66
3	Cod	1.04	8401811.00	144.08
4	Cod	16.00	129258600.00	2216.54
5	Cod	160.00	1292586000.00	22165.43
6	Plaice	1.28	10340690.00	9.83
7	Plaice	3.52	28436900.00	27.03
8	Plaice	7.36	59458980.00	56.53
9	Plaice	112.00	904810500.00	860.20

Seabird abundance: 19.10

# of seabirds killed: 22113.69

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 43.74

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 224.80 Y = -.78 Dist. = 224.80

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.55

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	5872287.00	100.70
2	Cod	.56	13702000.00	234.96
3	Cod	.88	21531720.00	369.23
4	Cod	6.00	146807200.00	2517.47
5	Cod	60.00	1468072000.00	25174.68
6	Plaice	.16	3914858.00	3.72
7	Plaice	.80	19574290.00	18.61
8	Plaice	1.12	27404000.00	26.05
9	Plaice	16.00	391485800.00	372.19

Seabird abundance: 25.90

# of seabirds killed: 16337.24

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C112A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 48.93

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 251.16 Y = .41 Dist. = 251.16

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.55

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1597390.00	27.39
2	Cod	.56	3727243.00	63.92
3	Cod	.88	5857096.00	100.44
4	Cod	6.00	39934740.00	684.81
5	Cod	60.00	399347500.00	6848.06
6	Plaice	.01	53246.33	.05
7	Plaice	.02	159739.00	.15
8	Plaice	.08	532463.30	.51
9	Plaice	.80	5324633.00	5.06

Seabird abundance: 27.60

# of seabirds killed: 31178.28

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 188.80

Days slick lasted: 7.00

Final position of slick from spill site (km):
X = 320.90 Y = .67 Dist. = 320.90

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.47	.00	34.97	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	29770840.00	510.51
2	Cod	.64	59541680.00	1021.03
3	Cod	1.04	96755220.00	1659.17
4	Cod	16.00	1488542000.00	25525.71
5	Cod	160.00	14885420000.00	255257.10
6	Plaice	1.28	119083400.00	113.21
7	Plaice	3.52	327479200.00	311.33
8	Plaice	7.36	684729300.00	650.97
9	Plaice	112.00	10419790000.00	9906.11

Seabird abundance: 19.10

# of seabirds killed: 30009.71

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A1S2
Season: Summer
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 200.47

Days slick lasted: 8.00

Final position of slick from spill site (km):
X = 262.61 Y = .38 Dist. = 262.61

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	44450240.00	762.24
2	Cod	.56	103717200.00	1778.56
3	Cod	.88	162984200.00	2794.88
4	Cod	6.00	1111256000.00	19055.96
5	Cod	60.00	11112560000.00	190559.60
6	Plaice	.16	29633500.00	28.17
7	Plaice	.80	148167500.00	140.86
8	Plaice	1.12	207434500.00	197.21
9	Plaice	16.00	2963350000.00	2817.26

Seabird abundance: 25.90

# of seabirds killed: 32407.82

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A1S3
Season: Fall
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 190.44

Days slick lasted: 7.00

Final position of slick from spill site (km):
X = 320.90 Y = .67 Dist. = 320.90

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.98	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	15315800.00	262.64
2	Cod	.56	35736860.00	612.82
3	Cod	.88	56157920.00	963.00
4	Cod	6.00	382894900.00	6565.93
5	Cod	60.00	3828949000.00	65659.30
6	Plaice	.01	510526.60	.49
7	Plaice	.02	1531580.00	1.46
8	Plaice	.08	5105266.00	4.85
9	Plaice	.80	51052660.00	48.54

Seabird abundance: 27.60

# of seabirds killed: 43440.80

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A2S1
Season: Spring
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 128.32

Days slick lasted: 6.00

Final position of slick from spill site (km):
X = 275.11 Y = .67 Dist. = 275.11

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.98	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	18257080.00	313.07
2	Cod	.64	36514150.00	626.15
3	Cod	1.04	59335490.00	1017.49
4	Cod	16.00	912853800.00	15653.73
5	Cod	160.00	9128538000.00	156537.30
6	Plaice	1.28	73028300.00	69.43
7	Plaice	3.52	200827800.00	190.93
8	Plaice	7.36	419912700.00	399.21
9	Plaice	112.00	6389977000.00	6074.96

Seabird abundance: 19.10

# of seabirds killed: 18833.65

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 136.67

Days slick lasted: 7.00

Final position of slick from spill site (km):
X = 229.78 Y = .38 Dist. = 229.78

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	29437180.00	504.79
2	Cod	.56	68686760.00	1177.85
3	Cod	.88	107936300.00	1850.91
4	Cod	6.00	735929500.00	12619.81
5	Cod	60.00	7359295000.00	126198.10
6	Plaice	.16	19624790.00	18.66
7	Plaice	.80	98123940.00	93.29
8	Plaice	1.12	137373500.00	130.60
9	Plaice	16.00	1962479000.00	1865.73

Seabird abundance: 25.90

# of seabirds killed: 20895.32

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 129.37

Days slick lasted: 6.00

Final position of slick from spill site (km):
X = 275.11 Y = .67 Dist. = 275.11

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	9981202.00	171.16
2	Cod	.56	23289470.00	399.37
3	Cod	.88	36597740.00	627.58
4	Cod	6.00	249530000.00	4278.97
5	Cod	60.00	2495301000.00	42789.73
6	Plaice	.01	332706.80	.32
7	Plaice	.02	998120.20	.95
8	Plaice	.08	3327067.00	3.16
9	Plaice	.80	33270670.00	31.63

Seabird abundance: 27.60

# of seabirds killed: 27250.69

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 108.23

Days slick lasted: 6.00

Final position of slick from spill site (km):
X = 275.11 Y = .67 Dist. = 275.11

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.98	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	15100740.00	258.95
2	Cod	.64	30201470.00	517.90
3	Cod	1.04	49077390.00	841.59
4	Cod	16.00	755036700.00	12947.46
5	Cod	160.00	7550368000.00	129474.70
6	Plaice	1.28	60402940.00	57.43
7	Plaice	3.52	166108100.00	157.92
8	Plaice	7.36	347316900.00	330.19
9	Plaice	112.00	5285257000.00	5024.70

Seabird abundance: 19.10

# of seabirds killed: 17397.75

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A3S2
Season: Summer
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 115.19

Days slick lasted: 7.00

Final position of slick from spill site (km):
X = 229.78 Y = .38 Dist. = 229.78

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.55

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	24694390.00	423.46
2	Cod	.56	57620240.00	988.08
3	Cod	.88	90546090.00	1552.70
4	Cod	6.00	617359700.00	10586.56
5	Cod	60.00	6173597000.00	105865.60
6	Plaice	.16	16462930.00	15.65
7	Plaice	.80	82314620.00	78.26
8	Plaice	1.12	115240500.00	109.56
9	Plaice	16.00	1646292000.00	1565.13

Seabird abundance: 25.90

# of seabirds killed: 19343.29

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 109.17

Days slick lasted: 6.00

Final position of slick from spill site (km):
X = 275.11 Y = .67 Dist. = 275.11

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.55

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	7494578.00	128.52
2	Cod	.56	17487350.00	299.88
3	Cod	.88	27480120.00	471.23
4	Cod	6.00	187364400.00	3212.95
5	Cod	60.00	1873645000.00	32129.49
6	Plaice	.01	249819.30	.24
7	Plaice	.02	749457.80	.71
8	Plaice	.08	2498193.00	2.38
9	Plaice	.80	24981930.00	23.75

Seabird abundance: 27.60

# of seabirds killed: 25172.37

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 29.97

Days slick lasted: 4.25

Final position of slick from spill site (km):
X = 183.68 Y = -.74 Dist. = 183.68

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	64.74	.00	34.93	.33

==========

Toxicity lasted for 5.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	2582035.00	44.28
2	Cod	.64	5164070.00	88.55
3	Cod	1.04	8391614.00	143.90
4	Cod	16.00	129101800.00	2213.85
5	Cod	160.00	1291018000.00	22138.53
6	Plaice	1.28	10328140.00	9.82
7	Plaice	3.52	28402390.00	27.00
8	Plaice	7.36	59386810.00	56.46
9	Plaice	112.00	903712300.00	859.16

Seabird abundance: 19.10

# of seabirds killed: 3717.65

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 32.57

Days slick lasted: 6.00

Final position of slick from spill site (km):
X = 196.94 Y = .38 Dist. = 196.94

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	64.40	.00	34.95	.65

==========

Toxicity lasted for 9.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	5915294.00	101.44
2	Cod	.56	13802350.00	236.68
3	Cod	.88	21689410.00	371.93
4	Cod	6.00	147882300.00	2535.91
5	Cod	60.00	1478823000.00	25359.05
6	Plaice	.16	3943529.00	3.75
7	Plaice	.80	19717650.00	18.75
8	Plaice	1.12	27604700.00	26.24
9	Plaice	16.00	394352900.00	374.91

Seabird abundance: 25.90

# of seabirds killed: 6559.31

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C122A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 30.14

Days slick lasted: 4.25

Final position of slick from spill site (km):
X = 183.68 Y = -.74 Dist. = 183.68

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	64.73	.00	34.95	.33

==========

Toxicity lasted for 5.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1619127.00	27.76
2	Cod	.56	3777964.00	64.79
3	Cod	.88	5936801.00	101.81
4	Cod	6.00	40478180.00	694.13
5	Cod	60.00	404781900.00	6941.25
6	Plaice	.01	53970.92	.05
7	Plaice	.02	161912.70	.15
8	Plaice	.08	539709.10	.51
9	Plaice	.80	5397092.00	5.13

Seabird abundance: 27.60

# of seabirds killed: 5399.91

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 295.15

Days slick lasted: 40.00

Final position of slick from spill site (km):
X = 165.73 Y = .18 Dist. = 165.73

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.40	.00	34.98	2.62

==========

Toxicity lasted for 40.94 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	16562630.00	284.02
2	Cod	.64	33125260.00	568.04
3	Cod	1.04	53828550.00	923.06
4	Cod	16.00	828131600.00	14200.90
5	Cod	160.00	8281316000.00	142009.00
6	Plaice	1.28	66250530.00	62.98
7	Plaice	3.52	182189000.00	173.21
8	Plaice	7.36	380940500.00	362.16
9	Plaice	112.00	5796921000.00	5511.14

Seabird abundance: 19.10

# of seabirds killed: 36430.23

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A1S2
Season: Summer
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 302.95

Days slick lasted: 34.92

Final position of slick from spill site (km):
X = 175.89 Y = .67 Dist. = 175.90

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.32	.00	34.99	2.69

==========

Toxicity lasted for 42.14 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	36330380.00	623.00
2	Cod	.56	84770900.00	1453.66
3	Cod	.88	133211400.00	2284.33
4	Cod	6.00	908259600.00	15574.95
5	Cod	60.00	9082595000.00	155749.50
6	Plaice	.16	24220250.00	23.03
7	Plaice	.80	121101300.00	115.13
8	Plaice	1.12	169541800.00	161.18
9	Plaice	16.00	2422025000.00	2302.62

Seabird abundance: 25.90

# of seabirds killed: 56553.39

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A1S3
Season: Fall
Amount (MT): 40512.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 299.07

Days slick lasted: 42.00

Final position of slick from spill site (km):
X = 176.69 Y = .34 Dist. = 176.69

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.38	.00	34.99	2.63

==========

Toxicity lasted for 41.19 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	9566635.00	164.05
2	Cod	.56	22322150.00	382.78
3	Cod	.88	35077660.00	601.52
4	Cod	6.00	239165900.00	4101.25
5	Cod	60.00	2391659000.00	41012.46
6	Plaice	.01	318887.80	.30
7	Plaice	.02	956663.50	.91
8	Plaice	.08	3188878.00	3.03
9	Plaice	.80	31888780.00	30.32

Seabird abundance: 27.60

# of seabirds killed: 58813.31

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A2S1
Season: Spring
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 214.02

Days slick lasted: 40.00

Final position of slick from spill site (km):
X = 165.73 Y = .18 Dist. = 165.73

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.40	.00	34.99	2.62

==========

Toxicity lasted for 40.94 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	11365700.00	194.90
2	Cod	.64	22731400.00	389.80
3	Cod	1.04	36938520.00	633.43
4	Cod	16.00	568284900.00	9745.02
5	Cod	160.00	5682849000.00	97450.22
6	Plaice	1.28	45462790.00	43.22
7	Plaice	3.52	125022700.00	118.86
8	Plaice	7.36	261411100.00	248.52
9	Plaice	112.00	3977994000.00	3781.89

Seabird abundance: 19.10

# of seabirds killed: 31098.46

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 218.75

Days slick lasted: 34.92

Final position of slick from spill site (km):
X = 175.89 Y = .67 Dist. = 175.90

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.31	.00	34.99	2.69

==========

Toxicity lasted for 42.14 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	24941000.00	427.69
2	Cod	.56	58195660.00	997.95
3	Cod	.88	91450330.00	1568.20
4	Cod	6.00	623524900.00	10692.29
5	Cod	60.00	6235250000.00	106922.90
6	Plaice	.16	16627330.00	15.81
7	Plaice	.80	83136660.00	79.04
8	Plaice	1.12	116391300.00	110.65
9	Plaice	16.00	1662733000.00	1580.76

Seabird abundance: 25.90

# of seabirds killed: 48169.55

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 217.00

Days slick lasted: 42.00

Final position of slick from spill site (km):
X = 176.69 Y = .34 Dist. = 176.69

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.38	.00	34.99	2.63

==========

Toxicity lasted for 41.19 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	6530448.00	111.98
2	Cod	.56	15237710.00	261.30
3	Cod	.88	23944980.00	410.61
4	Cod	6.00	163261200.00	2799.62
5	Cod	60.00	1632612000.00	27996.24
6	Plaice	.01	217681.60	.21
7	Plaice	.02	653044.80	.62
8	Plaice	.08	2176816.00	2.07
9	Plaice	.80	21768160.00	20.70

Seabird abundance: 27.60

# of seabirds killed: 50340.71

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 183.63

Days slick lasted: 40.00

Final position of slick from spill site (km):
X = 165.73 Y = .18 Dist. = 165.73

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.40	.00	34.99	2.62

==========

Toxicity lasted for 40.94 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	9579686.00	164.27
2	Cod	.64	19159370.00	328.55
3	Cod	1.04	31133980.00	533.89
4	Cod	16.00	478984300.00	8213.68
5	Cod	160.00	4789843000.00	82136.83
6	Plaice	1.28	38318740.00	36.43
7	Plaice	3.52	105376500.00	100.18
8	Plaice	7.36	220332800.00	209.47
9	Plaice	112.00	3352890000.00	3187.60

Seabird abundance: 19.10

# of seabirds killed: 28844.12

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A3S2
Season: Summer
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 187.33

Days slick lasted: 34.92

Final position of slick from spill site (km):
X = 175.89 Y = .67 Dist. = 175.90

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.31	.00	34.99	2.69

==========

Toxicity lasted for 42.14 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	21091760.00	361.68
2	Cod	.56	49214110.00	843.93
3	Cod	.88	77336460.00	1326.18
4	Cod	6.00	527294000.00	9042.10
5	Cod	60.00	5272941000.00	90421.05
6	Plaice	.16	14061170.00	13.37
7	Plaice	.80	70305870.00	66.84
8	Plaice	1.12	98428220.00	93.58
9	Plaice	16.00	1406118000.00	1336.80

Seabird abundance: 25.90

# of seabirds killed: 44635.79

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 186.32

Days slick lasted: 42.00

Final position of slick from spill site (km):
X = 176.69 Y = .34 Dist. = 176.69

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.38	.00	34.99	2.63

==========

Toxicity lasted for 41.19 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	5516667.00	94.60
2	Cod	.56	12872220.00	220.73
3	Cod	.88	20227780.00	346.87
4	Cod	6.00	137916700.00	2365.01
5	Cod	60.00	1379167000.00	23650.13
6	Plaice	.01	183888.90	.17
7	Plaice	.02	551666.70	.52
8	Plaice	.08	1838889.00	1.75
9	Plaice	.80	18388890.00	17.48

Seabird abundance: 27.60

# of seabirds killed: 46699.51

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 59.99

Days slick lasted: 40.00

Final position of slick from spill site (km):
X = 165.73 Y = .18 Dist. = 165.73

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.39	.00	35.00	2.61

==========

Toxicity lasted for 40.94 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	2854592.00	48.95
2	Cod	.64	5709184.00	97.90
3	Cod	1.04	9277424.00	159.09
4	Cod	16.00	142729600.00	2447.54
5	Cod	160.00	1427296000.00	24475.45
6	Plaice	1.28	11418370.00	10.86
7	Plaice	3.52	31400510.00	29.85
8	Plaice	7.36	65655620.00	62.42
9	Plaice	112.00	999107300.00	949.85

Seabird abundance: 19.10

# of seabirds killed: 16681.66

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 59.86

Days slick lasted: 34.92

Final position of slick from spill site (km):
X = 175.89 Y = .67 Dist. = 175.90

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.31	.00	35.00	2.69

==========

Toxicity lasted for 42.14 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	5877429.00	100.79
2	Cod	.56	13714000.00	235.17
3	Cod	.88	21550570.00	369.55
4	Cod	6.00	146935700.00	2519.67
5	Cod	60.00	1469357000.00	25196.73
6	Plaice	.16	3918286.00	3.73
7	Plaice	.80	19591430.00	18.63
8	Plaice	1.12	27428000.00	26.08
9	Plaice	16.00	391828600.00	372.51

Seabird abundance: 25.90

# of seabirds killed: 25713.52

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C132A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 14.3
Wind Speed: Low
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 61.15

Days slick lasted: 42.00

Final position of slick from spill site (km):
X = 176.69 Y = .34 Dist. = 176.69

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.38	.00	35.00	2.63

==========

Toxicity lasted for 41.19 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1598501.00	27.41
2	Cod	.56	3729835.00	63.96
3	Cod	.88	5861170.00	100.51
4	Cod	6.00	39962520.00	685.28
5	Cod	60.00	399625200.00	6852.83
6	Plaice	.01	53283.36	.05
7	Plaice	.02	159850.10	.15
8	Plaice	.08	532833.60	.51
9	Plaice	.80	5328336.00	5.07

Seabird abundance: 27.60

# of seabirds killed: 27022.80

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 245.59

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
38.35	26.14	.00	34.94	.58

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	2585763.00	44.34
2	Cod	.64	5171525.00	88.68
3	Cod	1.04	8403728.00	144.11
4	Cod	16.00	129288100.00	2217.05
5	Cod	160.00	1292881000.00	22170.49
6	Plaice	1.28	10343050.00	9.83
7	Plaice	3.52	28443390.00	27.04
8	Plaice	7.36	59472540.00	56.54
9	Plaice	112.00	905016900.00	860.40

Seabird abundance: 19.10

# of seabirds killed: 7911.73

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A1S2
Season: Summer
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 252.37

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.42	.00	34.99	2.60

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	5954045.00	102.10
2	Cod	.56	13892770.00	238.24
3	Cod	.88	21831500.00	374.37
4	Cod	6.00	148851100.00	2552.52
5	Cod	60.00	1488511000.00	25525.17
6	Plaice	.16	3969363.00	3.77
7	Plaice	.80	19846820.00	18.87
8	Plaice	1.12	27785540.00	26.42
9	Plaice	16.00	396936300.00	377.37

Seabird abundance: 25.90

# of seabirds killed: 38313.66

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A1S3
Season: Fall
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 188.37

Days slick lasted: 4.41

Final position of slick from spill site (km):
X = -25.28 Y = 55.88 Dist. = 61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
55.57	9.18	.00	34.96	.30

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	749912.20	12.86
2	Cod	.56	1749795.00	30.01
3	Cod	.88	2749678.00	47.15
4	Cod	6.00	18747800.00	321.49
5	Cod	60.00	187478000.00	3214.90
6	Plaice	.01	24997.07	.02
7	Plaice	.02	74991.22	.07
8	Plaice	.08	249970.70	.24
9	Plaice	.80	2499707.00	2.38

Seabird abundance: 27.60

# of seabirds killed: 3517.77

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A2S1
Season: Spring
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 176.27

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
34.19	30.29	.00	34.95	.57

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	1838832.00	31.53
2	Cod	.64	3677665.00	63.07
3	Cod	1.04	5976205.00	102.48
4	Cod	16.00	91941620.00	1576.63
5	Cod	160.00	919416100.00	15766.26
6	Plaice	1.28	7355329.00	6.99
7	Plaice	3.52	20227160.00	19.23
8	Plaice	7.36	42293140.00	40.21
9	Plaice	112.00	643591300.00	611.86

Seabird abundance: 19.10

# of seabirds killed: 6762.83

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 178.72

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.41	.00	34.99	2.59

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	4123464.00	70.71
2	Cod	.56	9621416.00	164.99
3	Cod	.88	15119370.00	259.27
4	Cod	6.00	103086600.00	1767.74
5	Cod	60.00	1030866000.00	17677.42
6	Plaice	.16	2748976.00	2.61
7	Plaice	.80	13744880.00	13.07
8	Plaice	1.12	19242830.00	18.29
9	Plaice	16.00	274897600.00	261.35

Seabird abundance: 25.90

# of seabirds killed: 32370.50

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 137.33

Days slick lasted: 4.41

Final position of slick from spill site (km):
X = -25.28 Y = 55.88 Dist. = 61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
54.02	10.73	.00	34.96	.29

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	539218.60	9.25
2	Cod	.56	1258177.00	21.58
3	Cod	.88	1977135.00	33.90
4	Cod	6.00	13480460.00	231.16
5	Cod	60.00	134804600.00	2311.65
6	Plaice	.01	17973.95	.02
7	Plaice	.02	53921.86	.05
8	Plaice	.08	179739.50	.17
9	Plaice	.80	1797395.00	1.71

Seabird abundance: 27.60

# of seabirds killed: 3033.90

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 150.38

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
32.03	32.45	.00	34.95	.57

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	1455704.00	24.96
2	Cod	.64	2911408.00	49.93
3	Cod	1.04	4731038.00	81.13
4	Cod	16.00	72785190.00	1248.13
5	Cod	160.00	727852000.00	12481.30
6	Plaice	1.28	5822816.00	5.54
7	Plaice	3.52	16012740.00	15.22
8	Plaice	7.36	33481190.00	31.83
9	Plaice	112.00	509496400.00	484.38

Seabird abundance: 19.10

# of seabirds killed: 6273.55

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A3S2
Season: Summer
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 151.36

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.41	.00	34.99	2.59

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	3504525.00	60.10
2	Cod	.56	8177226.00	140.22
3	Cod	.88	12849930.00	220.35
4	Cod	6.00	87613130.00	1502.40
5	Cod	60.00	876131300.00	15024.01
6	Plaice	.16	2336350.00	2.22
7	Plaice	.80	11681750.00	11.11
8	Plaice	1.12	16354450.00	15.55
9	Plaice	16.00	233635000.00	222.12

Seabird abundance: 25.90

# of seabirds killed: 29849.73

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 118.12

Days slick lasted: 4.41

Final position of slick from spill site (km):
X = -25.28 Y = 55.88 Dist. = 61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
53.20	11.55	.00	34.96	.29

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	443597.50	7.61
2	Cod	.56	1035061.00	17.75
3	Cod	.88	1626524.00	27.89
4	Cod	6.00	11089940.00	190.17
5	Cod	60.00	110899400.00	1901.72
6	Plaice	.01	14786.58	.01
7	Plaice	.02	44359.75	.04
8	Plaice	.08	147865.80	.14
9	Plaice	.80	1478658.00	1.41

Seabird abundance: 27.60

# of seabirds killed: 2825.92

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 46.19

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
11.67	52.81	.00	34.95	.57

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	376130.00	6.45
2	Cod	.64	752260.00	12.90
3	Cod	1.04	1222423.00	20.96
4	Cod	16.00	18806500.00	322.50
5	Cod	160.00	188065000.00	3224.96
6	Plaice	1.28	1504520.00	1.43
7	Plaice	3.52	4137430.00	3.93
8	Plaice	7.36	8650990.00	8.22
9	Plaice	112.00	131645500.00	125.16

Seabird abundance: 19.10

# of seabirds killed: 3616.33

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 43.72

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.41	.00	34.99	2.59

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1089284.00	18.68
2	Cod	.56	2541662.00	43.58
3	Cod	.88	3994040.00	68.49
4	Cod	6.00	27232090.00	466.98
5	Cod	60.00	272320900.00	4669.79
6	Plaice	.16	726189.00	.69
7	Plaice	.80	3630945.00	3.45
8	Plaice	1.12	5083323.00	4.83
9	Plaice	16.00	72618900.00	69.04

Seabird abundance: 25.90

# of seabirds killed: 8890.39

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C211A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 39.32

Days slick lasted: 4.41

Final position of slick from spill site (km):
X = -25.28 Y = 55.88 Dist. = 61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
45.15	19.61	.00	34.96	.29

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	113622.60	1.95
2	Cod	.56	265119.30	4.55
3	Cod	.88	416616.00	7.14
4	Cod	6.00	2840564.00	48.71
5	Cod	60.00	28405640.00	487.10
6	Plaice	.01	3787.42	.00
7	Plaice	.02	11362.26	.01
8	Plaice	.08	37874.18	.03
9	Plaice	.80	378741.80	.36

Seabird abundance: 27.60

# of seabirds killed: 1682.92

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 245.59

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
38.35	26.14	.00	34.94	.58

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	44605.29	.76
2	Cod	.64	89210.58	1.53
3	Cod	1.04	144967.20	2.49
4	Cod	16.00	2230265.00	38.24
5	Cod	160.00	22302640.00	382.45
6	Plaice	1.28	178421.20	.17
7	Plaice	3.52	490658.20	.47
8	Plaice	7.36	1025922.00	.98
9	Plaice	112.00	15611850.00	14.84

Seabird abundance: 19.10

# of seabirds killed: 7911.73

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A1S2
Season: Summer
Amount (MT): 40512.0
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 252.37

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.42	.00	34.99	2.60

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	237642.90	4.08
2	Cod	.56	554500.10	9.51
3	Cod	.88	871357.20	14.94
4	Cod	6.00	5941072.00	101.88
5	Cod	60.00	59410720.00	1018.78
6	Plaice	.16	158428.60	.15
7	Plaice	.80	792142.90	.75
8	Plaice	1.12	1109000.00	1.05
9	Plaice	16.00	15842860.00	15.06

Seabird abundance: 25.90

# of seabirds killed: 38313.66

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A1S3
Season: Fall
Amount (MT): 40512.0
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 188.37

Days slick lasted: 4.41

Final position of slick from spill site (km):
X = -25.28 Y = 55.88 Dist. = 61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
55.57	9.18	.00	34.96	.30

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	10930.16	.19
2	Cod	.56	25503.71	.44
3	Cod	.88	40077.26	.69
4	Cod	6.00	273254.00	4.69
5	Cod	60.00	2732540.00	46.86
6	Plaice	.01	364.34	.00
7	Plaice	.02	1093.02	.00
8	Plaice	.08	3643.39	.00
9	Plaice	.80	36433.87	.03

Seabird abundance: 27.60

# of seabirds killed: 3517.77

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A2S1
Season: Spring
Amount (MT): 25320.0
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 176.27

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
34.19	30.29	.00	34.95	.57

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	33454.41	.57
2	Cod	.64	66908.81	1.15
3	Cod	1.04	108726.80	1.86
4	Cod	16.00	1672720.00	28.68
5	Cod	160.00	16727200.00	286.84
6	Plaice	1.28	133817.60	.13
7	Plaice	3.52	367998.50	.35
8	Plaice	7.36	769451.40	.73
9	Plaice	112.00	11709040.00	11.13

Seabird abundance: 19.10

# of seabirds killed: 6762.83

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 178.72

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.41	.00	34.99	2.59

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	165728.60	2.84
2	Cod	.56	386700.00	6.63
3	Cod	.88	607671.40	10.42
4	Cod	6.00	4143214.00	71.05
5	Cod	60.00	41432140.00	710.48
6	Plaice	.16	110485.70	.10
7	Plaice	.80	552428.60	.53
8	Plaice	1.12	773400.00	.74
9	Plaice	16.00	11048570.00	10.50

Seabird abundance: 25.90

# of seabirds killed: 32370.50

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 137.33

Days slick lasted: 4.41

Final position of slick from spill site (km):
X = -25.28 Y = 55.88 Dist. = 61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
54.02	10.73	.00	34.96	.29

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	7849.88	.13
2	Cod	.56	18316.40	.31
3	Cod	.88	28782.91	.49
4	Cod	6.00	196247.10	3.37
5	Cod	60.00	1962471.00	33.65
6	Plaice	.01	261.66	.00
7	Plaice	.02	784.99	.00
8	Plaice	.08	2616.63	.00
9	Plaice	.80	26166.28	.02

Seabird abundance: 27.60

# of seabirds killed: 3033.90

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 150.38

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
32.03	32.45	.00	34.95	.57

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	26411.96	.45
2	Cod	.64	52823.92	.91
3	Cod	1.04	85838.86	1.47
4	Cod	16.00	1320598.00	22.65
5	Cod	160.00	13205980.00	226.46
6	Plaice	1.28	105647.80	.10
7	Plaice	3.52	290531.50	.28
8	Plaice	7.36	607475.10	.58
9	Plaice	112.00	9244186.00	8.79

Seabird abundance: 19.10

# of seabirds killed: 6273.55

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A3S2
Season: Summer
Amount (MT): 20256.0
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 151.36

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.41	.00	34.99	2.59

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	141445.10	2.43
2	Cod	.56	330038.50	5.66
3	Cod	.88	518631.90	8.89
4	Cod	6.00	3536127.00	60.64
5	Cod	60.00	35361260.00	606.38
6	Plaice	.16	94296.70	.09
7	Plaice	.80	471483.50	.45
8	Plaice	1.12	660076.90	.63
9	Plaice	16.00	9429671.00	8.96

Seabird abundance: 25.90

# of seabirds killed: 29849.73

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 118.12

Days slick lasted: 4.41

Final position of slick from spill site (km):

X =	Y =	Dist. =
-25.28	55.88	61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
53.20	11.55	.00	34.96	.29

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	6162.02	.10
2	Cod	.56	14378.04	.25
3	Cod	.88	22594.06	.39
4	Cod	6.00	154050.40	2.64
5	Cod	60.00	1540504.00	26.42
6	Plaice	.01	205.40	.00
7	Plaice	.02	616.20	.00
8	Plaice	.08	2054.00	.00
9	Plaice	.80	20540.05	.02

Seabird abundance: 27.60

# of seabirds killed: 2825.92

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 46.19

Days slick lasted: 8.71

Final position of slick from spill site (km):
X = -104.89 Y = -.12 Dist. = 104.89

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
11.67	52.81	.00	34.95	.57

==========

Toxicity lasted for 8.04 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	9071.53	.15
2	Cod	.64	18143.06	.31
3	Cod	1.04	29482.47	.50
4	Cod	16.00	453576.50	7.78
5	Cod	160.00	4535765.00	77.78
6	Plaice	1.28	36286.12	.03
7	Plaice	3.52	99786.83	.09
8	Plaice	7.36	208645.20	.20
9	Plaice	112.00	3175036.00	3.02

Seabird abundance: 19.10

# of seabirds killed: 3616.33

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 43.72

Days slick lasted: 10.61

Final position of slick from spill site (km):
X = -72.89 Y = -61.79 Dist. = 95.56

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.41	.00	34.99	2.59

==========

Toxicity lasted for 40.61 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	53431.97	.92
2	Cod	.56	124674.60	2.14
3	Cod	.88	195917.30	3.36
4	Cod	6.00	1335799.00	22.91
5	Cod	60.00	13357990.00	229.06
6	Plaice	.16	35621.32	.03
7	Plaice	.80	178106.60	.17
8	Plaice	1.12	249349.20	.24
9	Plaice	16.00	3562132.00	3.39

Seabird abundance: 25.90

# of seabirds killed: 8890.39

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C311A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 1430.0
Wind Speed: Median
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 39.32

Days slick lasted: 4.41

Final position of slick from spill site (km):
X = -25.28 Y = 55.88 Dist. = 61.33

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
45.15	19.61	.00	34.96	.29

==========

Toxicity lasted for 3.88 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1391.43	.02
2	Cod	.56	3246.67	.05
3	Cod	.88	5101.90	.09
4	Cod	6.00	34785.71	.60
5	Cod	60.00	347857.10	5.97
6	Plaice	.01	46.38	.00
7	Plaice	.02	139.14	.00
8	Plaice	.08	463.81	.00
9	Plaice	.80	4638.09	.00

Seabird abundance: 27.60

# of seabirds killed: 1682.92

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C221A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 155.56

Days slick lasted: 3.56

Final position of slick from spill site (km):
X = -114.09 Y = -.27 Dist. = 114.09

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
39.10	25.76	.00	34.90	.24

==========

Toxicity lasted for 3.05 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	1838616.00	31.53
2	Cod	.64	3677232.00	63.06
3	Cod	1.04	5975502.00	102.47
4	Cod	16.00	91930790.00	1576.44
5	Cod	160.00	919307900.00	15764.41
6	Plaice	1.28	7354464.00	6.99
7	Plaice	3.52	20224770.00	19.23
8	Plaice	7.36	42288160.00	40.20
9	Plaice	112.00	643515500.00	611.79

Seabird abundance: 19.10

# of seabirds killed: 4443.25

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C221A1S2
Season: Summer
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 189.27

Days slick lasted: 6.34

Final position of slick from spill site (km):
X = -106.10 Y = -65.04 Dist. = 124.45

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
20.26	44.39	.00	34.93	.42

==========

Toxicity lasted for 6.34 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	7271643.00	124.70
2	Cod	.56	16967170.00	290.96
3	Cod	.88	26662690.00	457.22
4	Cod	6.00	181791100.00	3117.38
5	Cod	60.00	1817911000.00	31173.77
6	Plaice	.16	4847762.00	4.61
7	Plaice	.80	24238810.00	23.04
8	Plaice	1.12	33934340.00	32.26
9	Plaice	16.00	484776200.00	460.88

Seabird abundance: 25.90

# of seabirds killed: 8569.46

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C221A1S3
Season: Fall
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 130.12

Days slick lasted: 2.26

Final position of slick from spill site (km):
X = -45.51 Y = 62.45 Dist. = 77.28

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
51.84	13.07	.00	34.93	.15

==========

Toxicity lasted for 1.77 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	310205.30	5.32
2	Cod	.56	723812.50	12.41
3	Cod	.88	1137420.00	19.50
4	Cod	6.00	7755134.00	132.99
5	Cod	60.00	77551340.00	1329.86
6	Plaice	.01	10340.18	.01
7	Plaice	.02	31020.54	.03
8	Plaice	.08	103401.80	.10
9	Plaice	.80	1034018.00	.98

Seabird abundance: 27.60

# of seabirds killed: 4153.96

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C221A2S1
Season: Spring
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 112.02

Days slick lasted: 3.56

Final position of slick from spill site (km):
X = -114.09 Y = -.27 Dist. = 114.09

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
34.96	29.90	.00	34.90	.24

==========

Toxicity lasted for 3.05 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	1255874.00	21.54
2	Cod	.64	2511749.00	43.07
3	Cod	1.04	4081592.00	69.99
4	Cod	16.00	62793720.00	1076.80
5	Cod	160.00	627937200.00	10767.95
6	Plaice	1.28	5023498.00	4.78
7	Plaice	3.52	13814620.00	13.13
8	Plaice	7.36	28885110.00	27.46
9	Plaice	112.00	439556100.00	417.89

Seabird abundance: 19.10

# of seabirds killed: 3843.54

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C221A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 133.55

Days slick lasted: 6.34

Final position of slick from spill site (km):
X = -106.10 Y = -65.04 Dist. = 124.45

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
13.49	51.16	.00	34.94	.42

==========

Toxicity lasted for 6.34 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	4875715.00	83.61
2	Cod	.56	11376670.00	195.09
3	Cod	.88	17877620.00	306.57
4	Cod	6.00	121892900.00	2090.23
5	Cod	60.00	1218929000.00	20902.34
6	Plaice	.16	3250476.00	3.09
7	Plaice	.80	16252380.00	15.45
8	Plaice	1.12	22753330.00	21.63
9	Plaice	16.00	325047600.00	309.02

Seabird abundance: 25.90

# of seabirds killed: 7328.81

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C221A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 94.94

Days slick lasted: 2.26

Final position of slick from spill site (km):
X = -45.51 Y = 62.45 Dist. = 77.28

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
49.62	15.30	.00	34.93	.15

==========

Toxicity lasted for 1.77 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	195370.60	3.35
2	Cod	.56	455864.70	7.82
3	Cod	.88	716358.80	12.28
4	Cod	6.00	4884264.00	83.76
5	Cod	60.00	48842640.00	837.56
6	Plaice	.01	6512.35	.00
7	Plaice	.02	19537.06	.02
8	Plaice	.08	65123.52	.06
9	Plaice	.80	651235.30	.62

Seabird abundance: 27.60

# of seabirds killed: 3623.37

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C221A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 95.72

Days slick lasted: 3.56

Final position of slick from spill site (km):
X = -114.09 Y = -.27 Dist. = 114.09

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
32.78	32.08	.00	34.90	.24

==========

Toxicity lasted for 3.05 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	1013853.00	17.39
2	Cod	.64	2027707.00	34.77
3	Cod	1.04	3295023.00	56.50
4	Cod	16.00	50692660.00	869.28
5	Cod	160.00	506926700.00	8692.84
6	Plaice	1.28	4055413.00	3.86
7	Plaice	3.52	11152390.00	10.60
8	Plaice	7.36	23318630.00	22.17
9	Plaice	112.00	354848600.00	337.36

Seabird abundance: 19.10

# of seabirds killed: 3586.11

Results from NRDAM/CME for Oil Spill on Grand Banks

Case code:	C221A3S2
Season:	Summer
Amount (MT):	20256.0
LC50 (ppb):	143.0
Wind Speed:	High
Wind Direction:	Mode

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 112.89

Days slick lasted: 6.34

Final position of slick from spill site (km):

X = -106.10 Y = -65.04 Dist. = 124.45

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
9.94	54.71	.00	34.94	.42

Toxicity lasted for 6.34 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	4165421.00	71.43
2	Cod	.56	9719316.00	166.67
3	Cod	.88	15273210.00	261.91
4	Cod	6.00	104135500.00	1785.73
5	Cod	60.00	1041355000.00	17857.29
6	Plaice	.16	2776948.00	2.64
7	Plaice	.80	13884740.00	13.20
8	Plaice	1.12	19438630.00	18.48
9	Plaice	16.00	277694800.00	264.00

Seabird abundance: 25.90

# of seabirds killed: 6802.15

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C221A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 81.66

Days slick lasted: 2.26

Final position of slick from spill site (km):
X = -45.51 Y = 62.45 Dist. = 77.28

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
48.43	16.48	.00	34.93	.15

==========

Toxicity lasted for 1.77 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	157593.90	2.70
2	Cod	.56	367719.00	6.31
3	Cod	.88	577844.10	9.91
4	Cod	6.00	3939847.00	67.56
5	Cod	60.00	39398460.00	675.61
6	Plaice	.01	5253.13	.00
7	Plaice	.02	15759.39	.01
8	Plaice	.08	52531.29	.05
9	Plaice	.80	525312.90	.50

Seabird abundance: 27.60

# of seabirds killed: 3392.04

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C221A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 29.69

Days slick lasted: 3.56

Final position of slick from spill site (km):
X = -114.09 Y = -.27 Dist. = 114.09

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
12.53	52.32	.00	34.91	.24

==========

Toxicity lasted for 3.05 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	312715.80	5.36
2	Cod	.64	625431.70	10.72
3	Cod	1.04	1016327.00	17.43
4	Cod	16.00	15635790.00	268.12
5	Cod	160.00	156357900.00	2681.25
6	Plaice	1.28	1250863.00	1.19
7	Plaice	3.52	3439875.00	3.27
8	Plaice	7.36	7192465.00	6.84
9	Plaice	112.00	109450600.00	104.05

Seabird abundance: 19.10

# of seabirds killed: 2136.46

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C221A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 32.50

Days slick lasted: 6.34

Final position of slick from spill site (km):
X = -106.10 Y = -65.04 Dist. = 124.45

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.09	64.55	.00	34.95	.41

==========

Toxicity lasted for 6.34 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1103533.00	18.92
2	Cod	.56	2574910.00	44.15
3	Cod	.88	4046288.00	69.39
4	Cod	6.00	27588330.00	473.09
5	Cod	60.00	275883300.00	4730.88
6	Plaice	.16	735688.60	.70
7	Plaice	.80	3678444.00	3.50
8	Plaice	1.12	5149821.00	4.90
9	Plaice	16.00	73568860.00	69.94

Seabird abundance: 25.90

# of seabirds killed: 3315.33

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C221A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 26.98

Days slick lasted: 2.26

Final position of slick from spill site (km):
X = -45.51 Y = 62.45 Dist. = 77.28

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
37.02	27.89	.00	34.94	.15

==========

Toxicity lasted for 1.77 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	34406.00	.59
2	Cod	.56	80280.67	1.38
3	Cod	.88	126155.30	2.16
4	Cod	6.00	860150.10	14.75
5	Cod	60.00	8601501.00	147.50
6	Plaice	.01	1146.87	.00
7	Plaice	.02	3440.60	.00
8	Plaice	.08	11468.67	.01
9	Plaice	.80	114686.70	.11

Seabird abundance: 27.60

# of seabirds killed: 2073.05

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C231A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 402.62

Days slick lasted: 37.52

Final position of slick from spill site (km):
X = -98.67 Y = -.73 Dist. = 98.67

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.76	.00	34.98	4.26

==========

Toxicity lasted for 67.52 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	1958137.00	33.58
2	Cod	.64	3916274.00	67.16
3	Cod	1.04	6363945.00	109.13
4	Cod	16.00	97906850.00	1678.92
5	Cod	160.00	979068500.00	16789.19
6	Plaice	1.28	7832548.00	7.45
7	Plaice	3.52	21539510.00	20.48
8	Plaice	7.36	45037150.00	42.82
9	Plaice	112.00	685348000.00	651.56

Seabird abundance: 19.10

# of seabirds killed: 32709.72

Results from NRDAM/CME for Oil Spill on Grand Banks

Case code:	C231A1S2
Season:	Summer
Amount (MT):	40512.0
LC50 (ppb):	143.0
Wind Speed:	Low
Wind Direction:	Mode

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 378.47

Days slick lasted: 34.92

Final position of slick from spill site (km):

X = -7.46 Y = -106.05 Dist. = 106.31

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.91	.00	34.99	4.10

Toxicity lasted for 64.92 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	5380954.00	92.27
2	Cod	.56	12555560.00	215.30
3	Cod	.88	19730160.00	338.34
4	Cod	6.00	134523800.00	2306.83
5	Cod	60.00	1345238000.00	23068.31
6	Plaice	.16	3587302.00	3.41
7	Plaice	.80	17936510.00	17.05
8	Plaice	1.12	25111120.00	23.87
9	Plaice	16.00	358730200.00	341.05

Seabird abundance: 25.90

# of seabirds killed: 38240.88

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C231A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 262.44

Days slick lasted: 34.92

Final position of slick from spill site (km):
X = -7.46 Y = -106.05 Dist. = 106.31

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.91	.00	34.99	4.09

==========

Toxicity lasted for 64.92 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	3416257.00	58.58
2	Cod	.56	7971266.00	136.69
3	Cod	.88	12526280.00	214.80
4	Cod	6.00	85406420.00	1464.56
5	Cod	60.00	854064300.00	14645.60
6	Plaice	.16	2277505.00	2.17
7	Plaice	.80	11387520.00	10.83
8	Plaice	1.12	15942530.00	15.16
9	Plaice	16.00	227750500.00	216.52

Seabird abundance: 25.90

# of seabirds killed: 21486.21

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C231A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 189.78

Days slick lasted: 8.23

Final position of slick from spill site (km):
X = 3.81 Y = 52.70 Dist. = 52.84

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
55.60	8.90	.00	34.96	.54

==========

Toxicity lasted for 7.28 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	664899.40	11.40
2	Cod	.56	1551432.00	26.60
3	Cod	.88	2437965.00	41.81
4	Cod	6.00	16622490.00	285.04
5	Cod	60.00	166224900.00	2850.45
6	Plaice	.01	22163.32	.02
7	Plaice	.02	66489.95	.06
8	Plaice	.08	221633.20	.21
9	Plaice	.80	2216332.00	2.11

Seabird abundance: 27.60

# of seabirds killed: 4652.63

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C231A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 234.87

Days slick lasted: 37.52

Final position of slick from spill site (km):
X = -98.67 Y = -.73 Dist. = 98.67

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.76	.00	34.98	4.26

==========

Toxicity lasted for 67.52 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	1173304.00	20.12
2	Cod	.64	2346608.00	40.24
3	Cod	1.04	3813238.00	65.39
4	Cod	16.00	58665200.00	1006.00
5	Cod	160.00	586652000.00	10059.98
6	Plaice	1.28	4693216.00	4.46
7	Plaice	3.52	12906340.00	12.27
8	Plaice	7.36	26985990.00	25.66
9	Plaice	112.00	410656400.00	390.41

Seabird abundance: 19.10

# of seabirds killed: 18318.57

Results from NRDAM/CME for Oil Spill on Grand Banks

Case code: C231A3S2
Season: Summer
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: Low
Wind Direction: Mode

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 220.58

Days slick lasted: 34.92

Final position of slick from spill site (km):
X = -7.46 Y = -106.05 Dist. = 106.31

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.91	.00	34.99	4.09

Toxicity lasted for 64.92 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	3386750.00	58.08
2	Cod	.56	7902417.00	135.51
3	Cod	.88	12418080.00	212.95
4	Cod	6.00	84668750.00	1451.91
5	Cod	60.00	846687600.00	14519.11
6	Plaice	.16	2257834.00	2.15
7	Plaice	.80	11289170.00	10.73
8	Plaice	1.12	15804830.00	15.03
9	Plaice	16.00	225783300.00	214.65

Seabird abundance: 25.90

# of seabirds killed: 21260.29

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C231A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 163.17

Days slick lasted: 8.23

Final position of slick from spill site (km):
X = 3.81 Y = 52.70 Dist. = 52.84

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
54.93	9.57	.00	34.96	.54

==========

Toxicity lasted for 7.28 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	562233.90	9.64
2	Cod	.56	1311879.00	22.50
3	Cod	.88	2061524.00	35.35
4	Cod	6.00	14055850.00	241.03
5	Cod	60.00	140558500.00	2410.31
6	Plaice	.01	18741.13	.02
7	Plaice	.02	56223.39	.05
8	Plaice	.08	187411.30	.18
9	Plaice	.80	1874113.00	1.78

Seabird abundance: 27.60

# of seabirds killed: 4323.63

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C231A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 66.85

Days slick lasted: 37.52

Final position of slick from spill site (km):
X = -98.67 Y = -.73 Dist. = 98.68

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.75	.00	34.99	4.25

==========

Toxicity lasted for 67.52 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	350797.70	6.02
2	Cod	.64	701595.30	12.03
3	Cod	1.04	1140092.00	19.55
4	Cod	16.00	17539880.00	300.78
5	Cod	160.00	175398800.00	3007.76
6	Plaice	1.28	1403191.00	1.33
7	Plaice	3.52	3858774.00	3.67
8	Plaice	7.36	8068346.00	7.67
9	Plaice	112.00	122779200.00	116.73

Seabird abundance: 19.10

# of seabirds killed: 6073.75

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C231A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 62.73

Days slick lasted: 34.92

Final position of slick from spill site (km):
X = -7.46 Y = -106.05 Dist. = 106.31

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	60.90	.00	34.99	4.09

==========

Toxicity lasted for 64.92 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1115938.00	19.14
2	Cod	.56	2603855.00	44.65
3	Cod	.88	4091772.00	70.17
4	Cod	6.00	27898450.00	478.41
5	Cod	60.00	278984400.00	4784.06
6	Plaice	.16	743958.60	.71
7	Plaice	.80	3719793.00	3.54
8	Plaice	1.12	5207710.00	4.95
9	Plaice	16.00	74395860.00	70.73

Seabird abundance: 25.90

# of seabirds killed: 6740.65

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C231A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: Low
Wind Direction: Mode

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 54.43

Days slick lasted: 8.23

Final position of slick from spill site (km):
X = 3.81 Y = 52.70 Dist. = 52.84

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
48.32	16.18	.00	34.96	.54

==========

Toxicity lasted for 7.28 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	129888.80	2.23
2	Cod	.56	303073.90	5.20
3	Cod	.88	476259.00	8.17
4	Cod	6.00	3247220.00	55.68
5	Cod	60.00	32472200.00	556.84
6	Plaice	.01	4329.63	.00
7	Plaice	.02	12988.88	.01
8	Plaice	.08	43296.27	.04
9	Plaice	.80	432962.70	.41

Seabird abundance: 27.60

# of seabirds killed: 2542.97

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 260.75

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 258.38 Y = -.69 Dist. = 258.38

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.98	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	2801434.00	48.04
2	Cod	.64	5602869.00	96.08
3	Cod	1.04	9104661.00	156.13
4	Cod	16.00	140071700.00	2401.97
5	Cod	160.00	1400717000.00	24019.68
6	Plaice	1.28	11205740.00	10.65
7	Plaice	3.52	30815780.00	29.30
8	Plaice	7.36	64432990.00	61.26
9	Plaice	112.00	980502000.00	932.16

Seabird abundance: 19.10

# of seabirds killed: 50363.78

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A1S2
Season: Summer
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 252.09

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 224.80 Y = -.78 Dist. = 224.80

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	6137418.00	105.25
2	Cod	.56	14320640.00	245.57
3	Cod	.88	22503870.00	385.90
4	Cod	6.00	153435500.00	2631.13
5	Cod	60.00	1534355000.00	26311.31
6	Plaice	.16	4091612.00	3.89
7	Plaice	.80	20458060.00	19.45
8	Plaice	1.12	28641280.00	27.23
9	Plaice	16.00	409161200.00	388.99

Seabird abundance: 25.90

# of seabirds killed: 56887.83

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A1S3
Season: Fall
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 263.05

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 251.16 Y = .41 Dist. = 251.16

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1554141.00	26.65
2	Cod	.56	3626328.00	62.18
3	Cod	.88	5698516.00	97.72
4	Cod	6.00	38853520.00	666.27
5	Cod	60.00	388535100.00	6662.65
6	Plaice	.01	51804.69	.05
7	Plaice	.02	155414.10	.15
8	Plaice	.08	518046.80	.49
9	Plaice	.80	5180469.00	4.93

Seabird abundance: 27.60

# of seabirds killed: 69280.98

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A2S1
Season: Spring
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 186.59

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 258.38 Y = -.69 Dist. = 258.38

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	1901116.00	32.60
2	Cod	.64	3802231.00	65.20
3	Cod	1.04	6178626.00	105.95
4	Cod	16.00	95055780.00	1630.03
5	Cod	160.00	950557800.00	16300.29
6	Plaice	1.28	7604462.00	7.23
7	Plaice	3.52	20912270.00	19.88
8	Plaice	7.36	43725660.00	41.57
9	Plaice	112.00	665390500.00	632.59

Seabird abundance: 19.10

# of seabirds killed: 42798.27

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 179.35

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 224.80 Y = -.78 Dist. = 224.80

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	35.00	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	3732739.00	64.01
2	Cod	.56	8709724.00	149.36
3	Cod	.88	13686710.00	234.70
4	Cod	6.00	93318470.00	1600.24
5	Cod	60.00	933184700.00	16002.37
6	Plaice	.16	2488493.00	2.37
7	Plaice	.80	12442460.00	11.83
8	Plaice	1.12	17419450.00	16.56
9	Plaice	16.00	248849200.00	236.58

Seabird abundance: 25.90

# of seabirds killed: 44745.24

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 188.61

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 251.16 Y = .41 Dist. = 251.16

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1022565.00	17.54
2	Cod	.56	2385986.00	40.92
3	Cod	.88	3749407.00	64.30
4	Cod	6.00	25564140.00	438.38
5	Cod	60.00	255641400.00	4383.77
6	Plaice	.01	34085.52	.03
7	Plaice	.02	102256.50	.10
8	Plaice	.08	340855.20	.32
9	Plaice	.80	3408552.00	3.24

Seabird abundance: 27.60

# of seabirds killed: 58924.57

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 158.89

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 258.38 Y = -.69 Dist. = 258.38

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	1659103.00	28.45
2	Cod	.64	3318206.00	56.90
3	Cod	1.04	5392084.00	92.46
4	Cod	16.00	82955140.00	1422.53
5	Cod	160.00	829551400.00	14225.25
6	Plaice	1.28	6636411.00	6.31
7	Plaice	3.52	18250130.00	17.35
8	Plaice	7.36	38159360.00	36.28
9	Plaice	112.00	580686000.00	552.06

Seabird abundance: 19.10

# of seabirds killed: 39581.21

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A3S2
Season: Summer
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 152.21

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 224.80 Y = -.78 Dist. = 224.80

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	35.00	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	3752148.00	64.34
2	Cod	.56	8755011.00	150.13
3	Cod	.88	13757870.00	235.92
4	Cod	6.00	93803690.00	1608.56
5	Cod	60.00	938036900.00	16085.58
6	Plaice	.16	2501432.00	2.38
7	Plaice	.80	12507160.00	11.89
8	Plaice	1.12	17510020.00	16.65
9	Plaice	16.00	250143200.00	237.81

Seabird abundance: 25.90

# of seabirds killed: 44528.96

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 160.76

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 251.16 Y = .41 Dist. = 251.16

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.56

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	945392.40	16.21
2	Cod	.56	2205916.00	37.83
3	Cod	.88	3466439.00	59.44
4	Cod	6.00	23634810.00	405.29
5	Cod	60.00	236348100.00	4052.93
6	Plaice	.01	31513.08	.03
7	Plaice	.02	94539.24	.09
8	Plaice	.08	315130.80	.30
9	Plaice	.80	3151308.00	3.00

Seabird abundance: 27.60

# of seabirds killed: 54500.20

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 47.22

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 258.38 Y = -.69 Dist. = 258.38

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.55

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	453765.00	7.78
2	Cod	.64	907529.90	15.56
3	Cod	1.04	1474736.00	25.29
4	Cod	16.00	22688250.00	389.06
5	Cod	160.00	226882500.00	3890.61
6	Plaice	1.28	1815060.00	1.73
7	Plaice	3.52	4991415.00	4.75
8	Plaice	7.36	10436590.00	9.92
9	Plaice	112.00	158817700.00	150.99

Seabird abundance: 19.10

# of seabirds killed: 22113.69

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 43.74

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 224.80 Y = -.78 Dist. = 224.80

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.55

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1232367.00	21.13
2	Cod	.56	2875523.00	49.31
3	Cod	.88	4518678.00	77.49
4	Cod	6.00	30809170.00	528.32
5	Cod	60.00	308091700.00	5283.19
6	Plaice	.16	821577.80	.78
7	Plaice	.80	4107889.00	3.91
8	Plaice	1.12	5751045.00	5.47
9	Plaice	16.00	82157780.00	78.11

Seabird abundance: 25.90

# of seabirds killed: 16337.24

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C212A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: Median
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 48.93

Days slick lasted: 10.00

Final position of slick from spill site (km):
X = 251.16 Y = .41 Dist. = 251.16

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.55

==========

Toxicity lasted for 40.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	262268.90	4.50
2	Cod	.56	611960.90	10.49
3	Cod	.88	961652.80	16.49
4	Cod	6.00	6556724.00	112.44
5	Cod	60.00	65567240.00	1124.35
6	Plaice	.01	8742.30	.01
7	Plaice	.02	26226.89	.02
8	Plaice	.08	87422.98	.08
9	Plaice	.80	874229.80	.83

Seabird abundance: 27.60

# of seabirds killed: 31178.28

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A1S1
Season: Spring
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 188.80

Days slick lasted: 7.00

Final position of slick from spill site (km):
X = 320.90 Y = .67 Dist. = 320.90

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.47	.00	34.97	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	4027790.00	69.07
2	Cod	.64	8055579.00	138.14
3	Cod	1.04	13090320.00	224.47
4	Cod	16.00	201389500.00	3453.45
5	Cod	160.00	2013895000.00	34534.53
6	Plaice	1.28	16111160.00	15.32
7	Plaice	3.52	44305680.00	42.12
8	Plaice	7.36	92639160.00	88.07
9	Plaice	112.00	1409726000.00	1340.23

Seabird abundance: 19.10

# of seabirds killed: 30009.71

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A1S2
Season: Summer
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 200.47

Days slick lasted: 8.00

Final position of slick from spill site (km):
X = 262.61 Y = .38 Dist. = 262.61

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	7891458.00	135.32
2	Cod	.56	18413400.00	315.76
3	Cod	.88	28935350.00	496.19
4	Cod	6.00	197286500.00	3383.09
5	Cod	60.00	1972865000.00	33830.93
6	Plaice	.16	5260972.00	5.00
7	Plaice	.80	26304860.00	25.01
8	Plaice	1.12	36826800.00	35.01
9	Plaice	16.00	526097200.00	500.16

Seabird abundance: 25.90

# of seabirds killed: 32407.82

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A1S3
Season: Fall
Amount (MT): 40512.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 190.44

Days slick lasted: 7.00

Final position of slick from spill site (km):
X = 320.90 Y = .67 Dist. = 320.90

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.98	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	2152918.00	36.92
2	Cod	.56	5023475.00	86.14
3	Cod	.88	7894033.00	135.37
4	Cod	6.00	53822950.00	922.96
5	Cod	60.00	538229500.00	9229.63
6	Plaice	.01	71763.94	.07
7	Plaice	.02	215291.80	.20
8	Plaice	.08	717639.30	.68
9	Plaice	.80	7176393.00	6.82

Seabird abundance: 27.60

# of seabirds killed: 43440.80

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A2S1
Season: Spring
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 128.32

Days slick lasted: 6.00

Final position of slick from spill site (km):
X = 275.11 Y = .67 Dist. = 275.11

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.98	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	2775756.00	47.60
2	Cod	.64	5551512.00	95.20
3	Cod	1.04	9021206.00	154.70
4	Cod	16.00	138787800.00	2379.95
5	Cod	160.00	1387878000.00	23799.50
6	Plaice	1.28	11103020.00	10.56
7	Plaice	3.52	30533310.00	29.03
8	Plaice	7.36	63842390.00	60.70
9	Plaice	112.00	971514600.00	923.62

Seabird abundance: 19.10

# of seabirds killed: 18833.65

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A2S2
Season: Summer
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 136.67

Days slick lasted: 7.00

Final position of slick from spill site (km):
X = 229.78 Y = .38 Dist. = 229.78

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	5331729.00	91.43
2	Cod	.56	12440700.00	213.33
3	Cod	.88	19549670.00	335.24
4	Cod	6.00	133293200.00	2285.73
5	Cod	60.00	1332932000.00	22857.29
6	Plaice	.16	3554486.00	3.38
7	Plaice	.80	17772430.00	16.90
8	Plaice	1.12	24881400.00	23.65
9	Plaice	16.00	355448600.00	337.93

Seabird abundance: 25.90

# of seabirds killed: 20895.32

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A2S3
Season: Fall
Amount (MT): 25320.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 129.37

Days slick lasted: 6.00

Final position of slick from spill site (km):
X = 275.11 Y = .67 Dist. = 275.11

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1485940.00	25.48
2	Cod	.56	3467193.00	59.46
3	Cod	.88	5448446.00	93.43
4	Cod	6.00	37148500.00	637.03
5	Cod	60.00	371484900.00	6370.27
6	Plaice	.01	49531.33	.05
7	Plaice	.02	148594.00	.14
8	Plaice	.08	495313.30	.47
9	Plaice	.80	4953133.00	4.71

Seabird abundance: 27.60

# of seabirds killed: 27250.69

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A3S1
Season: Spring
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 108.23

Days slick lasted: 6.00

Final position of slick from spill site (km):
X = 275.11 Y = .67 Dist. = 275.11

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.98	2.56

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	2404030.00	41.22
2	Cod	.64	4808061.00	82.45
3	Cod	1.04	7813098.00	133.98
4	Cod	16.00	120201500.00	2061.23
5	Cod	160.00	1202015000.00	20612.31
6	Plaice	1.28	9616121.00	9.14
7	Plaice	3.52	26444330.00	25.14
8	Plaice	7.36	55292700.00	52.57
9	Plaice	112.00	841410600.00	799.93

Seabird abundance: 19.10

# of seabirds killed: 17397.75

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A3S2
Season: Summer
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 115.19

Days slick lasted: 7.00

Final position of slick from spill site (km):
X = 229.78 Y = .38 Dist. = 229.78

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.45	.00	34.99	2.55

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	4436519.00	76.08
2	Cod	.56	10351880.00	177.52
3	Cod	.88	16267240.00	278.95
4	Cod	6.00	110913000.00	1901.95
5	Cod	60.00	1109130000.00	19019.49
6	Plaice	.16	2957679.00	2.81
7	Plaice	.80	14788400.00	14.06
8	Plaice	1.12	20703750.00	19.68
9	Plaice	16.00	295767900.00	281.19

Seabird abundance: 25.90

# of seabirds killed: 19343.29

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A3S3
Season: Fall
Amount (MT): 20256.0
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 109.17

Days slick lasted: 6.00

Final position of slick from spill site (km):
X = 275.11 Y = .67 Dist. = 275.11

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	62.46	.00	34.99	2.55

==========

Toxicity lasted for 10.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1212975.00	20.80
2	Cod	.56	2830274.00	48.53
3	Cod	.88	4447573.00	76.27
4	Cod	6.00	30324360.00	520.01
5	Cod	60.00	303243600.00	5200.06
6	Plaice	.01	40432.48	.04
7	Plaice	.02	121297.50	.11
8	Plaice	.08	404324.80	.38
9	Plaice	.80	4043249.00	3.84

Seabird abundance: 27.60

# of seabirds killed: 25172.37

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A4S1
Season: Spring
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 29.97

Days slick lasted: 4.25

Final position of slick from spill site (km):
X = 183.68 Y = -.74 Dist. = 183.68

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	64.74	.00	34.93	.33

==========

Toxicity lasted for 5.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.32	429390.10	7.36
2	Cod	.64	858780.20	14.73
3	Cod	1.04	1395518.00	23.93
4	Cod	16.00	21469500.00	368.16
5	Cod	160.00	214695000.00	3681.62
6	Plaice	1.28	1717560.00	1.63
7	Plaice	3.52	4723291.00	4.49
8	Plaice	7.36	9875972.00	9.39
9	Plaice	112.00	150286500.00	142.88

Seabird abundance: 19.10

# of seabirds killed: 3717.65

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A4S2
Season: Summer
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 32.57

Days slick lasted: 6.00

Final position of slick from spill site (km):
X = 196.94 Y = .38 Dist. = 196.94

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	64.40	.00	34.95	.65

==========

Toxicity lasted for 9.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	1299396.00	22.28
2	Cod	.56	3031925.00	51.99
3	Cod	.88	4764453.00	81.70
4	Cod	6.00	32484910.00	557.06
5	Cod	60.00	324849100.00	5570.55
6	Plaice	.16	866264.10	.82
7	Plaice	.80	4331321.00	4.12
8	Plaice	1.12	6063849.00	5.76
9	Plaice	16.00	86626420.00	82.36

Seabird abundance: 25.90

# of seabirds killed: 6559.31

Results from NRDAM/CME for Oil Spill on Grand Banks

==========

Case code: C222A4S3
Season: Fall
Amount (MT): 4051.2
LC50 (ppb): 143.0
Wind Speed: High
Wind Direction: NE

==========

Days spill came ashore: Never

Metric Tons which came ashore: .00

Maximum area of slick (sq. km): 30.14

Days slick lasted: 4.25

Final position of slick from spill site (km):
X = 183.68 Y = -.74 Dist. = 183.68

Final mass balance (%):

Surface	Water	Sediment	Atmosphere	Decay
.00	64.73	.00	34.95	.33

==========

Toxicity lasted for 5.00 days

#	Species	Larval Abundance	# Killed	Total lost Catch (kg)
1	Cod	.24	242732.80	4.16
2	Cod	.56	566376.60	9.71
3	Cod	.88	890020.40	15.26
4	Cod	6.00	6068321.00	104.06
5	Cod	60.00	60683210.00	1040.60
6	Plaice	.01	8091.10	.01
7	Plaice	.02	24273.29	.02
8	Plaice	.08	80910.95	.08
9	Plaice	.80	809109.50	.77

Seabird abundance: 27.60

# of seabirds killed: 5399.91

This publication is printed on paper containing recovered waste.