



CANADIAN ASSOCIATION
OF PETROLEUM PRODUCERS

SUBMISSION

**Bureau d'audiences publiques sur
l'environnement, Quebec**

**Inquiry and Public Hearing on the
Stakes Related to Seismic Surveys
in the St. Lawrence Gulf and
Estuary**

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1 Introduction

The Canadian Association of Petroleum Producers (CAPP) represents approximately 150 upstream companies that explore for, develop and produce petroleum. The upstream industry¹ is currently active in 12 of the 13 Canadian jurisdictions. Many of our member companies have extensive experience in offshore exploration and production activities in basins around the world. CAPP members produce over 98% of Canada's natural gas and crude oil, and are part of a \$75 billion a year industry that affects the livelihoods of more than half a million Canadians.

This submission outlines the regulatory environment, environmental management and best practices of the offshore upstream oil and gas industry with respect to offshore activities. We ask that it be considered by the panel in their assessment of the stakes related to seismic surveys in the Estuary and Gulf of St. Lawrence.

This submission will focus on the following key points:

- environmental risk and risk management
- strength of the regulatory regime
- offshore seismic
- impact on fisheries and relations with fishermen
- advancing the knowledge base
- economic benefits

¹ References to the oil and gas (O&G) industry in this report refer to the "upstream" (exploration and production) industry.

2 CAPP – Overview

CAPP's mission is to enhance the economic well-being and sustainability of the Canadian upstream petroleum industry in a socially, environmentally and technically responsible and safe manner. This mission is reflected in the operating practices of our members. Our members are involved in all aspects of oil and gas exploration and development and CAPP has initiated important initiatives (e.g. stewardship program, fisheries liaison) on behalf of the industry in order to achieve its mission.

CAPP provides leadership, expertise and is the voice for the upstream oil and gas industry across Canada. Many of our members have extensive expertise and experience around the world in all phases of offshore exploration and development.

CAPP has a track record of addressing issues and forming good relations with other stakeholders which has resulted in practical programs being developed for the offshore such as One Ocean in Newfoundland and Labrador, and the Petroleum Fisheries Liaison Group in Nova Scotia. CAPP participates in and helps fund several research initiatives and organizations, and our members endorse an industry wide Stewardship initiative for the responsible exploration, development and production of Canada's petroleum resources.

3 Environmental Risk and Risk Management

The offshore oil and gas business is a mature and responsible industry with vast experience in Canada (in the Arctic and Atlantic Canada) and throughout the world. Upstream companies operate in sensitive and challenging environments world-wide and would bring this knowledge and best practices from other areas to operations in the Gulf of St. Lawrence; further, industry would develop tailor-made solutions for that operating environment.

The upstream industry has been active in the offshore for nearly 60 years in the US Gulf of Mexico, almost 50 years in the UK North Sea, and for 40 years in Atlantic Canada. There are thousands of offshore production facilities world-wide and many occur within sensitive environments with an excellent environmental and safety record and proven risk management practices.

The upstream offshore industry has a high level of technical expertise, scientific research and applied science - the industry has made significant advances, both technically and environmentally, in the years of exploration in Canada's marine environment.

Examples include:

- *improvements in the compressed air sound source of seismic surveys* – to provide greater efficiency and reliability of the arrays and minimize horizontal propagation
- *solid core streamers* – advanced technical design and safer materials for seismic streamers
- *overall safety of all industry operations* – more rigorous training requirements; emergency

response plans and efforts to coordinate activities with stakeholders and other industries

- *Global Positioning Systems (GPS)* – for exact positioning of seismic streamers and vessels
- *directional drilling* – drilling from one surface location to minimize environmental impact; in some instances, this can allow for drilling under sensitive environments

In any activities undertaken in the Estuary and Gulf of St. Lawrence, the industry would bring "best practices" - technologies and lessons learned from around the world - which are continuing to evolve and improve. These best practices would then be tailored to the specific requirements, realities and challenges of the Estuary and Gulf of St. Lawrence marine environment.

Although offshore oil and gas exploration may seem to pose "unknowns" for stakeholders, these are not unknowns for our industry. They are the realities that we deal with safely and responsibly every day in offshore areas around the world. The upstream oil and gas industry is as anxious to prevent accidents and to protect the environment as everyone else; harming the environment is in no one's interest.

4 Strength of the Regulatory Regime

CAPP believes that Canada's offshore oil and gas regulatory regime is among the most stringent in the world, subjecting every phase of offshore oil and gas exploration to a formal and public environmental assessment and approval process. This is evidenced in the "Regulatory Roadmaps"² prepared for numerous Canadian jurisdictions. The Canadian Environmental Assessment Act (*CEAA*) specifically requires that each geophysical (seismic) survey project, exploration drilling program or offshore development project first undergoes a separate environmental assessment by a responsible authority. These assessments range from screenings (survey applications) to comprehensive public reviews (development applications), depending on the type and extent of the project. Additional regulation, safety and protection measures are established, for example, under:

- the Newfoundland and Nova Scotia federal-provincial Accord Acts
- the Federal Environmental Protection Act
- the Canada Oil and Gas Operations Act
- the Canada Shipping Act
- the Canada National Marine Conservation Areas Act
- the Oceans Act
- the new Species at Risk Act.

Offshore project applications and assessments are also reviewed by specialist agencies, such as the Department of Fisheries and Oceans (DFO) and Environment Canada, who provide expert advice and make recommendations about whether and how any project should proceed. The assessments examine the nature and extent of any potential impacts, and establish environmental

² www.oilandgasguides.com

protection plans and monitoring programs. Expert agencies, such as DFO are currently, and continually engaged in updating and refining how they review applications and contribute their expert advice to the assessment process (see, for example, "A Framework to Assist DFO Consideration of Requests for Review of Seismic Testing" DFO 2003).

On Canada's east coast, the federal-provincial regulatory Boards in Newfoundland and Labrador and Nova Scotia, which are responsible authorities under CEAA, have codes and standards which further guide, regulate and monitor safety and environmental protection. Regulations and guidelines continue to evolve in response to perceived needs (e.g. new 2004 Newfoundland Board Geophysical, Geological, Environmental and Geotechnical Program Guidelines).

The practice of the industry is to meet or exceed environmental and safety standards at all stages on a voluntary basis. The oil and gas industry takes a proactive role in establishing higher standards and implementing initiatives. Some of CAPP's members, for example, have developed Codes of Practice for their operations which include specific measures to limit impact when operating in areas of special concern. For example, both the Sable Offshore Energy Project and Marathon Canada Petroleum ULC have developed Codes of Practices for the Sable Gully, a Marine Protected Area (MPA), which identify specific protection measures for the Sable Gully environment.

In summary, the Canadian regulatory regime for offshore oil and gas is among the toughest in the world. The assessment process that every stage of every project goes through ensures that each proposal is examined in light of the special features and sensitivities of the project's environment, and establishes specific mitigations and protections, where needed. This process also accesses the best knowledge from within Canada's expert scientific agencies which review all proposals. At the same time, the upstream oil and gas industry itself applies its own high standards and best practices, based on experience and expertise gained from around the world.

5 Offshore Seismic

There is an abundance of information in the public domain related to studies conducted on the impacts of marine seismic acquisition on fish and benthic biota. The majority of the reports reviewed by us suggest that there are some short term impacts on aquatic species within areas immediately adjacent to the seismic program, but the long term effects are minimal. There are no known impacts on fish populations.

The Centre for Offshore Oil and Gas Environmental Research (COOGER), led by Dr. Ken Lee of DFO, has recently completed a body of scientific work that is undergoing peer review in the scientific community. The work is primarily focused on the impacts of seismic operations on a variety of marine species and will be important in furthering our understanding. The reports are:

- The Effects of Seismic Noise on Sea Turtles
- Effects of Seismic Noise on Fish
- Effects of Seismic and Marine Noise on Invertebrates

- Potential Effect of Seismic Surveys on Fish Eggs, Larvae and Zooplankton
- Potential Hydrophysical-Related Issues in Canada - Risks to Marine Mammals.
- Assessment of Regulatory Practices Governing the Limits of Sound Energy Produced During Seismic operations
- Applicability of Sound Propagation Models in the Marine and Freshwater Environment

Seismic is being studied around the world. A study completed in Norway in March 2003 (the link to this report is included in section 11.9 of this submission) noted that “recent studies on the impact of seismic surveys on fish have shown that there is negligible direct physical damage, but that there may be a behavioral change in the vicinity of the seismic source” . The report indicates that the radius of the affected zone is dependent upon many variables, including food supply and physical oceanographic conditions, making it “difficult to accurately determine the exact impact of seismic on the behaviour of fish.” Further, “the magnitude of [the effect on the behaviour of fish] ... may ... be within the noise level of all natural stimuli for the fish, and will not lead to long term changes in average catch rates or to the size of fish stocks in general.”

COOGER recently undertook a study in cooperation with industry and other stakeholders that focused on acoustic monitoring and marine mammal observations near the Gully Canyon. “In 2003, COOGER coordinated acoustical and biological studies in conjunction with seismic exploration programs conducted by the private sector off the coast of Nova Scotia. The research program included a baseline survey of acoustic recordings and whale distributions in April 2003 within known whale habitat areas, including the Gully and adjacent canyons on the Scotian Shelf, before seismic shooting commenced. With the onset of seismic operations, recordings of whale vocalizations and direct visual surveys by marine mammal observers were repeated. In addition, ocean bottom seismometers were deployed to quantify seismic noise levels to validate mathematical models on sound transmission in water. These sound models are currently used in environmental risk assessments.” (excerpt from COOGER website: http://www.dfo-mpo.gc.ca/science/cooger-crepge/research_e.htm#acoustic).

Industry and governments are working to better understand the issues around oil and gas activity in Atlantic Canada. In the meantime, companies use a variety of safeguards to ensure marine-life safety. For example, when Corridor Resources Inc. conducted seismic testing off Cape Breton, Nova Scotia recently it lowered the probability of disturbance by waiting until the fish completed their migration, ramped-up sound levels gradually to encourage marine animals to leave the area, and had a trained biological observer on the ship.

Mitigation measures for seismic surveys include:

- *Seasonal and geographical restrictions* – timing of and monitoring the activity for species migration patterns, breeding/spawning times, feeding activities and locations of sensitive areas
- *Ramp-up or Soft Start* – gradual commencement of a seismic source array to encourage marine species to leave the area
- *Source array size and configuration* – configuring source arrays to minimize horizontal propagation of energy

- *Safety zone monitoring* – shutdown of operations and avoidance of endangered species when detected within the safety zone
- *Vessel-based visual monitoring* – during operations observers monitor for marine mammals and birds, fishing vessels and gear and act as fisheries liaison
- *Seismic source array shut-down during turns*
- *Use of guard vessels* – a vessel used to minimize risk of interactions between seismic operations and fishing and shipping traffic or obstructions in the area

In addition to practices and mitigation measures undertaken by our members, the Canadian Regulatory Agencies give guidance on seismic. The Nova Scotia Offshore Board specifies the following:

“Surveys should be scheduled to the extent possible, to avoid sensitive fish life stages (i.e. spawning, rearing and migration times) particularly for those species identified as Species at Risk.”

“Seismic activities should be scheduled to avoid heavily fished areas, to the extent possible. The operator should implement operational arrangements to ensure that the operator and/or its survey contractor and the local fishing interests are informed of each other’s planned activities. Communication throughout survey operations with fishing interests in the area should be maintained. The use of a “Fisheries Liaison Officer” on-board the seismic vessel would be considered an acceptable approach.”

In summary, there are various research initiatives on the impact of seismic on the marine environment. Although there is limited conclusive evidence of impact, mitigative measures typically undertaken by our members through their codes of practice, coupled with various consultation initiatives, allow for the carrying out of seismic in a way that minimizes negative impact on the operations of other industries and have reduced the potential for negative impacts on the marine environment.

6 Impacts on Fisheries / Relations with Fishermen

The Canadian record on coexistence of the fishing and upstream oil and gas sectors is well developed and the experiences have been positive. Although there has been no evidence of any negative impacts on fisheries resources in Atlantic Canada from oil and gas exploration and development, the two industries are working together to establish research priorities and collect data.

Well established consultation and liaison mechanisms exist to deal with specific projects as well as larger industry-to-industry issues, including compensation in case of damage to fishing vessels and gear. Consultation with the fishing industry before each geophysical survey, as well as during preparation of environmental assessment reports/studies, has resulted in a two-way exchange of information. Operational and communications protocols for geophysical surveys

have been worked out and are routinely implemented to ensure that oil and gas exploration minimizes any interference with fishing or fisheries resources.

Formal agreements have been established between fishing industry groups and oil and gas projects (e.g. Sable Project offshore NS). Broader industry-to-industry issues related to shared use of the marine environment, and mutual cooperation and coexistence, are dealt with through formal liaison groups such as the Petroleum-Fisheries Liaison Group (PFLG) in Nova Scotia, and One Ocean in Newfoundland.

Both Newfoundland and Nova Scotia now routinely carry fishing industry observers on-board geophysical survey ships, to monitor operations and provide at-sea liaison and communication. Specific mitigations have been developed in consultation with the fishing industry and DFO. For example, protocols have been developed to address concerns about impacts on DFO trawl surveys in Newfoundland and Labrador and Nova Scotia.

Compensation protocols have been established for damage to fishing vessels and gear, although typically incidents are few and minor. These programs were developed through close co-operation and consultation with the fishing industry. The federal-provincial offshore Accord Acts also provide entitlement to compensation, which may be claimed for any "actual loss or damage" caused by spills, discharges, or debris, even if such emissions are authorized by regulation. "Actual loss or damage" *includes loss of income, including future income, and, with respect to any aboriginal peoples of Canada, includes loss of hunting, fishing and gathering opportunities*".

In summary, the oil and gas industry has been fully engaged with the fishing industry in Atlantic Canada for more than a decade, establishing informal and formal consultation and liaison mechanisms to deal with specific projects as well as larger industry -to-industry issues, and formal agreements have been signed among some participants. Operational protocols for geophysical surveys have been worked out and are now standard practice. Compensation programs exist but are rarely used.

7 Advancing the Knowledge Base – Oil and Gas Contributions

Research generated directly and indirectly by offshore oil and gas activities has made, and continues to make, an important contribution to our knowledge of the diverse marine environments in which the industry operates. Industry also continues to research and monitor potential effects of oil and gas activities in the areas in which it operates in Canada and other jurisdictions.

In many different areas, the upstream oil and gas industry supplements, enhances and leads research about marine ecosystems. Major environmental assessments have made substantial contributions to our knowledge of the marine environment. The following points illustrate some of the ways in which the upstream industry has advanced the knowledge base:

- Mobil Oil-sponsored science cruises of 1980 and 1981, part of the Hibernia Development Project Environmental Impact Statement, remain to this day one of the most comprehensive

sources of data about the Grand Banks marine ecosystem

- Oil and gas exploration and production facilities (e.g. Sable Project and Hibernia) have become important sites for environmental data collection
- Several leading international research centres have been established or developed in Canada as a result of offshore oil and gas, or are funded by the industry, such as the Centre for Cold Ocean Research and Engineering (C-CORE) and the Centre for Offshore and Remote Medicine (MEDICOR) at Memorial University, the Centre for Environmental and Marine Geology at Dalhousie, and the Arctic Institute at the University of Calgary
- Petroleum Research Atlantic Canada (PRAC) was created as a not-for-profit public-private sector partnership for inter-disciplinary research and development related to oil and gas in such areas as engineering, natural and social sciences and the environment
- A recent report for PRAC (CRS Ltd. 2003) notes that the industry has helped develop Newfoundland and Labrador as a centre of excellence in such areas as cold oceans engineering, distance technologies and marine science
- Oil and gas related studies on such topics as ice dynamics, iceberg scour, the fate of icebergs, remote sensing and remote telecommunications have added knowledge and brought benefits to researchers and industry well beyond the petroleum industry
- The Centre for Offshore Oil and Gas Environmental Research (COOGER), based at the Bedford Institute of Oceanography (BIO), was founded in 2002 to coordinate, Canada-wide, DFO's research into the environmental and oceanographic impact of offshore petroleum exploration, production and transportation. Other organizations participating in COOGER include Canadian universities, provincial and federal government agencies, international organizations, NGOs and the upstream oil and gas industry. COOGER currently lists more than 20 offshore oil and gas related environmental research projects
- Since 1983, the Environmental Studies Research Funds (ESRF) has been funded by the oil and gas industry (at arms length, through a federal agency) to conduct new research and analysis of environmental effects in the Canadian east and west coast offshore areas, and in the Arctic. To date, ESRF has commissioned more than 140 peer-reviewed studies and reports on such topics as effects of geophysical exploration on fisheries, marine mammal distribution in the Beaufort Sea, effects on eggs and larvae, oil spill clean-up, cumulative environmental effects, identification of ecologically sensitive areas, seabird monitoring and offshore safety standards.

Recent projects on the east coast funded by ESRF include the Electronic Atlas of Ichthyoplankton on the Scotian Shelf of North America (EAISSNA), a major source on the location, time of spawning, abundance and distribution of fish eggs and larvae that will be used for fisheries and biodiversity research, well beyond oil and gas related issues. Other significant projects supported by ESRF (and oil and gas operators in the area) include COOGER's research into marine mammals on the Scotian Shelf, particularly the endangered northern bottlenose whale, and a study of effects on snow crab in Newfoundland

- Numerous other research studies (e.g. effects monitoring) have also been conducted for specific exploration and development programs (such as WesternGeco's Mackenzie River 2002 program, Anderson/Devon's 2001 Beaufort Sea whale response monitoring, and Corridor Resources 2003 snow crab effects study).

As evidenced by the above list, which is not complete, the oil and gas industry in Canada has become a leading generator of, and contributor to, marine science and environmental research. Programs like ESRF help ensure that further research is conducted to improve understanding of marine ecosystems, and to test and refine standards and practices. Agencies like the newly-formed COOGER are leading new research on specific science issues. Ongoing exploration and development projects contribute real-world data. Collectively, these efforts contribute significantly to our general knowledge of Canada's marine environment, as well as to understanding and mitigating effects from upstream activities.

8 Economic Benefits

The potential for economic benefits from oil and gas activities in a province can be substantial and is felt directly and indirectly throughout the province. The oil and gas companies who work in the region use locally available supplies and services, where competitive.

Benefits accrue at all stages of a project but are more substantial at the development stage. As in onshore projects, benefits will accrue to all residents through added revenues to governments and the social and economic advantages these bring. In certain centres, the direct employment in the industry and associated servicing activities would be substantial. Direct and spin-off spending and investment would be expected in such areas as construction, marine transportation, equipment manufacture, research and development for industries, training, environmental research and monitoring, consulting services, health care, telecommunications, real estate, financial services, marine supplies and services, etc. Business, residential, sales and income taxes also contribute substantially to both local and provincial economies.

At this point the best evidence to demonstrate potential economic benefits from offshore developments is to share examples from other regions. A survey of CAPP members in 2002 revealed that the total expenditure on Atlantic Canada activities was \$2.3 Billion with \$1.49 Billion spent in Atlantic Canada, and the number of individuals employed³ by the industry was 4962.

As a result of oil and gas sector activities, Newfoundland and Labrador has led Canada in economic growth in recent years. A recent study for Petroleum Research Atlantic Canada (CRS Ltd 2003) reports that between 1999 and 2002 capital expenditures by Newfoundland's Oil and gas industry ranged between \$901 million and \$1,375 million annually; operating expenditures were between \$136 million and \$234 million; and annual wages, salaries and benefits ranged between \$171 million and \$272 million.

When indirect effects are included, the industry had an annual average direct and indirect Gross Domestic Product (GDP) impact of approximately \$1.4 billion, and directly and indirectly created about 8,800 person-years of employment per annum, over the 4-year period, with an indirect GDP effects peak of approximately \$2.0 billion. The 2003 report notes that

³ employees of operators, consultants and major contractors on December 27, 2002

Newfoundland and Labrador's total employment was 13,900 greater than it would have been without the industry.

The report also concludes that the oil and gas industry has created important new capabilities in the province, making local firms and individuals highly competitive nationally and internationally, increasingly for clients outside the province and outside the oil and gas industry

Experiences in Atlantic Canada show that direct benefits include employment wages, capital expenditures and purchases of a wide range of goods and services. Tax benefits would accrue at the municipal and provincial levels in the province. New training and experience, technology development, and research capabilities will increase capacity and the national and international competitiveness of the workforce and entrepreneurial sectors.

9 Conclusion

The oil and gas industry has a proven record of safe offshore operations and technically advanced practices to meet and exceed operating requirements and standards. Industry has years of experience operating in offshore basins around the world alongside other industries. This experience has proven our members' ability to carry out activities with appropriate consultation and mitigation to minimize negative impacts on the activities of other ocean users. Furthermore industry operates in a socially, environmentally and technically responsible and safe manner without significant negative impact on the marine environment.

There are various completed and ongoing research initiatives on the impact of seismic on the marine environment. Although there is limited conclusive evidence of impact, there are numerous mitigative measures that are undertaken by our members when conducting seismic activities that reduce the potential for negative impacts on the marine environment.

Any seismic activities undertaken by our industry in the Estuary and Gulf of St. Lawrence would bring with them the experience and best practices established from years of offshore experience and the ability to tailor these practices to the specific needs of individual operating environments.

10 Sources, References & Additional Materials

10.1 Canadian Environmental Assessment Act

<http://laws.justice.gc.ca/en/C-15.2/index.html>

10.2 Strategic Environmental Assessment

http://www.ceaa.gc.ca/016/index_e.htm

Cabinet Directive on SEA

http://www.ceaa.gc.ca/016/directive_e.htm

10.3 Species at Risk Act

<http://laws.justice.gc.ca/en/S-15.3/index.html>

10.4 Oceans Act

<http://laws.justice.gc.ca/en/O-2.4/index.html>

10.5 Canada - Nova Scotia Accord Act

<http://laws.justice.gc.ca/en/C-7.8/index.html>

10.6 Canada Newfoundland Accord Act

<http://laws.justice.gc.ca/en/C-7.5/index.html>

10.7 Newfoundland Board Geophysical, Geological, Environmental and Geotechnical Program Guidelines (2004)

<http://www.cnopb.nfnet.com/publicat/guidelin/ggegpg/ggegpg.pdf>

10.8 DFO Seismic Survey Framework

"A Framework to Assist DFO Consideration of Requests for Review of Seismic Testing" (DFO 2003)

http://www.dfo-mpo.gc.ca/csas/Csas/status/2003/HSR2003_001_E.pdf

10.9 Seismic Surveys Impacts on Fish and Fisheries – Norway March 2003

(For the English version click on the Adobe Acrobat icon on the left)

<http://www.olf.no/miljo/miljorapporter/?18380>

10.10 Representative Research Programs / Funds

Mobil Cruises (Grand Banks)

Mobil-sponsored science cruises of 1980 and 1981, part of the Hibernia Development Project Environmental Impact Statement, remain to this day one of the most comprehensive sources of data about the Grand Banks ecosystem.

Mobil (1985), Volume IV - Socio-Economic Assessment. Mobil Oil Canada, Ltd., St. John's, NF

Environmental Studies Research Funds (ESRF)

<http://www.esrfunds.org/>

The Environmental Studies Research Funds (ESRF) is a research program that sponsors environmental and social studies designed to assist in the decision making process related to oil and gas exploration and development on Canada's frontier lands. The ESRF program, initiated in 1983, receives its legislative mandate through the Canada Petroleum Resources Act. Funding for the ESRF is provided through levies on frontier lands (including Northern and Atlantic Canada offshore areas) paid by interest holders such as oil and gas companies. The ESRF is administered by a small secretariat that resides in the National Energy Board office in Calgary, Alberta, and is directed by a multi-stakeholder Management Board.

ESRF has commissioned more than 140 peer-reviewed studies and reports on such topics as effects of geophysical exploration on fisheries, marine mammal distribution in the Beaufort Sea, effects on eggs and larvae, oil spill clean-up, cumulative environmental effects, identification of ecologically sensitive areas, seabird monitoring and offshore safety standards.

Seismic-Fisheries Research Priorities Workshop (2002)

<http://www.esrfunds.org/Report%20139.pdf>

Proceedings of a Workshop to Develop Methodologies for Conducting Research on the Effects of Seismic Exploration on the Canadian East Coast Fishery, Halifax, Nova Scotia, 7-8 September 2000 (ESRF)

An Electronic Atlas of Ichthyoplankton on the Scotian Shelf of North America (EAISSNA)

<http://www.marinebiodiversity.ca/en/eaisna/eaisna.html>

Stewart, P.L., R.M. Branton, G.A. Black, H.A. Levy and T.L. Robinson (2003). EAISSNA – An Electronic Atlas of Ichthyoplankton on the Scotian Shelf of North America. Scotia-Fundy Region Department of Fisheries and Oceans, Bedford Institute of Oceanography, Dartmouth, Nova Scotia.

The EAISSNA database contains information on location and time of spawning, and abundance and distribution of eggs and larvae of marine fish on the Scotian Shelf of North America. 197 scientific publications from 1919 to 2001 were reviewed and original analysis conducted on datasets from Department of Fisheries and Oceans (DFO) Scotian Shelf Ichthyoplankton Program (SSIP) and Fisheries Ecology Program (FEP) for 1976-82 from data archives, providing information on 107 taxa of fish and invertebrates. The database is intended for use in environmental assessment and management activities associated with offshore hydrocarbon development and production and ocean management. Supporting maps and database tables, and possible enhancements and developments including standards based on World Wide Web access, are also described. Compact Disks of the report, lists, maps and data can be obtained from the authors.

C-CORE - Centre for Cold Ocean Research and Engineering

<http://www.c-core.ca/index.html>:

The Centre for Cold Ocean Research and Engineering is a global research and development corporation providing innovative engineering solutions to clients in the natural resource sectors such as oil and gas, pipeline, mining, pulp and paper, forestry, fisheries and aquaculture. C-CORE's services are organized to provide wide-ranging, complementary services in key industry categories (Intelligent Systems, Remote Sensing, Ice Engineering, and Geotechnical Engineering). These areas are enhanced by C-CORE's Harsh Environments Initiative (HEI), which identifies, adapts and transfers space technologies to applications for resource sectors operating in harsh terrestrial and marine environments.

The Centre for Offshore and Remote Medicine (MEDICOR)

<http://www.med.mun.ca/medicor/>:

MEDICOR was established in 1982 and has a mandate to carry out research and development projects related to all health aspects of offshore oil, marine, diving and space industries, as well as other industries involved with remote operations, environmental stresses or hazards. MEDICOR is part of the Faculty of Medicine of Memorial University of St. John's, Newfoundland, and is an integral part of the university's Ocean Studies Program.

Dalhousie University

Centre for Environmental and Marine Geology,

<http://www.registrar.dal.ca/calendar/front/CEIN.htm#CEIN65>:

This centre was originally founded as the Centre for Marine Geology in 1983 to promote interdisciplinary studies of various types of issues in marine geology. Since 1983 the role of the center has changed to reflect the consideration of environmental issues linked to marine geology. One of the Centre's objectives is to continue to expand its participation in a revitalized east coast offshore energy related problems.

Energy Initiatives at Dalhousie

<http://meguma.earthsciences.dal.ca/staff/wach/wach.htm#eiad>:

Energy initiatives at Dalhousie cover a broad range of research across several faculties and departments; Chemical, Civil and Petroleum Engineering, Computer Science, Law, Economics, Mathematics, Earth Sciences and Oceanography. Centres of excellence exist at Dalhousie in a number of fields that impact the energy sector. The challenges for Dalhousie University include meeting the increasing demand for highly skilled graduates that can fill the technical roles required in the expanding Atlantic Canada energy sector and develop innovative research that can assist the energy sector in achieving development of the onshore and offshore resources.

Center for Offshore Oil and Gas Environmental Research (COOGER)

http://www.dfo-mpo.gc.ca/media/newsrel/2002/hq-ac144_e.htm

http://www.dfo-mpo.gc.ca/science/cooger-crepge/main_e.htm

Fisheries and Oceans Canada established the Centre for Offshore Oil and Gas Environmental Research (COOGER) to coordinate the department's nation-wide research into the environmental and oceanographic impacts of offshore petroleum exploration, production and transportation. The Secretariat office of this national research centre, based at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia, seeks to:

- Improve scientific knowledge,
- Identify priority research needs, and
- Coordinate and implement collaborative research efforts.

By building on existing regional expertise and infrastructure to coordinate research at a national scale, COOGER addresses the departmental mandate and industry need by providing scientific knowledge for use to ensure safe and environmentally sound management of offshore oil and gas operations.

COOGER strives to improve the quality of science and minimize research duplication by fostering collaborations with other government research agencies, universities and industry. COOGER research findings will be available for use by external partners as well as Fisheries and Oceans Canada resource managers.

COOGER also fosters collaboration at the international level. COOGER aims to learn from past experiences of other key countries to optimize the progress of Canadian research programs. It is recognized within COOGER that there is vast potential to conduct comprehensive, large-scale research projects to address global concerns through the sharing of expertise and resources in an international setting.

Press Release - COOGER Scientists Study Offshore Seismic Exploration (April 25, 2003): Dartmouth, N.S. - Scientists from the Department of Fisheries and Oceans (DFO) will carry out a \$1-million research program before - and during - petroleum seismic exploration off Nova Scotia this spring.

A national team of federal scientists who specialize in marine mammals, physical oceanography, and marine geo-science, will leave Halifax on April 25 onboard the R.V. Strait Signet for the eastern Scotian Shelf. Scientists will gather background data on ocean noise levels, and the distribution of Northern Bottlenose whales and other marine mammals before seismic exploration begins.

Once seismic exploration begins, additional instruments on the seabed and in the water column will monitor and record noise levels and the whale sounds. Researchers will monitor any changes in marine mammal distribution or behaviour. The seismic research will be co-ordinated with the seismic activities.

The field studies, expected to be completed by September, will provide scientists with more background information on the location and population of marine mammals in the Scotian Shelf area.

Funding is being provided by DFO, Natural Resources Canada, the Atlantic Canada Opportunities Agency, the Nova Scotia Department of Energy, and from the industry-supported Environmental Science Research Fund.

The project is co-ordinated by DFO's national Centre for Offshore Oil and Gas Environmental Research (COOGER). "Our goal is to verify the range of seismic sound under various conditions, and assess in much greater detail potential impact on marine mammals," says Dr. Kenneth Lee, the director of COOGER.

When carrying out seismic testing, exploration companies will initiate several measures to protect marine mammals from potentially harmful seismic noise levels. These include increasing sound levels gradually, so whales have time to move to a safer location. They will monitor sound levels and use trained shipboard observers to check for whales. If whales are observed near the seismic vessels, the operation will be halted until the whales leave the area.

Seismic exploration activities will not be conducted in the Sable Gully, an area that is slated to become a Marine Protected Area.

Petroleum Research Atlantic Canada (PRAC)

<http://www.pr-ac.ca/index.html>

Created in 2002, and succeeding the Atlantic Canada Petroleum Institute (ACPI), PRAC is a non-profit public-private partnership mandated to foster within Atlantic Canada interdisciplinary research and development (R&D) related to oil and gas and the diffusion of that knowledge. Research proposals are solicited across a broad range of topics, in matters related to:

- Engineering
- Natural and social sciences
- Environment
- Public policy and socio-economics
- Human resources, education and training

- Pre-commercialization R&D in support of technology development

A key objective of PRAC is to add significant value to Atlantic Canada by building capacity and scale in oil and gas research and development. In collaboration with partners, PRAC acts as a catalyst to establish research priorities, coordinate the writing of research proposals, identify leveraging opportunities and provide ongoing support in the administration of research programs.

PRAC brings industry stakeholders together to determine research priorities related to the oil and gas industry, usually through workshops and other modes of communication. Although research priorities change, they remain focused on the areas of:

- Hydrocarbon Evaluation
- Policy
- Operations and Technology
- Training and Education
- Environmental Impacts and Effects

Since 1999, PRAC and its members have contributed \$1.7 million to research and development in Atlantic Canada, which has levered an additional \$6.2 million in funds, which means that over \$7.9 million in research is being performed as a result.

Program on Energy Research and Development (PERD)

<http://www.cnopb.nfnet.com/env/research.htm>

<http://www2.nrcan.gc.ca/es/oerd/english/View.asp?x=659>

PERD is a federal, interdepartmental program operated by Natural Resources Canada that directly funds 40 per cent of all non-nuclear energy research and development conducted in Canada by the federal and provincial governments. It addresses all aspects of non-nuclear energy supply and use.

Atlantic Region Coastal Mapping Project (Environment Canada)

http://www.ec.gc.ca/science/sandejan01/article5_e.html:

To minimize the impact of spills on the Atlantic coast, Environment Canada scientists in Dartmouth, Nova Scotia, have developed a computerized mapping system that enables emergency responders to plan their strategies more quickly and effectively. This program not only identifies the most important and vulnerable coastal resources at risk during an environmental emergency, but also recommends the best protection and clean-up techniques for the situation. It can also be used as a tool for pre-spill planning and training spill responders.

10.11 Newfoundland Economic Benefits summary

Newfoundland seen leading pack, Globe and Mail, March 10, 2003

<http://www.globeinvestor.com/servlet/ArticleNews/story/RTGAM/20030310/wbcibc0310>

“According to its latest provincial outlook, Newfoundland and Labrador should grow at an annual pace of 4.6 per cent this year, building on last year's "extraordinary 7.5 per cent gain.”

Economic Growth in Newfoundland will Continue to be Driven by Oil Production and Exploration, Say TD Economists, TD Bank, October 13, 2000

<http://www.tdcanadatrust.com/tdbank/cgi-bin/print.pl?DOC=/tdtoday/releases/200010135.html>

Unparalleled momentum propelling Newfoundland & Labrador's economic performance: RBC Economics, RBC Financial Group, 29 August 2002.

http://www.rbc.com/newsroom/20020829pec_nf.html

Newfoundland and Labrador remains number one in employment growth, Government of Newfoundland and Labrador, 10 September 1999

<http://www.gov.nf.ca/releases/1999/hre/0910n08.htm>

Firms make record bid to seek oil off Newfoundland, Globe and Mail, 18 December 2003

<http://www.globeandmail.com/servlet/story/RTGAM.20031218.wnoof1218/BNStory/Business/>

Economic Outlook, Conference Board of Canada, 29 Oct. 2002

<http://www.newswire.ca/fr/releases/archive/October2002/29/c5951.html>

"Newfoundland and Labrador will not only lead all the provinces in 2002, but its 9.7 per cent growth is a full percentage point higher than its previous forecast. It is being driven by an 86 per cent increase in mineral fuels output, primarily from the Hibernia oil field and also from Terra Nova production, as well as a booming construction sector."

Socio-Economic Benefits From Petroleum Industry Activity In Newfoundland and Labrador Report, CRS Ltd. for Petroleum Research Atlantic Canada 2003

http://www.pr-ac.ca/files/Socio-Economic_Benefits_-_Report.pdf

"Based primarily on information about ... oil and gas company expenditures and associated employment, the research shows that the industry has made a large direct contribution to the economy of Newfoundland and Labrador. For example, between 1999 and 2002, its total capital expenditures ranged between \$901 million and \$1375 million per annum. Operating expenditures amounted to varied between \$136 million and \$234 million and the total wages, salaries and benefits ranged between \$171 million and \$272 million. The person-years of employment increased from 2957 in 1999 to 3871 in 2000, but declined to 3328 by 2002. They are expected to increase again in 2003 and 2004, associated with peak White Rose development activity.”

10.12 Fisheries Liaison and Compensation

One Ocean, Newfoundland

One Ocean was formed in 2002 as an inter-industry organization to promote cooperation and understanding between the fishing and petroleum industries of Newfoundland and Labrador. The organization will work as a liaison between these two important industries that operate in a common marine environment to enhance mutual knowledge and understanding between the two industries. One Ocean is led by an advisory board of representatives from both industries, the Fish, Food, and Allied Workers, the Fisheries Association of Newfoundland and Labrador, and CAPP. (from CAPP's website: http://www.capp.ca/?V_DOC_ID=721).

Petroleum-Fisheries Liaison Group, Nova Scotia

Nova Scotia's petroleum and commercial fishing industries have established the Nova Scotia Petroleum – Fisheries Liaison Group which has a mandate to ensure a broad perspective for the operation of both commercial fisheries and oil and gas operations. (from CAPP's website: http://www.capp.ca/default.asp?V_DOC_ID=720)

Fisheries Liaison Officer Program

(An overview presentation is located at:

<http://www.bcseafoodalliance.com/documents/Canpitt.pdf> & Canning & Pitt - <http://www.canpitt.ca/index.htm>)

A voluntary program established between Geophysical Operators and Newfoundland Fishers which provides Fisheries-industry led monitoring/observer coverage of seismic programs.

This:

- provides survey planning / information exchange to help ensure that there are no at-sea conflicts with fishing activities
- builds and maintains trust between the petroleum and fisheries industries
- provides the FFAWU (Fish, Food, and Allied Workers, the Fisheries Association of Newfoundland and Labrador), and Survey Operator with feedback about environmental and fisheries issues.

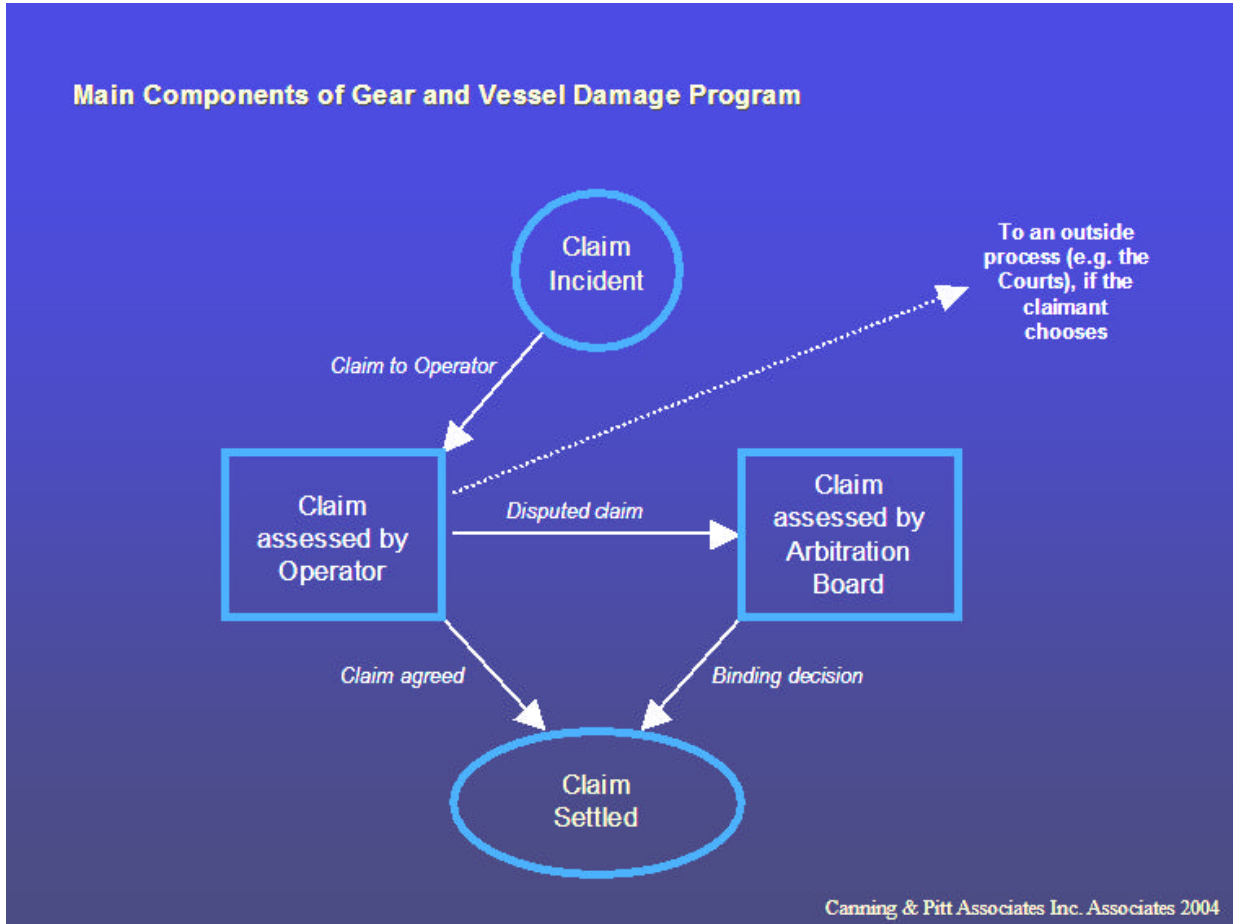
Canning & Pitt Associates and the FFAWY, 2002

CNSOPB/CNOPB Compensation Guidelines

The Nova Scotia and Newfoundland and Labrador Offshore Boards have guidelines respecting the damages relating to offshore petroleum activity:

<http://www.cnopb.nfnet.com/publicat/guidelin/compensa/compgle.pdf>

Industry-to-Industry Gear Damage Compensation Program diagram (e.g. Hibernia, Sable Project)



(Canning & Pitt - <http://www.canpitt.ca/index.htm> & <http://www.bcseafoodalliance.com/documents/Canpitt.pdf>)

Spills and Debris Liability from the NS (Sections 165-170) and Newfoundland (Sections 160 - 165) Accord Acts

<http://laws.justice.gc.ca/en/C-7.8/27524.html>