FACT SHEET

Saint-Laurent Vision 2000

REPORT OF THE MULTIPARTITE COMMITTEE ON CONTAMINATED SITES OF CONCERN FOR THE ST. LAWRENCE BELUGA

BACKGROUND

In June 1994, a panel of experts commissioned by Fisheries and Oceans Canada (DFO) and the World Wildlife Fund was given the mandate to prepare a recovery plan for the St. Lawrence beluga population. In late 1995, upon completing its work, the panel published the St. Lawrence Beluga Recovery Plan setting out five strategies for action. These strategies are underpinned by a number of activities, with priority accorded to efforts to identify and clean up contaminated sites that could pose a threat to beluga.

In response to the recommendations of the Beluga Recovery Plan, the St. Lawrence Vision 2000 (SLV 2000) partners undertook to prepare an inventory of the contaminated sites in the St. Lawrence River that are considered a priority because of their potential danger to the beluga population and to formulate recommendations for action. A Multipartite Committee, composed of representatives from Fisheries and Oceans Canada (DFO), Environment Canada (EC), Heritage Canada (HC) and ministère de l'Environnement et de la Faune du Québec, began work in January 1997.

ISSUES

From the outset, the Committee realised that it would be difficult to establish a direct link between contaminated sediments and the beluga, primarily because of incomplete data on the contaminated sites (contaminant levels and toxicity of sediments) and also because of knowledge gaps related to the processes governing the transport and release of sediments, the rates at which beluga bioaccumulate contaminants and the species' diet and feeding habits. Accordingly, it was decided that the work of identifying, selecting and classifying contaminated sites should not focus exclusively on the potential threat that the sites represent for the beluga population, but should instead employ a more preventive approach seeking to protect the beluga's ecosystem as a whole and to reclaim local uses (for example, creating beaches or improving wildlife habitat).

METHODOLOGY

The study area was limited to the aquatic sites along the St. Lawrence between Cornwall and Blanc-Sablon as well as along the Saguenay, excluding the Great Lakes, the international section of the river and the tributaries of the St. Lawrence and the Saguenay.

The Multipartite Committee retained the services of a consultant to update the inventory of contaminated aquatic sites, analyse all other available data and present a simple scientific approach for conducting a summary assessment of sites that may affect the beluga population.

The consultant produced two reports. The report entitled «Identification et description des sites aquatiques contenant des contaminants préoccupants pour le béluga du Saint-Laurent (Gagnon and Bergeron, 1997)» is an inventory of 38 contaminated sites of concern for the beluga; a series of fact sheets synthesise the knowledge on all the sites, which are classified in two categories.

The second report which devises a method for ranking the individual sites, is entitled «Évaluation sommaire du risque relatif de sites contaminés pour le béluga du Saint-Laurent (Gagnon and Bergeron, 1998). » The consultant has developed an original approach which is based on existing knowledge but inevitably presents serious limitations. Several experts have studied the approach and confirmed its scientific rigour and the validity of the underlying hypotheses. However, due to gaps in our present knowledge, we cannot determine the effects of the contaminated sites on the health of the beluga.

In a subsequent stage, the Multipartite Committee prepared its own report «Report of the Multipartite Committee on Contaminated Sites of Concern for the St. Lawrence Beluga (1998).» This document draws on the two reports submitted by the consultant and on the Committee members' expertise regarding the beluga's specific environment and existing policies and regulations. It outlines strategies that should be adopted on a priority basis to deal with the contaminated aquatic sites.

RESULTS

Selection of sites containing contaminants of concern for the beluga

Contaminated sites were selected on the basis of data available in June 1997 on sediment quality, sediment dynamics and sources of contamination. The toxic substances considered in the study were those identified in the Recovery Plan as being of concern for the beluga. The level above which sediments were considered contaminated is the Toxic Effect Threshold (TET) established by Environment Canada and ministère de l'Environnement et de la Faune du Québec (1992). This threshold was chosen because it applies to the majority of substances of concern for the beluga and because it permits identification of contaminated areas of limited areal extent. The selected sites are locations where the sediment deposits are considered to be sufficiently stable, from a medium- and long-term perspective, such that any necessary measures can be planned and implemented.

Based on updated data, 38 sites were selected and divided into two categories, A and B. Tables 1 and 2 below list the sites in each category. Owing to the lack of data for Category B sites, only the Category A sites have been classified.

Table 1: Category A sites - List of contaminated sites for which the data can be used to determine the level and areal extent of surface sediment contamination by toxic substances of concern for the beluga

Ref. No.	Name of site	Substance(s) Exceeding the TET
A-1	Cap-aux-Meules harbour	PCB
A-2	Irving Whale wreck site	PCB
A-3	New Carlisle barachois	Hg, Pb, PCB, PAH
A-4	Baie-Comeau Port, Cargill wharves	PCB, PAH
A-5	Baie-Comeau Port, Anse du Moulin	PCB, PAH
A-6	Baie des Anglais	PCB, PAH
A-7	Upper basin of Saguenay Fjord and Ha! Ha! Bay	Hg, PAH
A-8	Port of Québec, St. Charles estuary	Pb, PAH
A-9	Port of Québec, Inner Louise Basin	Pb
A-10	Port of Montréal, Pointe-aux-Trembles wharf	PAH
A-11	Port of Montréal, Marien wharf basin	Hg, PAH
A-12	Port of Montréal, Hôtel-de-Ville park basin	Hg, PAH
A-13	Port of Montréal, Sector 103 basins	Hg, Pb, PAH
A-14	Port of Montréal, Racine Terminal, downstream	Pb
A-15	Port of Montréal, Vickers basin	Hg, Pb, PCB, PAH
A-16	Port of Montréal, Elevator No. 4 basin	Hg, Pb
A-17	Port of Montréal, Sutherland pier basin	PAH
A-18	Port of Montréal, Clock basin	Pb
A-19	Port of Montréal, Jacques-Cartier basin	Hg, Pb
A-20	Port of Montréal, Jetty No. 1 basin	Hg, Pb
A-21	Port of Montréal, Harbour Station basin	Hg, Pb, PAH
A-22	Port of Montréal, Bickerdike basin	Hg, Pb
A-23	Lachine Canal	Hg, Pb, PCB, PAH
A-24	Lesser Laprairie basin	Pb

Source : Gagnon and Bergeron, 1997

Table 2: Category B sites - List of contaminated sites for which the data cannot be used to establish the level and areal extent of surface sediment contamination by substances of concern for the beluga

Ref. No.	Name of site	Substance(s) Exceeding the TET	Year of exceedance
B-1	Étang du Nord harbour	PAH	1995
B-2	Port-Daniel-Est harbour	PAH	1996
B-3	Port of Gaspé, Sandy Beach wharf	PAH	1992
B-4	Port of Sept-Îles, fishing harbour	Hg	1987
B-5	Port of Baie-Comeau	PCB, PAH	1993
B-6	Trois-Pistoles, ferry wharf	Pb	1989
B-7	Baie Sainte-Catherine, wharf	PAH	1991
B-8	Port of Rivière-du-Loup	Hg	1997
B-9	Cap-Saint-Ignace flats	Hg	1989
B-10	Port of Bécancour	Hg	1982
B-11	Bassin de Lachine	Pb, Hg	1990
B-12	Lake St. Louis, îles de la Paix	Hg	1984-1985
B-13	Lake St. Louis, mouth of the St. Louis River	Hg, PAH, HCB PAH	1984-1985 1988
B-14	Port of Valleyfield	Pb	1986

Source : Gagnon and Bergeron, 1997

Classification of Category A sites based on their risk for the beluga

Category A sites (Table 1) have been classified based on their potential risk for the beluga. Since risk is defined as the result of exposure to a danger, the first step consisted in evaluating the likelihood that this species would be exposed to the toxic substances found at the 24 Category A sites. Five pathways of exposure were identified for the beluga:

1. Consumption of benthos at contaminated sites;
2. Consumption of fish that feed at the contaminated sites;
3. Skin exposure to substances released from the sites;
4. Consumption of benthos contaminated by substances released from the sites;
5. Consumption of fish contaminated by substances released from the sites.

Pathways 1 and 2 do not come into play because practically none of the 24 Category A sites are used by beluga. Consumption of fish species that feed at the contaminated sites is not a decisive factor for classifying the sites because the species that are part of the beluga's diet do not spend sufficient time at those sites to bioaccumulate contaminants (eels contaminated with mirex are the only exception). Beluga may be contaminated through exposure pathways 3, 4 and 5 because the toxic substances released from the 24 sites can be transported by water masses to the feeding grounds of this species or its prey, from sites several hundred kilometers both upstream and downstream from the feeding areas.

A risk assessment model combining pathways 3, 4 and 5 was developed in order to assess the relative risk of toxic substances being released at the sites and contaminating the food chain in the beluga's geographic range. Ten substances (lead, mercury, total PCBs and 7 PAHs) were included in the model. The data available on the other substances (hexachlorobenzene, organochlorine pesticides, dioxins, furans and individual PCB congeners) were too fragmentary to permit comparison of the sites.

The model developed involves six main variables: 1) areal extent of the site, 2) average concentration of each toxic substance in surface sediments, 3) relative rate of release of toxics to the water column, 4) relative rate of transport of released substances to the beluga's range, 5) relative biomagnification potential of toxics in the beluga's prey, and 6) relative dangerousness of the toxics for the beluga. Each of the variables in the model has an associated level of uncertainty, and this uncertainty varies with the site and substance considered.

A risk index was calculated for each contaminated site. Since the index considers only exposure pathways 3, 4 and 5, which entail high levels of uncertainty, it does not constitute an absolute measure of risk for the beluga. The score obtained can only be used to rank the sites based on the relative risk.

In view of the high levels of uncertainty associated with the model variables, a sensitivity analysis was conducted to determine the degree of variability of the ranking based on relative risk. A set of scenarios were studied by successively modifying a single variable. The sensitivity analysis identified three groups of Category A sites that were not subject to change, regardless of the scenario studied (Table 3). These groups were divided into subgroups to determine the relative risk by unit area. From the standpoint of implementing remedial measures and reclaiming local uses, it is more effective to focus on small areas posing a high risk than to work on large areas representing a moderate level of risk.

Table 3: Classification of Category A contaminated sites based on the their relative risk for the beluga

Group 1. Relatively high risk		
Sub-group 1A[3]	**Sub-group 1B[3]**	**Sub-group 1C[3]**
PM - Sector 103	Lesser LaPrairie Bassin	Saguenay Fjord[2]
PBC - Anse du Moulin	Lachine Canal	Baie des Anglais
PM - Racine		
PM - No. 4 elevator		
PBC - Cargill		
PM - Hôtel-de-Ville park		
Group 2. Intermediate risk		
Sub-group 2A	**Sub-group 2B**	**Sub-group 2C**
PM - Pte-aux-Trembles	PM - Bickerdike	PM - Harbour Station
	PQ - St-Charles	
	PM - Sutherland	
	PM - Marien wharf	
	PM - Vickers	
	Irving Whale	
	PM - Clock basin	
Group 3. Relatively low risk		
Sub-group 3A	**Sub-group 3B**	**Sub-group 3C**
		PM - Jetty No. 1
		PM - Jacques-Cartier
		Cap-aux-Meules
		PQ - Louise basin
		New Carlisle

Source: Multipartite Committee on Contaminated Sites of Concern for the Beluga, 1998

N.B. : The names used in table 3 were abbreviated. Full names are shown in table 1 of the page 3.
1: PM: Port of Montréal; PQ: Port of Québec; PBC: Port of Baie-Comeau.
2: Based on data from before the 1996 floods. The surface sediments in the upper basin of the Saguenay Fjord are less contaminated now.
3: Sub-group A: relatively high risk, Sub-group B: intermediate risk, Sub-group C: relatively low risk.

The findings on bioaccumulation of the toxics in fish and on mammalian toxicity and carcinogenicity suggest that PCBs are the main toxics determining the risk for beluga. These are the only substances that are abundant in sediments, strongly biomagnified in fish and very toxic to mammals. Consequently, a different ranking might have been obtained if individual PCB congeners (notably planar PCBs) could have been considered. Indeed, some PCB congeners are extremely toxic to mammals and could have made up a greater proportion of PCBs at some sites.

Since PCBs are a key determinant of the risk level, the relative contribution of the contaminated aquatic sites was determined in relation to the total budget of PCBs transported in the St. Lawrence River. The results are presented in Table 4.

Table 4: Comparison of the importance of the different PCB sinks in the St. Lawrence ecosystem in the late 1980s and early 1990s

Sink	Quantity of BPC (tons)
Water masses	
• Lower Estuary	1,1
• Gulf	2,4
Sediment deposits[1]	
• Lake St. Louis	0,9
• Lake St. Pierre	4,0
• Sites used intensively by belugas in the Middle Estuary	0,5
• Upstream part of the Laurentian Channel (Lower Estuary > 200 m)	24,0
• Downstream part of the Laurentian Channel (Gulf > 200 m)	6,0
• 24 contaminated aquatic sites - Category A	1,2
• 14 contaminated aquatic sites - Category B	?
Aquatic biomasses	
• Gulf plankton	1,8
• Gulf benthos	3,6
• Gulf fish species	< 0,1

Source : Gagnon and Bergeron, 1998

1: For sediment deposits, it is assumed that only the PCBs found in the first 5 centimetres of sediment are likely to be resuspended; the figure for contaminated aquatic sites (1.2 t) may thus underestimate the actual figure.

This profile (Table 4) suggests that, in the early 1990s, the contribution of contaminated sites was much less important than that of other PCB sources such as those associated with the Great Lakes, industrial and urban discharges and long-range atmospheric transport. Although toxic loadings from a number of sources have declined considerably in recent years and contaminated aquatic sites now represent a relatively larger source, the toxic loads from the contaminated sites remain small compared with the other sources contained in the overall budget. However, even if the inputs from the contaminated sites represent a relatively low risk for the beluga, the sites may nonetheless pose a potential threat to wildlife and local uses.

CONCLUSION

The Multipartite Committee has established that, based on current knowledge, we cannot determine the absolute risk that the contaminated sites represent for the beluga. We are, however, able to conclude that the sites may contribute to the toxic load to which beluga are exposed. Although the sites pose a relatively low risk for this species and extensive clean-up operations do not appear justified, it must be borne in mind that the contamination situation may constrain local uses of the river by wildlife and humans.

Consequently, the Committee proposes the following actions:

1. Characterise the Category B sites with the highest priority, more specifically those situated in the beluga's range;

2. Monitor the Category A sites and extend this monitoring to Category B sites which, based on the characterisation findings, are worrisome for the beluga. Draw up actions plans if necessary;

3. Continue to acquire knowledge of the beluga and the pathway of contaminant exposure in the St. Lawrence and the food chain; in particular, learn more about contaminant remobilization and release, the beluga's diet, contamination of its prey and PCB congeners;

4. Using the new knowledge, establish new sediment quality criteria that take into account biomagnification in the food chain and the toxicity of substances for the beluga (and other vertebrates).

Phase III of the St. Lawrence action plan should provide the framework for continuing the required efforts to protect the beluga.

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INFORMATION :

Caroll Bélanger
Environmental Protection Branch
Environment Canada
Tel: (514) 283-2339
E-mail : caroll.bélanger@ec.gc.ca

Luc Foisy
Canadian Heritage - Parks Canada
Ecosystem Conservation Section
Tel : (418) 648-4049
E-mail : luc_foisy@pch.gc.ca

Pierre Terrault
Ministère de l'Environnement du Québec
Direction des politiques du secteur industriel
Tel : (514) 873-8878
E-mail : pierre.terrault@mef.gouv.qc.ca

Gordon Walsh
Fisheries and Oceans Canada
Fish Habitat Management
Tel : (418) 775-0577
E-mail : walshg@dfo-mpo.gc.ca

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