

From: Brown, Robin
Sent: Thursday, June 10, 2010 2:25 PM
To: Ladell, Kate <Kate.Ladell@dfo-mpo.gc.ca>
Subject: RE: question re: impacts of copper on salmon

Just for you to know:

This is an area of "tension" between EC and DFO. DFO has largely withdrawn from the 'contaminants research' field (at least on paper - there are still internally subversive elements at work and I leave it up to your imagination to decide where those elements might be located).

The DFO position is that the responsibility for "contaminants research" goes with their responsibility for enforcing Section 36(3) of the Fisheries Act (deleterious substances). In a pinch, we sort of accept that if we can demonstrate a population-level impacts on fish (including marine mammals) then we might tolerate some research on this in DFO

EC doesn't quite see it this way and neither Department is particularly consistent on WHAT they do, WHERE they do it and HOW they justify it against their mandate. There is a recent Report from the Auditor-General of this element of dysfunction in the Federal family. There is a pretty large gaps between what EC is prepared to do and what DFO is prepared to do and this gap is largest in the marine environment.

In the Oceans Program, over time we have redefined "Marine Environmental Quality" to largely exclude the contaminants issue (in line with our claim that this is not our job and we are not funded to do it). This leaves us with an operational definition/focus for our MEQ program that mystifies/confuses/bemuses many others.

Regards

Robin

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From: Ladell, Kate
Sent: June 10, 2010 1:53 PM
To: Brown, Robin
Subject: RE: question re: impacts of copper on salmon

Thanks, Robin. I have forwarded to Jas.

From: Brown, Robin
Sent: June 10, 2010 1:47 PM
To: Ladell, Kate
Subject: RE: question re: impacts of copper on salmon

DFO-289913

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Science\Robin Brown\Personal Folders-Cohen-RobinBr
own\RMB-SENT-2010\

CAN134834_0001

This is not a subject that has had a lot of recent attention. A search of WAVES shows - note that author JC Davis is ex RDG and ex ADM Science John Davis

CATNO	17557					
Title	Acute and sublethal copper sensitivity, growth and saltwater survival in young Babine Lake sockeye salmon					
Responsible	by J.C. Davis and I.G. Shand					
Author	Davis, J.C.; Shand, I.G.					
Imprint	West Vancouver, B.C. : Fisheries and Marine Service, 1978					
Date	1978					
Pagination	v, 55 p.					
Series	Technical report (Canada. Fisheries and Marine Service); 847					
Descriptors	f; Canada; British Columbia; Babine L.; fry; smolts; parasitism; fingerlings; copper; toxicity; osmoregulation; salinity tolerance; growth; environmental conditions; bioassays					
Collection Spec	DFO					
Species Name	Oncorhynchus nerka (anadromous/anadrome)					
Abstract	A series of experiments was conducted during the spring, summer and fall of 1977 to determine the potential copper toxicity hazard to Babine Lake, B.C., sockeye salmon (<i>Oncorhynchus nerka</i>) fry, lake fingerlings and smolts. In order to study the potential hazard of low sublethal copper level exposure to fish overwintering in the lake prior to outmigration, salinity transfer studies, growth studies and mortality after seawater transfer were examined in sockeye smolts. In addition, copper sensitivity in relation to infestation with the cestode parasite <i>Eubothrium salvelini</i> , and general nutritional state of migrating smolts were examined as peripheral issues.					
Resume	Du printemps a l'automne de 1977, les A. ont mesure les risques d'intoxiation par le cuivre des alevins nouvellement eclos, de ceux de la grosseur d'un doigt et des smolts de saumon sockeye (<i>Oncorhynchus nerka</i>) du lac Babine (C.-B.) Afin de mesurer les risques d'exposition du poisson qui hiverne dans le lac avant de migrer a une concentration subletale de cuivre, les A. ont examine les resultats d'etudes sur le passage en eau salee des smolts de sockeye, et sur leur croissance et leur mortalite en ce milieu. Chez le smolt migrateur, ils ont aussi etudie les relations entre sa sensibilite au cuivre et le parasitisme par le cestode (<i>Eubothrium salvelini</i>), ainsi que son etat general de sante lie a la nutrition.					
Numbers	Cat. no. Fs 97-6/847					
ISSN	07017626					
Language	eng					
Copies						
Location	Call No	Availability	Due Date	Item ID	Holdings	Copy Notes
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BVAFI	SH 223 F56 no.847 c.2	SHELF		02019505		
BVAFI	SH 223 F56 no.847	SHELF		02019504		
MWFW	Shelved in microfiche drawers	SHELF		225292		
MWFW	Shelved with serials	SHELF		05002258		
NBAB	Can. Gov. Doc.	SHELF		06011547		

<u>NBMF</u>	SH 223 T25 847	SHELF		07011217		c.2 microfiche
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<u>NSDB</u>	Documents	SHELF		09037595		No.838-847 bound together
<u>NSDB</u>	Documents	SHELF		09037603		
<u>OBUC</u>	Shelved with serials	SHELF		120334		
<u>OOFI</u>	SH 223 F56 no.847 c.1	SHELF		12030025		
<u>OOFI</u>	SH 223 F56 no.847 c.2	SHELF		12030024		2 copies
<u>QQPSM</u>	SH 223 F56 No 847	SHELF		14008376		

CATNO	72210					
Title	Effects of copper and zinc on smoltification of coho salmon					
Responsible	by Harold W. Lorz, Barry P. McPherson					
Author	Lorz, H.W.; McPherson, B.P.					
Corporate Author	United States. Environmental Protection Agency. Office of Research and Development					
Imprint	Corvallis, Oregon : Environmental Research Laboratory, 1977					
Date	1977					
Pagination	68 p.					
Series	Research reporting series. 3, Ecological research; EPA-600/3-77-032					
Descriptors	smolts; pollution effects; copper; zinc					
Species Name	Oncorhynchus kisutch					
Language	eng					
Copies						
Location	Call No	Availability	Due Date	Item ID	Holdings	Copy Notes
<u>BNP</u>	serials	LOST		53546		Replaced
<u>BNP</u>	serials	SHELF		01010299		Ricker Gift
<u>BVAFI</u>	SH 167 S17 E44 1977	SHELF		02027678		
<u>BVIEM</u>	EPA-600-3 /77-032	SHELF		04019420		
<u>NSDB</u>	Document Coll.	SHELF		09025316		

CATNO	16682					
Title	Exposure of chum salmon, <i>Oncorhynchus keta</i> , to copper in a controlled ecosystem experiment (CEPEX)					
Responsible	by J.A.J. Thompson and D.W. Paton					
Author	Thompson, J.A.J.; Paton, D.W.					
Corporate Author	Canada. Fisheries and Marine Service. Research and Development Directorate					
Imprint	West Vancouver, B.C. : Pacific Environment Institute, 1976					
Date	1976					
Pagination	vii, 22 p.					

Series	Technical report (Canada. Fisheries and Marine Service. Research and Development Directorate); 660					
Descriptors	copper; controlled conditions					
Species Name	Oncorhynchus keta					
Abstract	Chum salmon fry, <i>Oncorhynchus keta</i> , were exposed to nominal copper concentrations of 2.5-5.0 micrograms/l over a period of 42 days in a controlled ecosystem. Samples were obtained at two-week intervals during the experiment. Gills and dorsal muscle from each fish were analysed for total copper content by atom reservoir spectrophotometry (graphite furnace). Statistical analysis of the data indicated that fish exposed to elevated copper concentrations accumulated significantly greater amounts of the metal in the gills when compared with controls. Copper data for the muscle samples exhibited only random fluctuations over the experimental period. The results suggest that copper concentrations of this magnitude, i.e. 10 to 20 times greater than ambient levels, are below threshold values required to promote bioaccumulation in the species tested.					
Resume	De jeunes saumons keta (<i>Oncorhynchus keta</i>) ont ete soumis a des concentrations maximales de cuivre de 2,5 a 5,0 microgrammes par litre pendant 42 jours dans un ecosysteme controle. Des echantillons ont ete preleves a des intervalles de 2 semaines au cours de l'experience. Les branchies et muscles dorsaux de chaque poisson ont ete analyses par spectrophotometrie en reservoir atomique (four en graphite) pour en deceler la teneur totale en cuivre. L'analyse statistique des donnees a revele que les poissons exposes a de fortes concentrations de cuivre ont accumule dans leurs branchies beaucoup plus de metal que les temoins. Dans les echantillons musculaires, on n'a decele que des fluctuations aleatoires au cours de la periode de l'experience. Les resultats indiquent que des concentrations de cuivre de cette intensite, c'est-a-dire de 10 a 20 fois superieures aux concentrations ambiantes, sont encore en-deca du seuil de bioaccumulation dans l'espece etudiee.					
ISSN	00687553					
Language	eng					
Copies						
Location	Call No	Availability	Due Date	Item ID	Holdings	Copy Notes
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BVIEM	FRB-TR /660	SHELF		04009317		
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MFWF	Shelved with serials	SHELF		05001719		
NBAB	Can. Gov. Doc.	SHELF		250682		Bound with technical report no. 655 (Barcode 06011521)
NBMF	SH 223 T25 660	SHELF		07011043		c.2 microfiche
NFSF	Shelved with serials	SHELF		145896		
NSDB	Documents	SHELF		09037238		
NSDB	Documents	SHELF		09037227		
OBUC	Shelved with serials	SHELF		120272		
OOFI	SH 223 F56 no.660 c.2	SHELF		12029612		
OOFI	SH 223 F56 no.660 c.1	SHELF		12029613	2 copies	

QQPSM	SH 223 F56 No 660	SHELF		14008196		
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CATNO	26445
Title	Avoidance of copper in the presence of humic acid by juvenile Atlantic salmon
Responsible	W.G. Carson and W.V. Carson
Author	Carson, W.G.; Carson, W.V.
Corporate Author	Fisheries Research Board of Canada
Imprint	St. Andrews, N.B. : Fisheries Research Board of Canada, 1973
Date	1973
Pagination	14 p.
Series	Manuscript report series (Fisheries Research Board of Canada); 1237
Descriptors	juveniles; copper; humic acid; avoidance reactions
Collection Spec	DFO
Species Name	Salmo salar (anadromous/anadrome)
Abstract	Experiments in a Y-trough and in an avoidance tube indicate that the avoidance reaction of juvenile Atlantic salmon (Salmo salar) to copper in the presence of humic acid is either eliminated or decreased, depending on copper and humic acid concentrations. Better sensitivity is achieved in the avoidance tube than in the Y-trough.
ISSN	04107721
Language	eng

Copies						
Location	Call No	Availability	Due Date	Item ID	Holdings	Copy Notes
<u>BNP</u>	Shelved with serials	SHELF		01009100		
<u>BVAFI</u>	SH 223 F55 no.1237	SHELF		02017511		
<u>MWFW</u>	serial c1(Cdn Man Rpt F&Aqu Sci) c2fiche	SHELF		05037487	Paper and microfiche copies	
<u>NBAB</u>	Microfiche	SHELF		1237		
<u>NBAB</u>	Can. Gov. Doc.	SHELF		254329		Bound with manuscript no. 1230 (Barcode 06011229)
<u>NBMF</u>	Microfiche	SHELF		26445M		
<u>NFSF</u>	Shelved with serials	SHELF		147684		
<u>NSDB</u>	Documents	SHELF		09062758		
<u>NSDB</u>	Documents	SHELF		09062745		Bound No.1230-1241
<u>OOFI</u>	SH 223 F55 no. 1237	SHELF		12017397		
<u>QQPSM</u>	SH 223 F55 No 1237	SHELF		14002640		
<u>QQPSM</u>	Microfiches	SHELF		319010		

CATNO	28437
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Title	Toxicity of copper and zinc to juvenile Atlantic salmon in the presence of humic acid and lignosulfonates
Responsible	W.G. Carson and W.V. Carson
Author	Carson, W.G.; Carson, W.V.
Corporate Author	Fisheries Research Board of Canada
Imprint	St. Andrews, N.B. : Fisheries Research Board of Canada, 1972
Date	1972
Pagination	5, [9] p.
Series	Manuscript report series (Fisheries Research Board of Canada); 1181
Descriptors	copper; zinc; toxicity; humic acids; sulphur compounds
Collection Spec	DFO
Species Name	Salmo salar (anadromous/anadrome)
Abstract	Humic acid reduces the acute toxicity of copper (increases the incipient lethal level) to juvenile Atlantic salmon, but has no effect on the acute toxicity (incipient lethal level) of zinc. Lignosulfonates are approximately three times less efficient than humic acid in reducing the acute toxicity of copper.
ISSN	04107721
Language	eng

Copies

Location	Call No	Availability	Due Date	Item ID	Holdings	Copy Notes
<u>BNP</u>	Shelved with serials	SHELF		01009111		
<u>BVAFI</u>	SH 223 F55 no.1181	SHELF		02017615		
<u>MWFW</u>	Series (Can Manusc Rep..)	SHELF		05037337		
<u>NBAB</u>	Microfiche	SHELF		1181		
<u>NBAB</u>	Can. Gov. Doc.	SHELF		255091		Bound with manuscript no. 1173 (Barcode 06011219)
<u>NBMF</u>	Microfiche	SHELF		28437M		
<u>NFSF</u>	Shelved with serials	SHELF		148125		
<u>NSDB</u>	Documents	SHELF		09062359		
<u>NSDB</u>	Documents	SHELF		09062347		Bound No.1171-1182
<u>OOFI</u>	SH 223 F55 no. 1181	SHELF		12019678		
<u>QQPSM</u>	SH 223 F55 No 1181	SHELF		14004234		
<u>QQPSM</u>	Microfiches	SHELF		319434		

CATNO	1222
Title	Preliminary investigation of Atlantic salmon acclimation to lethal and sublethal copper concentration by means of bioassay

Author	Cote, R.P.					
Publisher	Canada. Fisheries Service (Maritimes Region). Resource Development Branch					
Date	1971					
Pagination	15 p					
Series	Manuscript report; 71-17					
Notes	Restricted/Restreint. Date: December 1971					
Descriptors	F; Canada; New Brunswick; Tetagouche R.; heavy metals; copper; water pollution; lethal limits; bioassays; juveniles; acclimatization; tolerance					
Species Name	Salmo salar (anadromous/anadrome)					
Abstract	The Bedford Toxicity Laboratory undertook to conduct a series of bioassays for the River Development Section in order to provide information on the possibility of acclimation of Tetagouche River salmon to lethal and sublethal copper concentrations. Three primary purposes of the investigation were: 1)To determine the effect of Tetagouche water and its high heavy metal content on a foreign stock from a low mineral content river. 2)To show if Tetagouche River salmon are acclimated to the high concentrations of copper present is simply in a less nocent form. 3)Should Tetagouche fish show an acclimation ability to high copper concentration, determine the limits of tolerance. This report comprises information on static bioassays conducted on young salmon from the Cain's River and the Tetagouche River, comparisons with hatchery-reared fish at similar concentrations, avoidance tests and some hematocrit values.					
Numbers	CREMANR					
Language	eng					
Copies						
Location	Call No	Availability	Due Date	Item ID	Holdings	Copy Notes
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<u>NBAB</u>	shelved with serials	SHELF		06012212		
<u>NBMF</u>	SH 223 M25 No71-17	SHELF		07015059		
<u>NSDB</u>		SHELF		69462		
<u>OOFI</u>	SH 223 C322 no.71-17	SHELF		12002747		

There was a flurry of work in the 90s regarding acid mine drainage at Brittania Beach:

CATNO	261789
Title	Metal analyses from water samples collected near Britannia Mine and in Howe Sound, British Columbia, 1997 and 1998
Responsible	by G.E. Piercey, C.D. Levings, and J.A. Grout
Author	Piercey, G.E.; Levings, C.D.; Grout, J.A.
Corporate Author	Canada. Dept. of Fisheries and Oceans. West Vancouver Laboratory
Imprint	West Vancouver, B.C. : The Laboratory, 2001
Date	2001
Pagination	iii, 39 p.
Series	Canadian data report of fisheries and aquatic sciences; 1082

Notes	Includes: 1 diskette
Descriptors	INE; British Columbia; Howe Bay; water samples; metals; chemical analysis; water analysis; copper; mine tailings
Abstract	Data are presented on the results of dissolved metals analyses from a sampling program on Howe Sound to assess dispersion of acid mine drainage and copper from the abandoned Britannia Mine.
Resume	Cet article presente les resultats d'analyse des metaux dissous effectuees sur des echantillons preleves dans la baie Howe dans le cadre d'un programme destine a evaluer la dispersion du drainage minier acide et la presence de cuivre provenant de la mine abandonnee Britannia.
Numbers	Cat. no. Fs97-13/1082E
ISSN	07066465
Language	eng

Copies

Location	Call No	Availability	Due Date	Item ID	Holdings	Copy Notes
<u>BVAFI</u>	QH 90.5 C33 no.1082	SHELF		02019059		
<u>BVIEM</u>	FMS-DR /1082	SHELF		04015913		
<u>MWFW</u>	Serials (Cdn data report)	SHELF		05025096		
<u>NBAB</u>	Can. Gov. Doc.	SHELF		06021364		
<u>NBMF</u>	QH 90.5 C33 No1082	SHELF		07019216		
<u>NFSF</u>		SHELF		08020547		
<u>NSDB</u>	Documents Coll.	SHELF		09033656		
<u>OOFI</u>	QH 90.5 C33 no.1082 MICRO	SHELF		12056342		
<u>OOFI</u>	QH 90.5 C33 no.1082 c.2	SHELF		12055669		
<u>OOFI</u>	QH 90.5 C33 no.1082 c.1	SHELF		12055668	2 copies	
<u>QQPSM</u>	QH 90.5 C33 No1082	SHELF		14045670		

CATNO	239907
Title	Biological data from near Britannia Mine and in Howe Sound, British Columbia, during 1997-1998
Responsible	By J.A. Grout, C.D. Levings, G.E. Piercey and B. Mossop
Author	Grout, J.A.; Levings, C.D.; Piercey, G.E.; Mossop, B.
Imprint	West Vancouver, B.C. : Fisheries and Oceans Canada, West Vancouver Laboratory, 1999
Date	1999
Pagination	iv, 95 p.
Series	Canadian data report of fisheries and aquatic sciences; 1055
Notes	Bibliogr.: p. 5-6
Descriptors	INE; Canada; British Columbia; Howe Sound; Britannia Creek; beach seines; juveniles; seining; cages; epibenthos
Other Terms	epibenthic sled; Britannia Mine
Collection Spec	DFO
Species Name	Mytilidae; Amphipoda; Salmonidae
	Data are presented for several biological studies conducted on Howe Sound during 1997 and

Abstract	1998 to assess the impacts of acid mine drainage from the Britannia Mine on marine organisms. Studies assessed individual and community differences for invertebrates, mussels, and fish at contaminated sites near Britannia Creek and lesser impacted areas further away. Fish species composition and abundance determined by beach seine sampling are reported for stations near the estuaries of Britannia and Furry creeks Epibenthic sled samples were collected at beach seine sites to obtain data on fish food invertebrate community composition and abundance. Basket traps filled with Fucus gardneri were also deployed at these two areas to provide data on the abundance and colonization potential for amphipods. Mesh bags containing Mytilus edulis were deployed in cages at 15 stations throughout Howe Sound to gather data on bioaccumulation of heavy metals in mussels and their biological responses. Oncorhynchus tshawytscha juveniles were placed in cages at Britannia Creek and an uncontaminated area to document the survival of salmonids. Physical oceanographic data collected during the studies are also presented where appropriate.					
Resume	Les auteurs presentent les donnees de plusieurs etudes biologiques menees dans la baie Howe en 1997 et 1998 en vue d'etablir les impacts des eaux d'exhaure acides s'ecoulant de la mine Britannia sur les organismes marins. Les etudes ont evalue les differences entre les individus et les communautes chez les invertebres, les moules et les poissons de sites contamines situes a proximite du ruisseau Britannia et de zones moins touchees un peu plus eloignees. La composition et l'abondance des especes de poisson, etablies par echantillonnage a la senne de rivage, sont signalees pour les stations a proximite des estuaires des ruisseaux Britannia et Furry. A l'aide d'un traineau epibenthique, les auteurs ont recueilli des echantillons aux sites de peche a la senne de rivage pour obtenir des donnees sur la composition et l'abondance de la communaute des invertebres servant de nourriture aux poissons. Des nasses remplies de Fucus gardneri ont aussi ete mouillees a ces deux endroits pour obtenir des donnees sur l'abondance des amphipodes et leur colonisation potentielle. Des sacs en filets renfermant des specimens de Mytilus edulis ont ete places dans des cages a 15 stations dans la baie Howe pour recueillir des donnees sur la bioaccumulation de metaux lourds chez les moules et sur leurs reactions biologiques. Des specimens d'Oncorhynchus tshawytscha juveniles ont ete places dans des cages dans le ruisseau Britannia et dans une zone non contaminee pour documenter la survie des salmonides. Des donnees d'oceanographie physique recueillies pendant les etudes sont egalement presentees le cas echeant					
Numbers	MPWGSC cat. no. Fs 97-13/1055E					
ISSN	07066465					
Language	eng					
Copies						
Location	Call No	Availability	Due Date	Item ID	Holdings	Copy Notes
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BVIEM	FMS-DR /1055	SHELF		04013083		
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MWFW	shelved with serials	SHELF		05011599		2 copies
NBAB	Microfiche	SHELF		MF1055		
NBAB	Can. Gov. Doc.	SHELF		06020038		
NBMF	Microfiche	SHELF		07017191A		
NBMF	QH 90.5 C33 No1055	SHELF		07017191		

<u>NFSF</u>		SHELF		08015646		
<u>NSDB</u>	Documents Coll.	SHELF		10005676		
<u>NSSCG</u>	QH90.5 .C33 NO. 1055	SHELF		50558010165559		
<u>OOFI</u>	QH 90.5 C33 no.1055 c.2	SHELF		12048258		2 copies
<u>OOFI</u>	QH 90.5 C33 no.1055 c.1	SHELF		12048257		2 copies
<u>OOFI</u>	QH 90.5 C33 no.1055 MICRO	SHELF		12048265		
<u>QQPSM</u>	QH 90.5 C33 No1055	SHELF		14039045		Aussi sur microfiches

Regards

Robin

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<http://www-sci.pac.dfo-mpo.gc.ca/osap/>

From: Ladell, Kate
Sent: June 2, 2010 3:43 PM
To: Aulakh,Jaspal [PYR]; Davis, Neil; Ibey, Hilary
Cc: Brown, Robin
Subject: RE: question re: impacts of copper on salmon

Hi Jas,

Sorry, but I'm not aware of this work, but have cc'd Robin Brown with Science as he is likely in a better position to know if this work is happening.

Kate

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 Kate Ladell  
 Marine Planning & Protected Areas Specialist

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 Science\Robin Brown\Personal Folders-Cohen-RobinBr  
 own\RMB-SENT-2010\

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Direction des océans, de l'habitat et de la mise en valeur  
Fisheries and Oceans Canada  
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**From:** Aulakh, Jaspal [PYR] [mailto:Jas.Aulakh@ec.gc.ca]  
**Sent:** June 2, 2010 3:28 PM  
**To:** Davis, Neil; Ibey, Hilary; Ladell, Kate  
**Subject:** question re: impacts of copper on salmon

Do any of you happen to know if DFO is doing any work to determine the impact of copper on salmon? If you can provide me with a contact, that would be great.

Thanks,  
Jas

**Jas Aulakh**

Senior Policy Analyst | Analyste principal en politiques  
Intergovernmental and International Affairs | Affaires intergouvernementales et internationales  
Strategic Integration and Partnerships Division | Division de l'intégration stratégique et des partenariats  
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