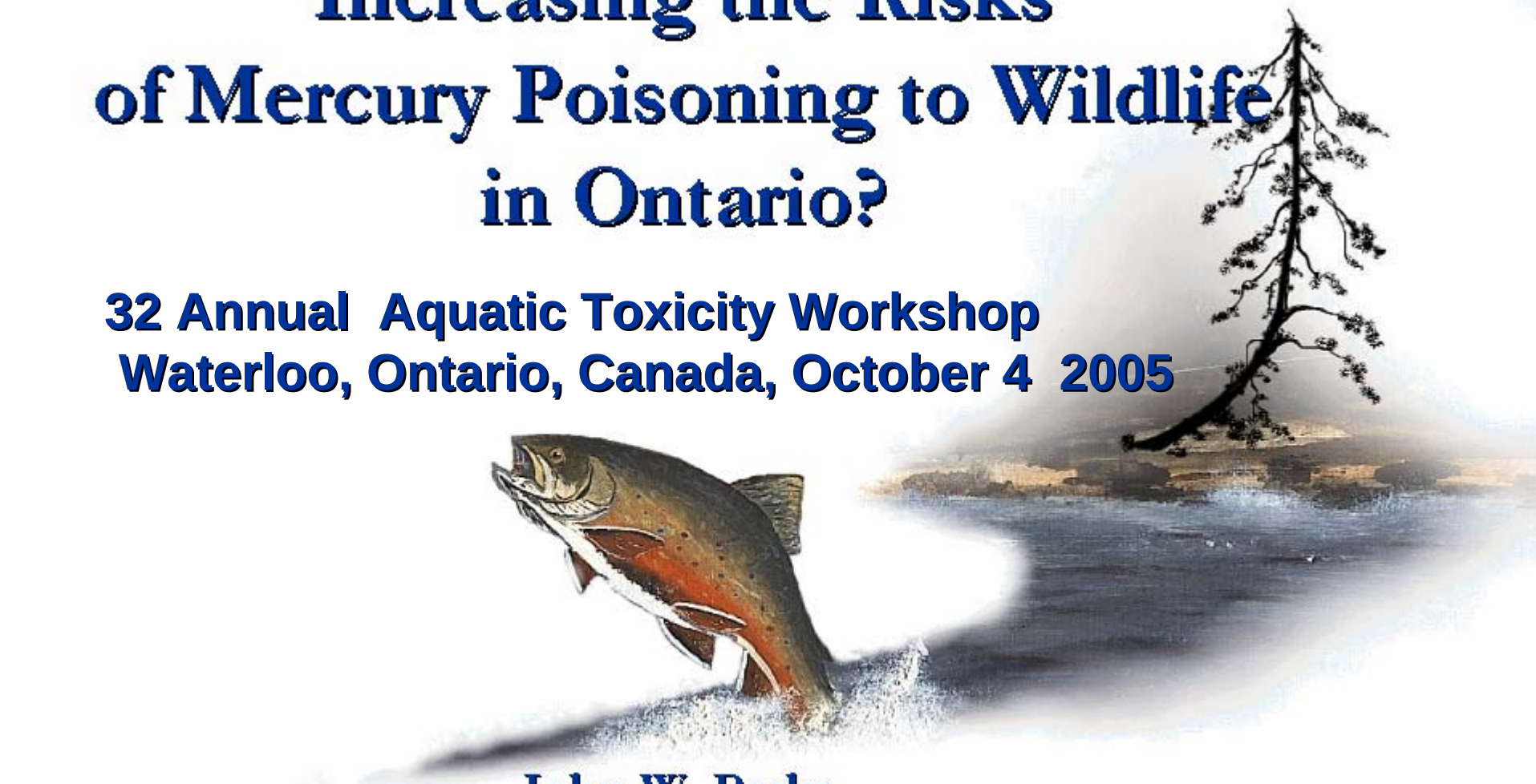
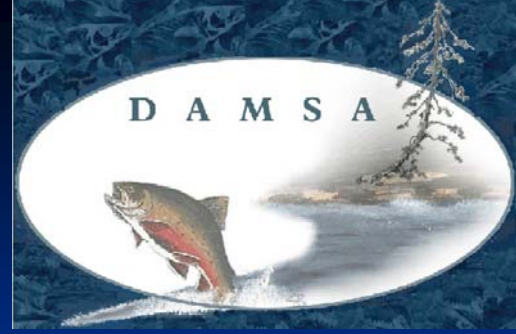
Are Brook Trout Stocking Programs Increasing the Risks of Mercury Poisoning to Wildlife in Ontario?

32 Annual Aquatic Toxicity Workshop
Waterloo, Ontario, Canada, October 4 2005



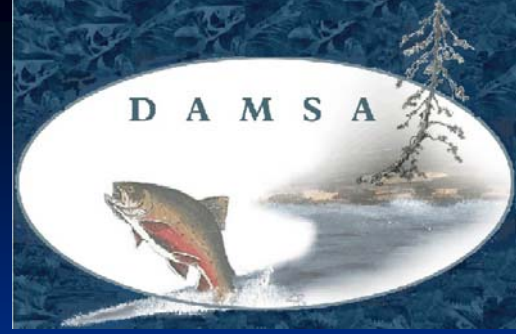
John W. Parks
Damsa Integrated Resources Management Inc.

Overview

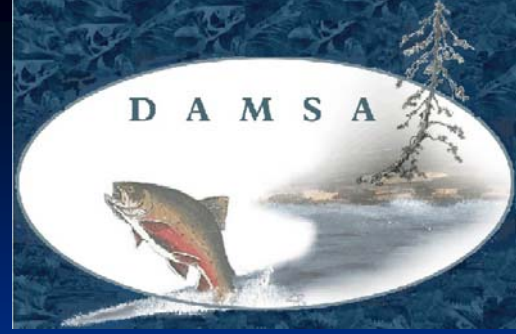


- 1. Evidence of mercury poisoning to wildlife in Ontario
- 2. Source of poisoning – Me Hg in aquatic food webs
- 3. Brook trout as a food source of MeHg to wildlife
- 4. Concentrations of mercury in Ontario Brook Trout from the Ontario Ministry of the Environment MOE Sport Fish Guide.
- 5. Comparisons of these mercury concentrations in brook trout with Canadian Tissue Residue Guidelines (Environment Canada) for methylmercury to estimate potential risk.
- 6. Why stocking programs for brook trout may contribute to these risks, or even increase them.
- 7. Future considerations/recommendations

Evidence for Risks of MeHg Poisoning to Wildlife in Ontario

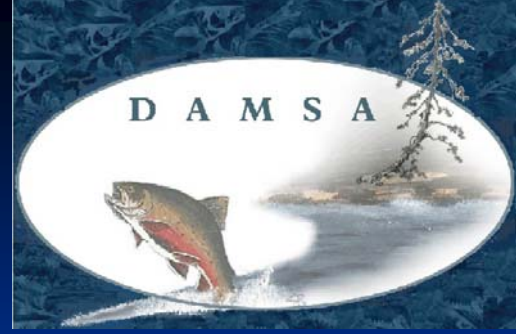


- Wren, C.D. 1985. Probable Case of mercury poisoning in a wild otter, *Lutra canadensis* in Northwestern Ontario. Canadian Field Naturalist 99:112-115.
- Mierle, G., E.M. Addison, K. S. Macdonald and D.G. Joachim.2000. Mercury levels in tissues of Otters from Ontario, Canada: Variation with age, sex and location. Environ. Toxicol. Chem 19:3044-30.
- Klenavic, K.M. 2004. Mercury levels in wild mink (*Mustela vison*) and river otter (*Lutra Canadensis*) from Ontario and Nova Scotia: Relation to age , sex, parasitism and body condition. M Sc Thesis, Trent University, Peterborough, Ontario, Canada.
- Bar, J.F. 1986. Population dynamics of the common loon (*Gavia immer*) associated with mercury contaminated waters in North-western Ontario. Occasional paper 56. 23 p.
- Scheuhammer, A.M., and P.J. Blancher. 1994. Potential risk to common loons (*Gavia immer*) from methylmercury exposure in acidified lakes. Hydrobiol., 279/280:445-455.



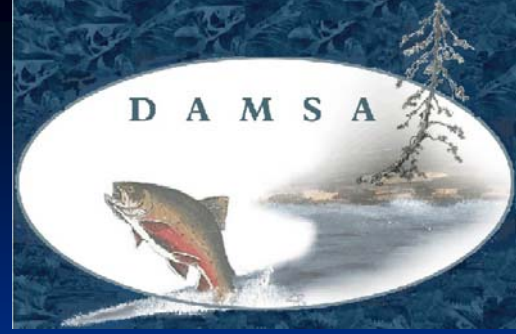
Fish and other aquatic biota are the important sources of methylmercury to many birds and wildlife

– and are the primary source of risk



- Brook trout are a source of food for many wildlife including kingfishers mergansers, loons, herons, otters and mink…

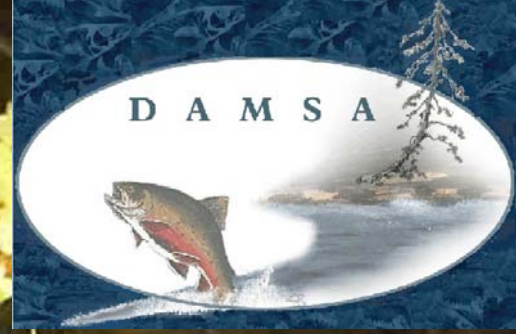
Assessing the Risk -Environment Canada



- The risk of mercury poisoning to birds and wildlife from consuming aquatic organisms was assessed by Environment Canada (2002) in "Canadian Tissue Residue Guidelines for the Protection of Consumers of Aquatic Life: Methylmercury."

- Establishes species specific upper limits for mercury levels in the diet of various consumers of aquatic organisms based upon the ecotoxicology of methylmercury (MeHg) to the birds or wildlife species.

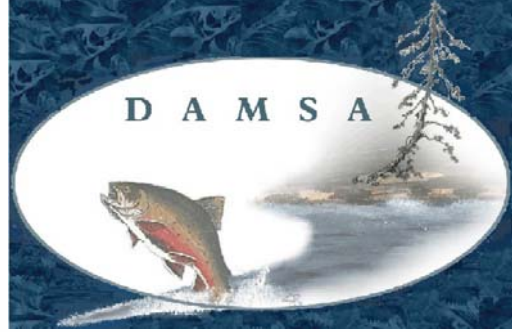
- The goal of the Canadian Tissue Residue Guidelines (CTRG) values is to determine a methylmercury concentration in food that will not adversely affect wildlife.

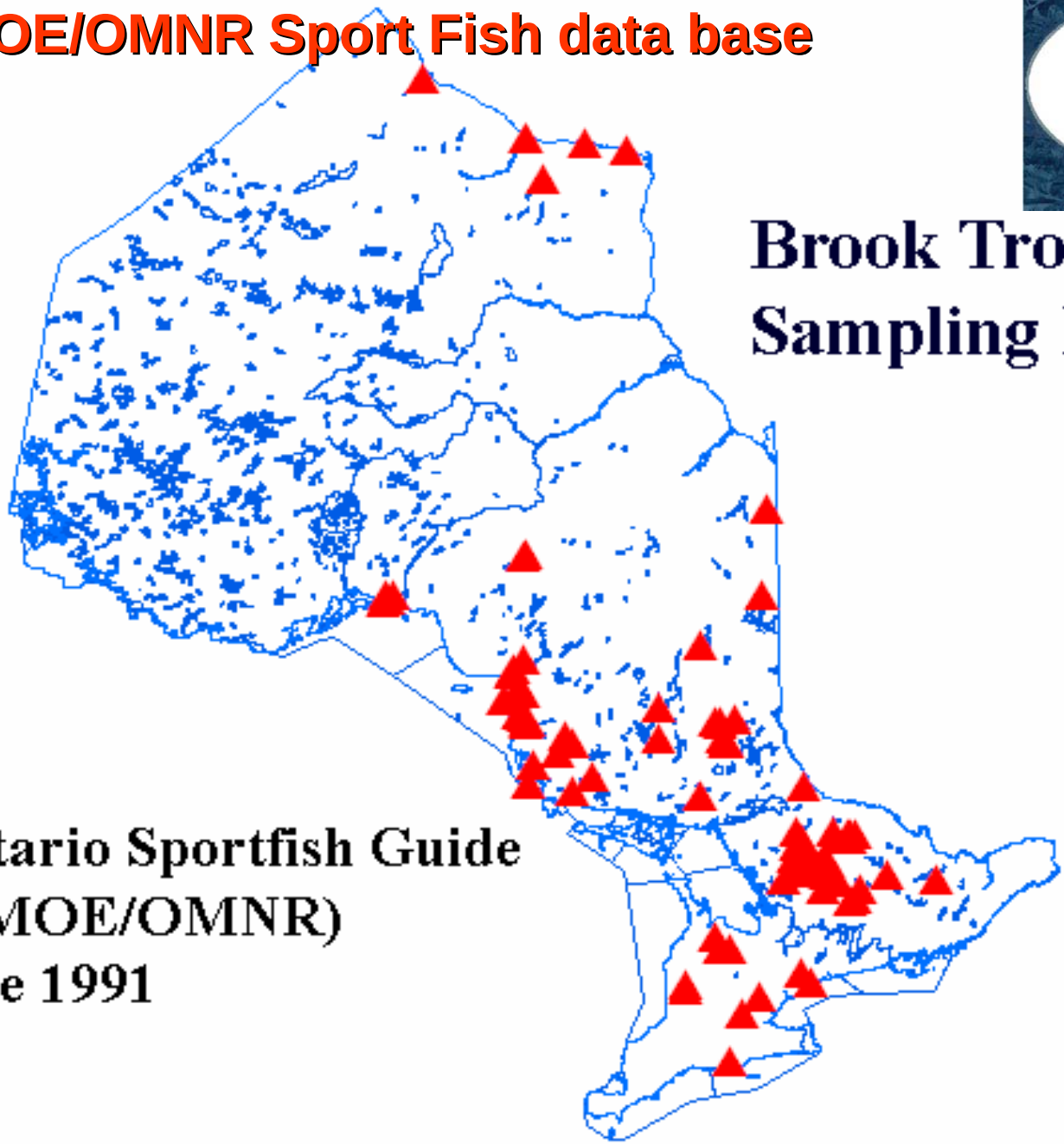


Evaluating the Role Of Brook Trout as Sources of Methylmercury

Insight into the role Brook trout may contribute to mercury poisoning of wildlife can be obtained by examining the concentrations of mercury in Brook trout in Ontario in the context of Canadian Tissue Residue Guidelines (CTRG)

Brook trout data was obtained for the OMOE/OMNR Sport Fish data base



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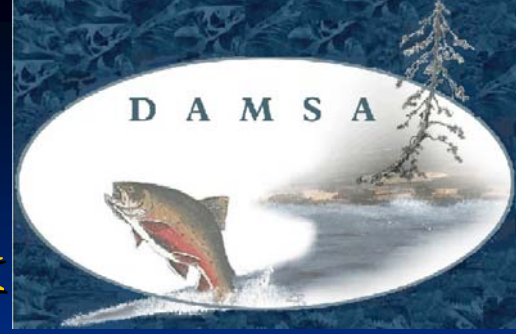
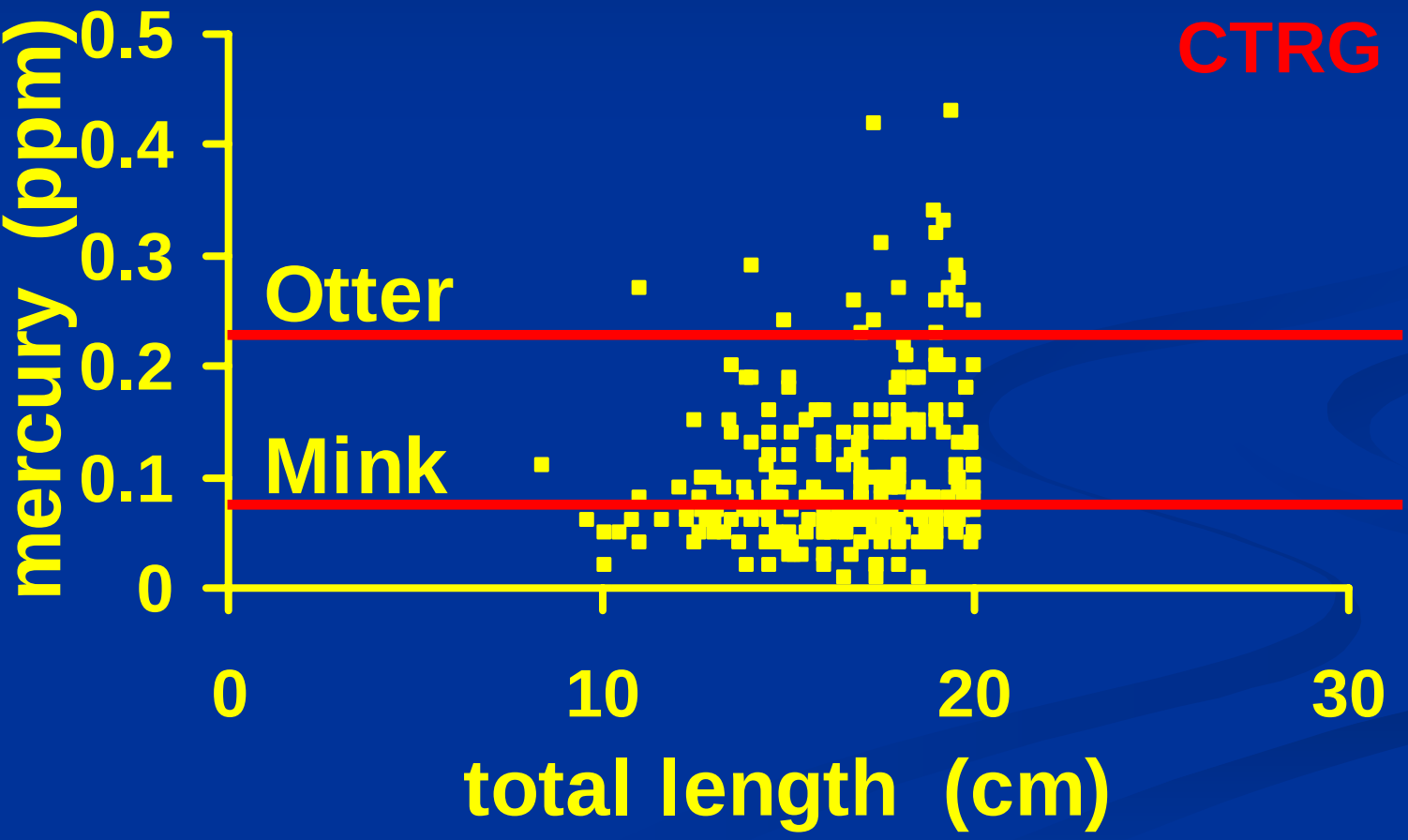
No attempt was made to separate results for stocked versus native fish

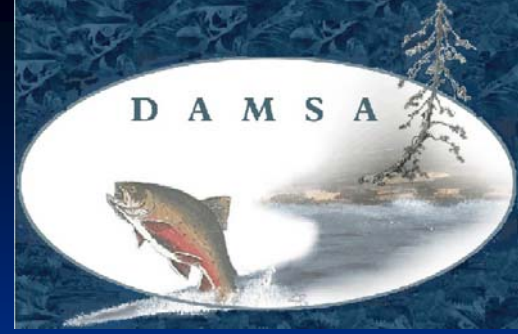
Comparison of Hg in brook trout (<20cm) with Canadian Tissue Residue Guideline for MeHg for Mink and Otter

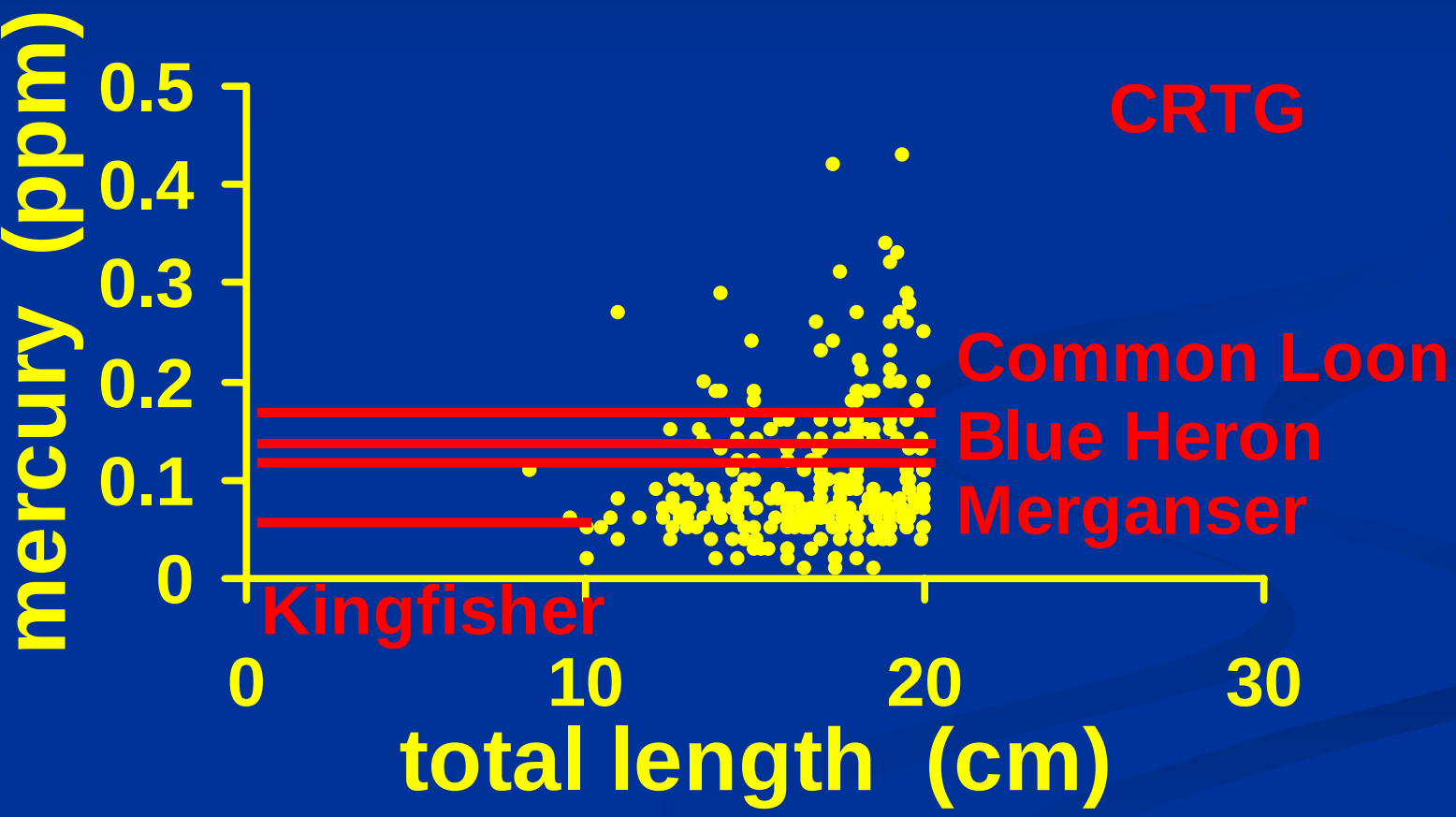




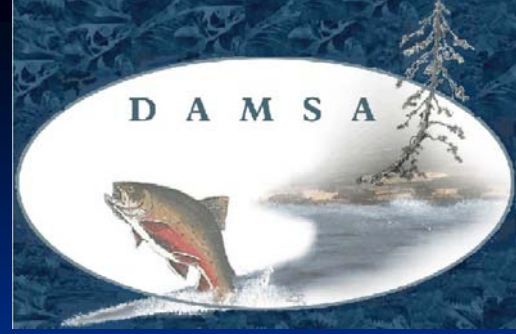
Ontario Brook Trout, OMOE/OMNR Sport Fish Monitoring Program

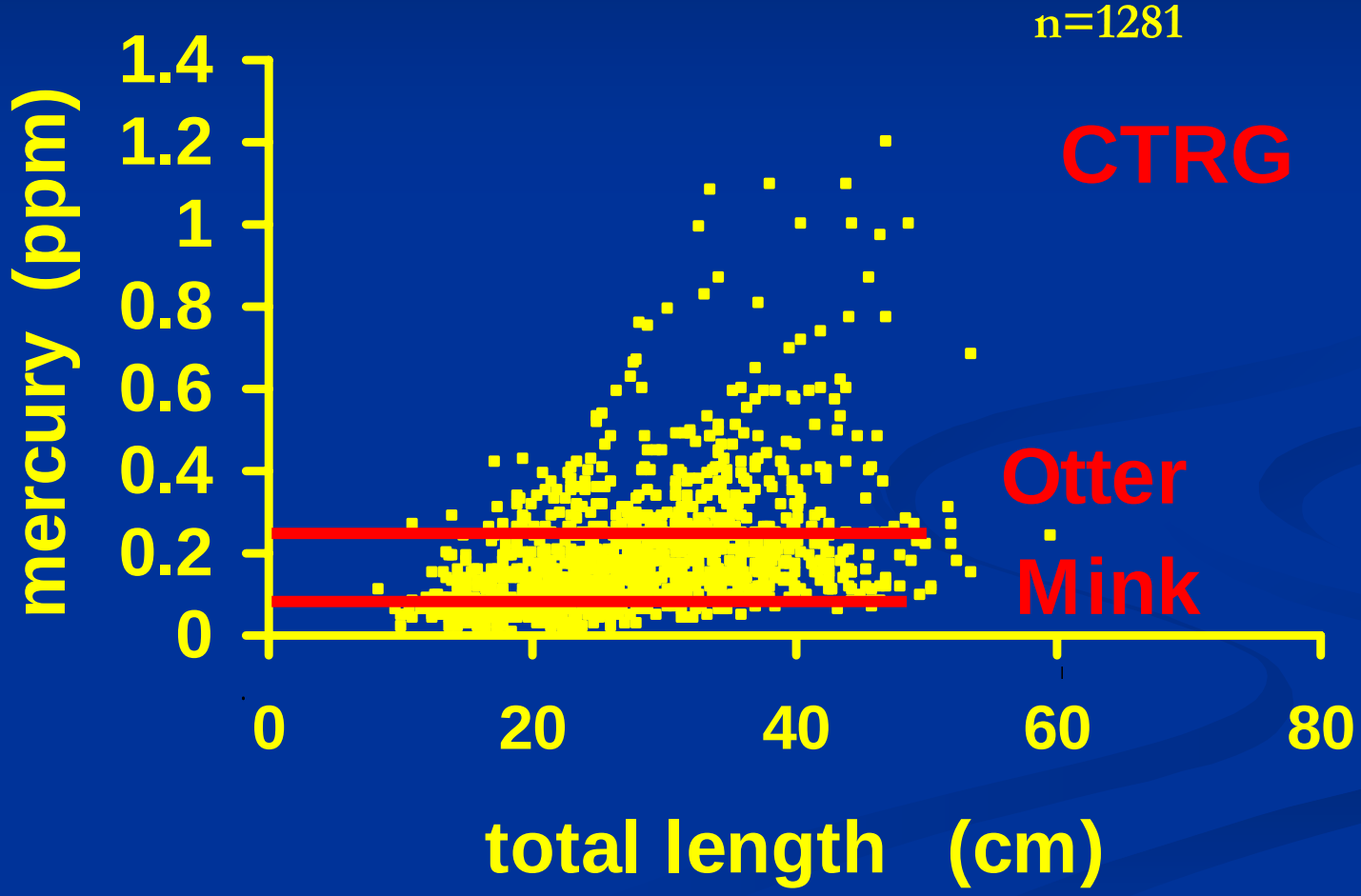
Comparison of Hg in Brook Trout (<20cm) with Canadian Tissue Residue Guideline for MeHg for Selected Birds





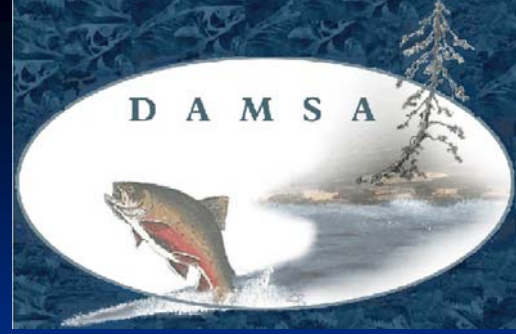
Comparison of Hg in Brook Trout with Canadian Tissue Residue Guideline for MeHg for Mink and Otter





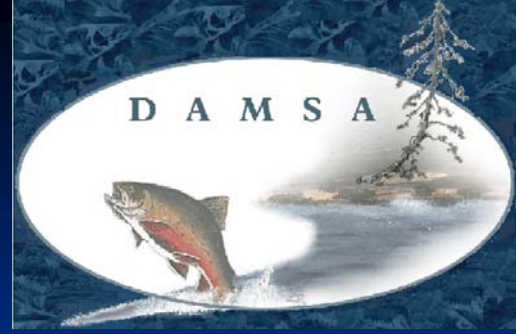
Ontario Brook Trout, OMOE/OMNR Sport Fish Monitoring Program

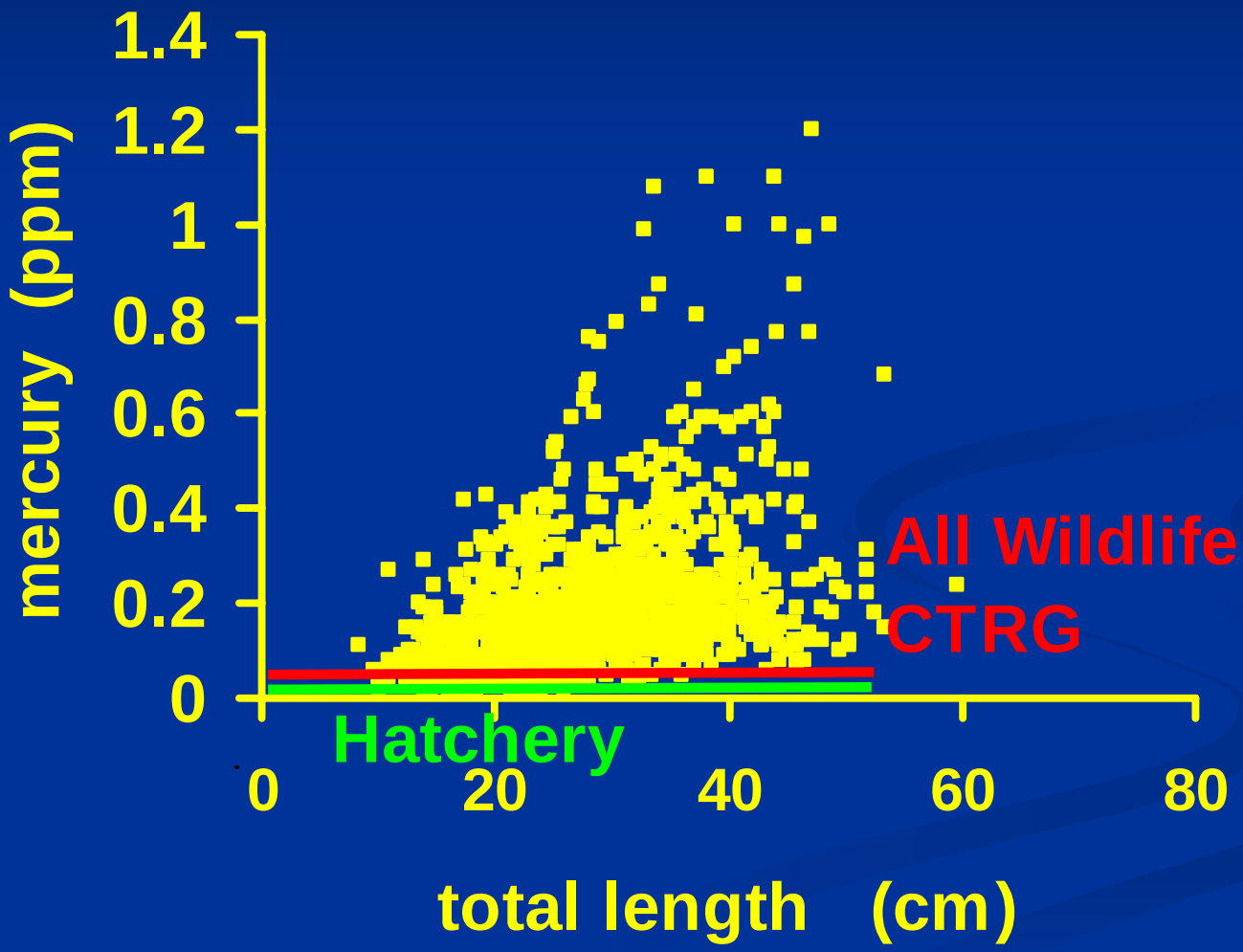
Why stocking programs create risk?

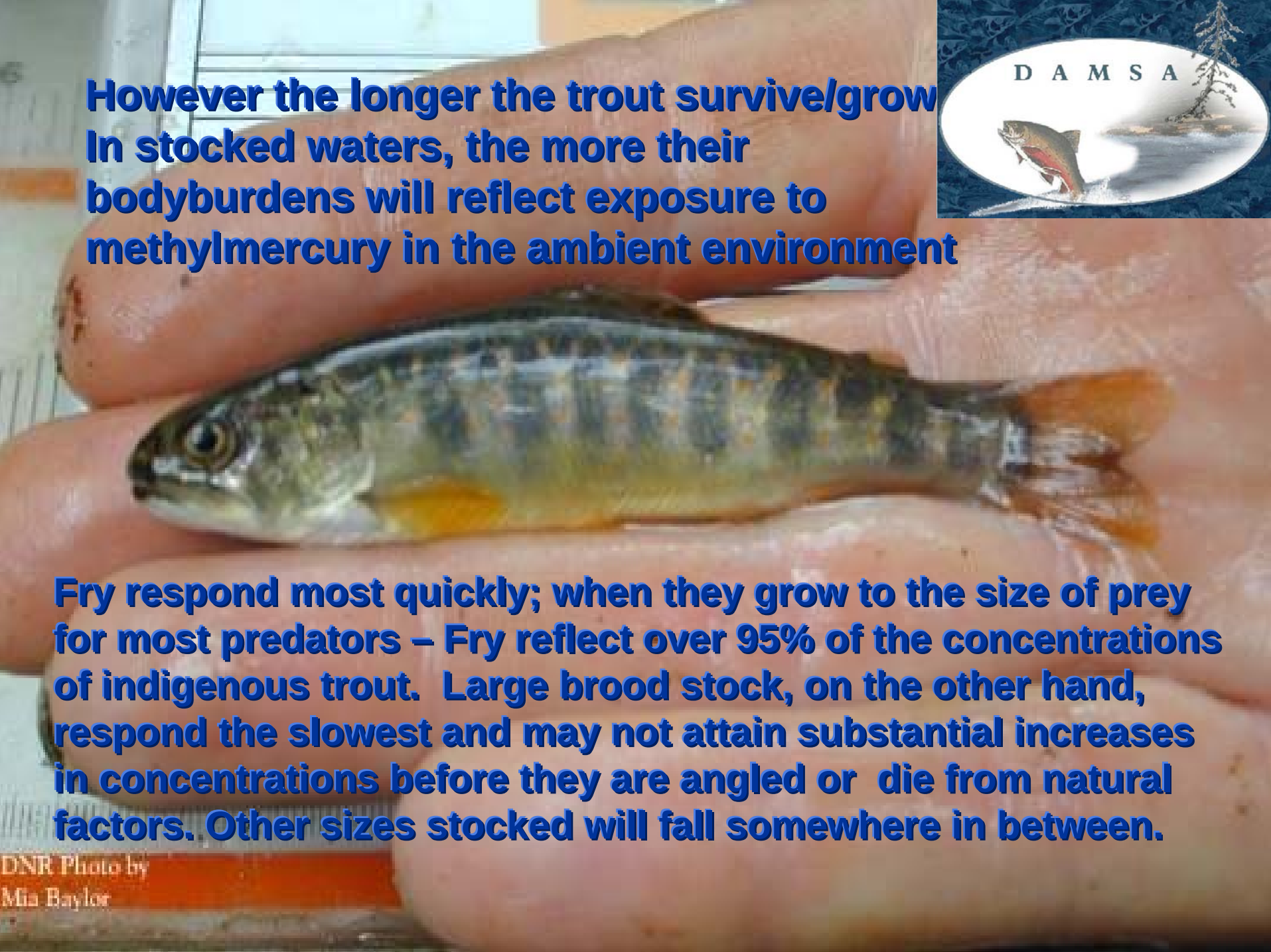


- Mercury levels in brook trout in Ontario are at levels that pose risk to wildlife.
- OMNR stocking programs – stock over 650 lakes annually in Ontario waters of various sizes (fry, fingerlings, yearlings, catchables and adult).
- Lake characteristics may be capable of producing high mercury levels in fish.

When stocked, most trout would create little or no risk as they have very low mercury concentrations.






However the longer the trout survive/grow In stocked waters, the more their bodyburdens will reflect exposure to methylmercury in the ambient environment
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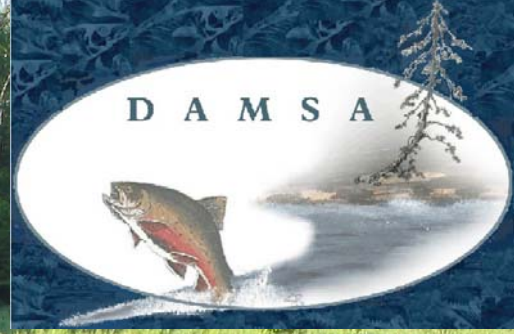
Fry respond most quickly; when they grow to the size of prey for most predators – Fry reflect over 95% of the concentrations of indigenous trout. Large brood stock, on the other hand, respond the slowest and may not attain substantial increases in concentrations before they are angled or die from natural factors. Other sizes stocked will fall somewhere in between.
DNR Photo by
Mia Baylor

Lakes with the potential for fish to accumulate higher mercury concentrations
have certain characteristics:



Low pH
High DOC
Low productivity
Trout as top predator

Brook trout are particularly comfortable in these environs and many stocked lakes in Ontario would typically have one or more of these characteristics


Trout are vulnerable to predation during spawning
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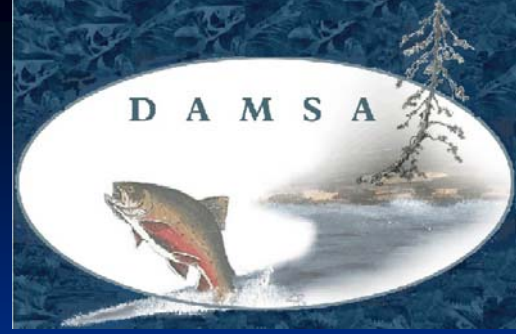
Stocked brook trout even more so

Summary

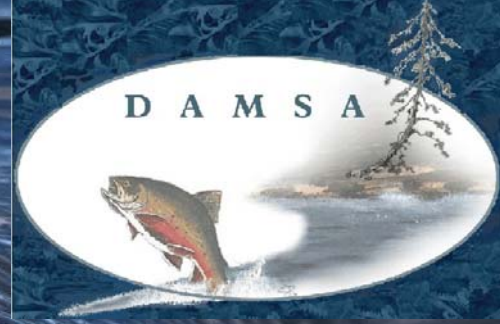


- Mercury concentrations in certain brook trout in Ontario pose risks of mercury poisoning to fish consuming wildlife according to *Canadian Tissue Residue Guidelines for the Protection of Consumers of Aquatic Life: Methylmercury*." By Environment Canada (2002).

- Weight of evidence clearly suggests that stocked trout can be *contributing* to those risks.

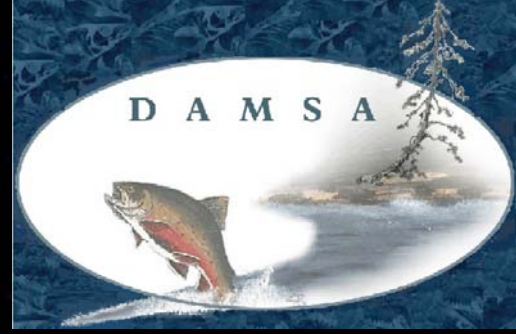
- Risks possibly even *increase* on a lake specific basis where trout stocking bioconcentrates mercury to harmful levels which previously did not exist in aquatic food webs.

Future Considerations… based on precautionary principle



- Assess stocked trout to identify/quantify risks of stocking to wildlife.
- Likely < 10% of stocked waters tested for mercury in brook trout, possibly only a few percent or less.
- Focus studies on highest potential risk areas including lakes with high mercury/methylmercury loadings, high dissolved organic carbon concentrations, low productivity, low pH.

Where high risks exist -

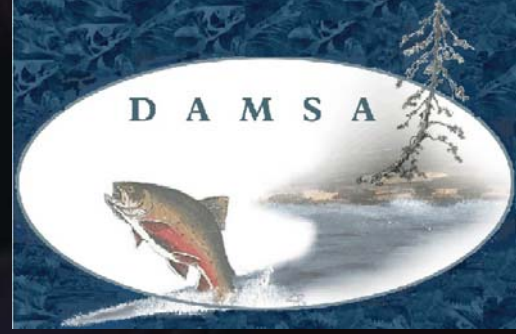


- Possible modifications to stocking size, numbers.

- Modifications to ecosystems to reduce mercury accumulation could include increasing productivity, raising pH, and/or other biogeochemical alterations that reduce the levels of methylmercury to which wildlife are ultimately exposed.

Paul Jordan

Possible inclusion of sterile trout



- Sterile trout vulnerability to predation at spawning times in stocked lake is reduced as they do not participate in spawning behaviour (Warrilow et al. 1997).

- According to bioenergetic modelling, sterile trout accumulate lower levels of mercury in comparison to sexually mature counterparts (Rodgers 1994).

- Warrilow et al. 1997. Can. J. Fish. Aquat. Sci. 54:1808-1812.
- Rodgers, D. 1994. Mercury Pollution: Integration and Synthesis, C.J. Watras and J.W. Huckabee eds. Ann Arbour Michigan p 427- 439.

Scott Smith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Comments or Questions?