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Equality Among All Fish

Executive Summary The habitats and their associated organisms are key to healthy populations of commercially-valuable aquatic species. If their habitat is not protected from destruction, obstruction, pollution or neglect in food supply, we can ensure successful Canadian fisheries operations for the long term. Amending the *Fisheries Act* from discriminating against species of little economic value and its current state of disregard for fish habitats to the original intention – protection for all fish and their homes – is the recommended course of action to avoid fisheries devastation and declining species populations.

Introduction Fish habitats are just as important as fish that are economically important. Habitats include everything that is necessary for optimal growth of the fish stock, such as but not limited to the health of the watershed that they spawn in, the quality of the waters that hosts their life cycle and plentiful food supply for the entire stock. Eroded or dammed watersheds alter fish populations and numbers. Contaminants in the waters that contain the fish would pose health risks to the population. Without adequate food supply, the growth of the population may be stunted, or cause the starvation of the majority of the fish that rely on the food source. To keep Canadian fisheries healthy and thriving for generations to come, the *Fisheries Act* must reflect proper protection of all fish species and their homes.

Research Results Changes in watersheds often have negative impacts on all fish that use it. Common problems with implementation of dams are that fish movement are obstructed, and their abundance above or below the dam may change in response to inaccessibility[1, 2]. Erosion of riverbeds caused by damming can hinder species' reproduction[3], such as irregular stream flow displacing fish fry and potentially causing mortality[4, 5]. These would be true for both species that are considered commercially valuable as well as species that are not protected by the Act.

[6]Pollution damages fish population health.

[1]Gehrke, P.C., Gilligan, D.M. and Barwick, M. (2002). Changes in fish communities of the shoalhaven river 20 years after construction of Tallowa dam, Australia. *River Research and Applications*, 18, 265-286.
[2]Katano, O., Nakamura, T., Abe, S., Yamamoto, S. and Baba, Y. (2006). Comparison of fish communities between above- and below-dam sections of small streams; barrier effect to diadromous fishes. *Journal of Fish Biology*, 68, 767-782.
[3]Shen, Y., & Diplas, P. (2010). Modeling unsteady flow characteristics of hydropeaking operations and their implications on fish habitat. *Journal of Hydraulic Engineering*, *136*(12), 1053-1066.
[4]Liebig, H., Cereghino, R., Lim, P., Belaud, A., and Lek, S. (1999). "Impact of hydropeaking on the abundance of juvenile brown trout in a Pyrenean stream." *Archiv Hydrobiol.*, 144, 439–454.
[5]Orth, D. J., Diplas, P., Dolloff, A., and Newcomb, T. (2004). "Influences of fluctuating releases on stream fishes in the smith river below philpott dam." *Final Rep*. (Contract No. 08220203). Federal Aid in Sport Fish Restoration Program, Federal Aid Grant *F-121-R-5*, Virginia Dept. of Game and Inland Fisheries, Richmond, Va.
[6]http://www.myessentia.com/blog/wp-content/uploads/2010/08/oilsands_a1.jpg

Water quality is to aquatic species as the atmosphere is to humans – it is essential for their vitality. Activities such as mining, fracking and extraction of fossil fuels can affect nearby bodies of water by releasing polycyclic aromatic hydrocarbons (PAHs) or other petroleum-related compound[7], nitrogen, sulfur, or heavy metals[8] into the water. These in turn are ingested by fish that are exposed to the toxins, and can damage their genetic components[9] or external tissues[10]. If these species happen to be commercially-viable species, then ingestion of these poisons may be inevitable by humans; if these species are not protected, their predators would risk ingesting the toxins in their next meal. None of these scenarios are ideal for the harvesting of aquatic species, especially as food choices.

Not protecting the food sources and supplies of aquatic can lead to starvation of fish populations. Often benthic species such as invertebrates, cephalopods, molluscs, crustaceans and small fish are deemed unimportant; in fact, these are the very organisms on which economically-important species such as trout or salmon feed on. Although benthic organisms do not seem to retain toxic compounds within their tissues, those who are eaten by a predator while having toxins in their digestive tracts may or may not pass the toxic compounds to the predator[11]. This effect is in need of more research, but the bottom line is that humans do not want to consume these same compounds that can still be lingering from the food chain succession.

Implications Damaging the habitat and food supply of fish, regardless of their status in the fisheries industry, will ultimately impact the operations and quantity of catch of fisheries. Neglect of aquatic species that seem insignificant to fisheries can result in a negative feedback in the ecosystem, and can lead to smaller harvest quantities or decline of desirable species and their populations.

Recommendations Amending the *Fisheries Act* from reading, “No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery,” back to the original text of, “No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat.” This will restore the protection that all fish were entitled to as the *Fisheries Act* had first intended for, without discrimination of species for their economic worth, and taking into account each individual species’ role in the functional ecosystem.

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[8]Rodrigues R. V., K. C. Miranda-Filho, E. P. Gusmão, C. B. Moreira, L. A. Romano & L. A. Sampaio. (2010). Deleterious effects of water-soluble fraction of petroleum, diesel and gasoline on marine pejerrey *Odontesthes argentinensis* larvae. *Science of the Total Environment*, 408, 2054-2059.
[9]Fenech, M., W. P. Chang, M. Kirsch-Volders, N. Holland, S. Bonassi & E. Zeiger. (2003). Human project: detailed description of the scoring criteria for the cytokinesis block micronucleus assay using isolated human lymphocyte cultures. *Mutation Research*, 534, 65-75.
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