American Fisheries Society

Organized 1870 to Promote the Conservation, Development and Wise Utilization of the Fisheries

5410 Grosvenor Lane, Suite 110 * Bethesda, Maryland 20814-2199

301-897-8616 * FAX 301-897-8096 * www.fisheries.org

Donna L. Parrish
President 2014-2015

Douglas J. Austen
Executive Director

Date: 21 August 2014
To: USEPA Region X
Subject: Pebble Mine Comments; Docket # EPA-R10-OW-2014-0505
From: Doug Austen

On Monday 4 August 2014, the tailings dam of Imperial Metals Corporation's Mount Polley copper-gold mine failed, sending 19 million cubic yards of mine waste downstream into a tributary of British Columbia's Fraser River (see: http://globalnews.ca/video/1491048/aerials-of-destruction-caused-by-mount-polley-mine-tailings-pond-breach-2). The spill turned a 1-m wide creek downstream into a 30-m wide torrent and washed out a road. Authorities imposed water-use bans 30 km downstream, but those bans will not protect spawning or rearing salmon because as little as 5 parts per billion of copper can impair a salmon's ability to smell, which is a key for their ability to find their way home to spawn and to evade predators.

Low copper concentrations can have far-reaching behavioral and pathological effects on fish, especially in low ionic strength waters. Dilute copper concentrations (5 µg/L) impair salmonid olfactory function (Giattina et al. 1982; Hansen et al. 1999a; b; Baldwin et al. 2003; Sandahl et al. 2006; Hecht et al. 2007; McIntyre et al. 2008), making them more susceptible to predation (McIntyre et al. 2012). In laboratory studies, Hansen et al. (1999c) found that Rainbow Trout *O. mykiss* and Brown Trout *Salmo trutta* actively avoided metal concentrations characteristic of those in the Clark Fork River, Montana. Similarly, Woodward et al. (1997) reported that Cutthroat Trout *O. clarki* avoided metal concentrations simulating those found in the Coeur d'Alene River Basin, Idaho. The migratory behavior of Atlantic Salmon *S. salar* was altered by releases from a New Brunswick copper-zinc mine (Elton 1974). DeCicco (1990) found that Dolly Varden *Salvelinus malma* migrations were altered by an Alaskan copper mine and Goldstein et al. (1999) observed altered Chinook Salmon migration associated with Idaho metal mines. Esselman et al. (in Chambers et al. 2012) and Hughes (2013) reported <15% intolerant fish in an assemblage, once catchment mine density exceeded one mine per 5 km.

Imperial Metals Corporation is a respectable Canadian mining firm, the mine and tailings dam were built to modern technical standards, and the breach occurred on a sunny summer day, not after an earthquake or a major storm event. The modern Mount Polley Mine tailings dam is the same type of tailings dam proposed for Pebble Mine, and it was designed and built by the same engineering firm that designed the Pebble Mine dams, Knight Piesold (see: http://dnr.alaska.gov/mlw/mining/largemine/pebble/water-right-apps/index.cfm).

However, the Pebble mine and dams are proposed to be over 100 times larger than Mount Polley and in a geologically and hydrologically less stable area.

The Mount Polley tailings dam failure underlines the high risk of mining in the headwaters of Earth's largest wild salmon fishery in Bristol Bay.

REFERENCES

Baldwin, D.H., J.F. Sandahl, J.S. Labenia and N.L. Scholz. 2003. Sublethal effects of copper on coho salmon: impacts on nonoverlapping receptor pathways in the peripheral olfactory nervous system. Environmental Toxicology and Chemistry 22: 2266-2274.

Chambers, D., R. Moran, L. Trasky, S. Bryce, L. Danielson, L. Fulkerson, J. Goin, R.M. Hughes, J. Konigsberg, R. Spies, G. Thomas, M. Trenholm, and T. Wigington. 2012. Bristol Bay's wild salmon ecosystems and the Pebble Mine: key considerations for a large-scale mine proposal. Wild Salmon Center and Trout Unlimited, Portland, Oregon.

DeCicco, A. L. 1990. Northwest Alaska Dolly Varden studies. Fishery Data Series 90-08. Alaska Department of Fish and Game, Fairbanks.

Elton, P.F. 1974. Impact of recent economic growth and industrial development on the ecology of northwest Miramichi Atlantic salmon (*Salmo salar*). Journal of the Fisheries Research Board of Canada 31:521-544.

Giattina, J.D., R.R. Garton, and D.G. Stevens. 1982. Avoidance of copper and nickel by rainbow trout as monitored by a computer-based data acquisition system. Transactions of the American Fisheries Society 111:491-504.

Goldstein, J. N., D. F. Woodward, and A. M. Farag. 1999. Movements of adult Chinook salmon during spawning migration in a metals-contaminated system, Coeur d'Alene River, Idaho. Transactions of the American Fisheries Society128:121–129.

Hansen, J.A., J.C.A. Marr, J. Lipton, D. Cacela, and H.L. Bergman. 1999a. Differences in neurobehavioral responses of Chinook salmon (*Oncorhynchus tshawytscha*) and rainbow trout (*Oncorhynchus mykiss)* exposed to copper and cobalt: behavioral avoidance. Environmental Toxicology and Chemistry 18:1972-1978.

Hansen, J.A., J.D Rose, R.A. Jenkins, K.G. Gerow, and H.L. Bergman. 1999b. Chinook salmon (*Oncorhynchus tshawytscha*) and rainbow trout (*Oncorhynchus mykiss)* exposed to copper: neurophysiological and histological effects on the olfactory system. Environmental Toxicology and Chemistry 18:1979-1991.

Hansen, J. A., D. F. Woodward, E. E. Little, A. J. DeLonay, and H. L. Bergman. 1999c. Behavioral avoidance: possible mechanism for explaining abundance and distribution of trout in a metals-impacted river. Environmental Toxicology and Chemistry 18: 313- 17.

Hecht, S.A., D.H. Baldwin, C.A. Mebane, T. Hawkes, S.J. Gross, and N.L. Scholz. 2007. An overview of sensory effects on juvenile salmonids exposed to dissolved copper: applying a benchmark concentration approach to evaluate sublethal neurobehavioral toxicity. NOAA Technical Memorandum NMFS-NWFSC-83. Seattle, Washington.

Hughes, R.M. 2013. A call for better mining regulations. Fisheries 38:391-391.

McIntyre, J.K., D.H. Baldwin, D.A. Beauchamp, and N.L. Scholz. 2012. Low-level copper exposures increase visibility and vulnerability of juvenile coho salmon to cutthroat trout predators. Ecological Applications 22:1460-1471.

McIntyre, J.K., D.H. Baldwin, J.P. Meador, and N.L. Scholz. 2008. Chemosensory deprivation in juvenile coho salmon exposed to dissolved copper under varying water chemistry conditions. Environmental Science and Technology 42:1352-1358.

Sandahl, J.F., G. Miyasaka, N. Koide, and H. Ueda. 2006. Olfactory inhibition and recovery in chum salmon (*Oncorhynchus keta*) following copper exposure. Canadian Journal of Fisheries and Aquatic Sciences 63:1840–1847.

Woodward, D. F., J. K. Goldstein, A. M. Farag, and W. G. Brunbaugh. 1997. Cutthroat trout avoidance of metals and conditions characteristic of a mining waste site: Coeur d'Alene River, Idaho. Transactions of the American Fisheries Society 126: 699-706.