

# Rachel's Environment & Health News

## #399 - Canaries In The Ocean

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Does pollution really matter? Just look at the oceans. In Puget Sound in the far northwest, the Pacific salmon and steelhead are gone; this year for the first time there will be no Pacific salmon fishing at all.

Near Gloucester and New Bedford, Massachusetts, the oldest U.S. fishing grounds, the three main commercial fish --cod, haddock, and flounder -- have all but disappeared. The fishing grounds are barren and the Atlantic fishermen have asked the federal government to treat them like earthquake disaster victims.[1]

In the Chesapeake Bay, where oysters were once abundant beyond imagining, they are now scarce and stunted by disease. Researchers at University of Maryland say the oysters' immune systems have been weakened by pollution; now disease and overfishing are wiping them out. [2] In the Gulf of Mexico, grouper and red snapper have always been bounteous, but no more.

Worldwide, 13 of 17 principal fishing zones are depleted or in steep decline. The causes? Pollution and overfishing, United Nations and U.S. government experts agree.[1]

If the fish are being harmed by contamination what about other marine species --the sea turtles, the walruses, the sea lions, and the seals?

Between 1986 and 1991, green sea turtles began appearing with massive tumors called fibropapillomas. Up to half of all turtles of this species now have these huge growths which can kill them by impeding their ability to swim and eat. The fibropapillomas have been linked to infection by a herpes-like virus.[3]

In 1987, seals in Siberia's Lake Baikal died in large numbers from a distemper virus --one later recognized as quite similar to the distemper microbe that kills dogs, foxes and wolves by damaging their respiratory, gastrointestinal, and nervous systems.

In 1988, white-sided dolphins experienced a mysterious, lethal epidemic in the waters off Lubec, Maine. That same year in the North and Baltic Seas, some 25,000 harbor seals --about 60 to 70% of all the seals living there --abruptly died. Subsequent investigation identified the source of the epidemic as the canine-like distemper virus.

In 1989, 274 bottlenosed dolphins were found dead along the shores of the Gulf of Mexico, many of them covered with a strange fungus. Between 1990 and 1992 more than 1000 Mediterranean striped dolphins died of an infection resembling canine distemper. Tests on the bodies of seals from the Gulf and from the Mediterranean revealed high levels of PCBs [polychlorinated biphenyls] in their tissues. PCBs are industrial chemicals spread throughout the planet by a single chemical company, and its licensees, between 1929 and 1976.

All these episodes involved populations of animals that carried high levels of organochlorine compounds in their tissues. Now scientists in the Netherlands have evidence that industrial pollution damages the immune systems of marine mammals.[4]

In a controlled experiment, Dutch virologist Albert D.M.E. Osterhaus of Erasmus University in Rotterdam fed two groups of harbor seals fish from different sources. One group of seals received relatively clean fish from the North Atlantic and the other group received fish from the industrially-polluted Baltic sea. The Baltic fish contained 10 times as much organochlorine pollution as the Atlantic fish. Osterhaus emphasizes that both kinds of fish were taken from catches destined for human consumption.

For 2 years, the researchers sampled blood from the seals every six to nine weeks and made various measurements of immune system function. Almost immediately after the experiment began, vitamin A levels dropped 20 to 40 percent in the blood of seals fed fish from

the Baltic and remained low throughout the 2-year experiment. Vitamin A is associated with disease resistance; lower vitamin A levels in the blood correspond to greater vulnerability to disease.

The Baltic-fed seals showed other changes in their blood. The concentration of granulocytes was consistently elevated 10 to 15 percent, compared to the Atlantic-fed seals. Granulocytes are white blood cells that fight bacterial infections. Osterhaus speculates that the Baltic-fed seals may have suffered from higher levels of chronic infection.

Seals fed Baltic fish showed another important change: the level of NK cells in the blood remained 20 to 50 percent below normal throughout the study. NK cells are "natural killer" cells that attack foreign bodies in the blood, thus providing important immune protection.

Other key components of the immune system were compromised in the Baltic-fed seals. In a healthy immune system, B cells produce antibodies and T cells orchestrate the immune response to foreign invaders. In the Baltic-fed seals, the T-cell response to a standard set of antigens dropped 25 to 60 percent, compared to the Atlantic-fed seals. After interviewing Osterhaus, Janet Raloff reported in SCIENCE NEWS that, "Additional, unpublished data suggest that the antibody responses of B cells also were impaired."

The Osterhaus experiments are not the final word on what's been killing seals for the last 10 years, but they are highly suggestive that pollution harms the immune system of marine mammals. Because they have large stores of blubber, because organochlorine compounds accumulate in fat, and because they eat high on the food chain, marine mammals tend to collect organochlorine compounds in their bodies. During periods of stress (such as illness or famine) these organochlorine compounds can move back into the blood stream and be distributed throughout the body.

Last December a group of wildlife specialists, representing diverse disciplines, met to discuss the global situation. In April they issued a joint statement that said, in part,[5]

"We are certain of the following:

"Declines in a number of species and many taxa (including plants) are in progress on the North American continent. Some of these declines are related to exposure to man-made chemicals. Such declines are not solely a U.S. or North American problem but are occurring on a global scale....

"Populations of many long-lived species are declining, some to the verge of extinction, without society's knowledge....

"Wildlife are exposed to compounds [industrial chemicals] that disrupt development of the reproductive, immune, nervous and endocrine systems and thereby can lead to population instability. The pollutants of greatest concern affect cellular and molecular processes that regulate developmental, endocrine, and immunological functions....

"Chemical releases on one continent may not only affect animals on that continent but animals on other continents and in other hemispheres. They are carried as particulates or gases in the air, surface waters, groundwater, and ocean currents across or between continents and by animals that travel long distances from the site of contamination. The contaminant, therefore, can enter the food web in places remote from the site of release....

"Contamination of apparently useful habitat is not always visible and may not cause overt lethality. Instead, contaminants may cause population-threatening changes in functionality. For example, populations may not be able to recover from infectious diseases because of: immunosuppression; the inability to obtain sufficient food or avoid predators; the loss of parenting instinct because of

neurotoxicological effects; or the result of abnormal sexual development of anatomy or behavior because of endocrine disruption....

"We estimate with confidence that:

"In many cases wildlife and humans have exceeded their capacity to compensate for exposure to chemicals....

"When an animal is exposed at the same time to many chemicals that individually are at non-toxic levels, additivity, antagonism, potentiation, and synergy [multiplier effects] can result in unpredictable consequences. Concomitant [simultaneous] exposure to multiple chemicals can cause massive or subtle, but potentially tragic, effects....

"Wildlife are reliable sentinels of effects of chemicals on human populations....

"We believe that:

"Traditional assessments of risks posed by single chemicals are not adequate for assessing the risks for embryos exposed to multiple chemicals....

"Until more people understand the insidious nature of developmental toxicants, little will change. More popular press articles and other media should broadcast the message about the effects of developmental toxicants using the wildlife/human connection...."

Miners used to keep canaries in cages in the coal mines, to warn of a buildup of toxic gases. When the canaries died, it served as a stark warning that conditions were deteriorating dangerously.

Today our canaries are in the ocean. Only fools will ignore them.

--Peter Montague

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[1] Timothy Egan, "U.S. Fishing Fleet Trawling Coastal Water Without Fish," NEW YORK TIMES March 7, 1994, pgs. A1, B7.

[2] Merrill Leffler, "Bay Oysters: Battered by Disease," MARINE NOTES [a University of Maryland Sea Grant Program publication] (September, 1992), pgs. 1-3.

[3] Janet Raloff, "Something's Fishy," SCIENCE NEWS Vol. 146 (July 2, 1994), pgs. 8-9.

[4] R.D.L. Swart and others, "Impairment of immune function in harbor seals (*Phoca vitulina*) feeding on fish from polluted waters," AMBIO Vol. 23 No. 2 (March 1994), pgs. 155-159.

[5] "Statement from the Work Session on Environmentally-Induced Alterations in Development: A Focus on Wildlife; Wingspread Conference Center, Racine, Wisconsin December 10-12, 1993." [A consensus statement from 23 scientists published April 20, 1994 by the World Wildlife Fund in Washington, D.C.; for a copy of the statement and an accompanying press release phone: (202) 778-9510 or (202) 778-9536.] And see: Peter J.H. Reijnders and Sophie M.J.M. Brasseur, "Xenobiotic Induced Hormonal and Associated Developmental Disorders in Marine Organisms and Related Effects in Humans: An Overview," in Theo Colborn and Coralie Clement, editors, CHEMICALLY-INDUCED ALTERATIONS IN SEXUAL AND FUNCTIONAL DEVELOPMENT: THE WILDLIFE/HUMAN CONNECTION [Advances in Modern Environmental Toxicology Vol. XXI] (Princeton, N.J.: Princeton Scientific Publishing Co., 1992), pgs.

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