

superfood: salmon



An Upstream Battle

Saving a nutritious fish from demise

BY MICHAEL A. MILLER

It was 1992 when “Lonesome Larry” had finally done it. After navigating thousands of miles of unknown territory of the Pacific Ocean, he completed his arduous journey home.

To his (probable) dismay, after snaking through convoluted rivers and climbing 65,000 feet across 900 miles, Larry discovered he was the only one who made it back to Redfish Lake, Idaho. Larry was a salmon—and he was the last of his kind.

Belonging to the Salmonidae family, salmon are categorized by the genus *Salmo*, the Atlantic swimmers, and *Oncorhynchus*—those that roam the Pacific. Both are anadromous, meaning they spend portions of their lives in each salt- and fresh-water environments.

Spawned in freshwater streams, rivers, and estuaries, adolescent salmon foray into the salty Atlantic or Pacific oceans, spending 1 to 5 years feeding and growing until they reach sexual maturity. In a fashion still unexplained by humankind, the fish mysteriously orient themselves with near perfect accuracy and charge upstream

toward their freshwater birthing grounds to breed. This complex lifecycle means the persistent fish rely on multiple ecosystems vulnerable to human impact.

A TRAGIC BACKSTORY

Tracked back to the early Miocene era and surviving the Pleistocene ice age, salmon have already been through a lot—but that was just the beginning. Many cultures have revered the pink fish over the millennia for its determination and prosperity. Salmon appears in Celtic, Irish, Welsh, and Norse mythology. Native American tribes, especially on the northwestern coast and Columbia River, depended heavily on salmon in their diet, and what they didn’t eat fresh was dried and saved as jerky.

The once bountiful fish was said to have proliferated early American waters in such dense numbers that one could cross streams atop their backs. Pacific salmon flourished in the waters of Alaska and the Pacific coast of North America from California to British Columbia. Their Atlantic brethren swam waters from Long Island all the way to Quebec and Newfoundland. Salmon have also been introduced to landlocked freshwater bodies like the Great Lakes.

However, things took a dive for salmon in the 19th century when European settlers’ demand for fish skyrocketed and salmon populations buckled. Soon, Atlantic salmon was all but extinct. According to the FDA, weirs in Maine caught 90 tons of Atlantic salmon in the late 1800s and just half that in the early 1900s. A mere 16 percent of rivers that historically supported Atlantic salmon still do, and the fish that remain are in critical condition. Pacific salmon didn’t fare much better, and now many species of both varieties are listed as endangered or threatened under the Endangered Species Act.

This was due, in part, to the erection of dams in salmon-harboring freshwater bodies. Fish on the way out were pulverized by man-made turbines, and fish on the way in were abruptly halted

by permanent blockades. Industrial pollution such as toxic runoff from Californian mines, agriculture, and deforestation also introduced debilitating changes to the salmon's fragile ecosystem. Commercial overfishing played a part in the salmon population's downfall as well. Canneries and fish traps started popping up in the late 1800s, further plummeting salmon's existence to dire levels.

FISHING FOR A HEALTHY HEART

Why is it important to keep healthy, wild salmon around? Not only are salmon of cultural importance, they are extremely nutritious. You are probably already aware of salmon's most famous nutrient—omega-3 essential fatty acids. Salmon contains a surprisingly high 2 grams of omega-3 per serving, comprised of both eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

Omega-3s are renowned for their heart-helping properties, so the next time you hear the term fatty fish, drop all notions of heart hindrance. Research lauds these unsaturated fats for decreasing the incidence of cardiovascular heart disease. A study in the *American Journal of Clinical Nutrition* showed that 4 grams per day of omega-3 fatty acids decreased triglycerides in the blood by 25 to 30 percent.

Hypertension, another risk factor of heart disease, may be reduced by omega-3s as well. The polyunsaturated fat is also thought to decrease risk of heart attack, stroke, and arrhythmia, and slow the growth rate of atherosclerotic plaque. Not stunned, yet? Just wait, there's more.

UPPING THE ANTIOXIDANT ANTE

Oxygen is a resource without which we would die in minutes—however, oxygen also has a dark side. It causes oxidative stress in the body, harming cell membranes and other cellular structures such as lipids, proteins, and even DNA. Luckily, a defense mechanism is available in the form of antioxidants, which prevent cell damage caused by free radicals—atoms formed by a reaction

between oxygen and other molecules (think rust). Oxidative stress is thought to lead to heart disease, cancer, infection, and other chronic conditions like dementia.

A study in the journal *Antioxidants & Redox Signaling* found that two servings of salmon per week increased antioxidant defenses in pregnant women.

Wild salmon get their pink color from astaxanthin, a powerful antioxidant in the marine algae they eat. This fat-soluble carotenoid is incorporated into the cell membrane, preserving its structure and preventing cell damage. It is shown by numerous studies to prevent lipid peroxidation and reduce oxidative stress biomarkers. According to some experts, astaxanthin is up to 6,000 times more potent than superstar antioxidant vitamin C and 500 times more potent than co-star vitamin E.

Salmon is one of the most proliferous sources of an antioxidant trace metal known as selenium. George Mateljan, award-winning author of *The World's Healthiest Foods*, writes that this mineral is required for the proper function of glutathione peroxidases, a group of enzymes responsible for protecting cells from oxidative stress. As an added bonus, selenium boosts the immune system. However, the results can be a mixed bag as some infectious agents are thwarted while others actually benefit from adding selenium to the diet.

BUILDING BRAIN POWER

You may never possess the salmon-like ability to locate your home from thousands of miles away without the help of your trusty GPS, but studies show that eating salmon may have a positive effect on cognitive function. A few nutrients that abound in salmon are responsible for this, including omega-3s and astaxanthin.

Omega-3s are multi-purpose healers, and they are back for more of the limelight. They are highly concentrated in the brain, and DHA in particular has been shown to be a crucial component to memory and cognitive function, especially in children and the elderly. A 2013 study found that 3- to 5-year-

olds who consumed omega-3 fats as infants excelled in school testing, scoring higher in vocabulary, rule-learning and inhibition tasks, and intelligence testing.

On the opposite end of the age spectrum, scientists believe DHA may protect against Alzheimer's disease and dementia. Oxidative stress, inflammation, and increased cholesterol levels have all been associated with the disease, which would suggest fatty fish consumption could have a positive effect on symptoms. Sure enough, in a 12-month study of Alzheimer's patients, participants who supplemented with omega-3 fatty acids experienced slower cognitive decline than the placebo group.

It is known that Alzheimer's and dementia sufferers have elevated levels of a particular free-radical called phospholipid hydroperoxide, which hangs out in red blood cells where it may be wreaking havoc. As discussed above, salmon is filled with antioxidants, and one in particular may help protect the brain.

Astaxanthin is able to pass through the blood-brain barrier and deliver its magnificent cellular protection to the cells upstairs. In a study from Tohoku University in Japan, astaxanthin supplementation was able to decrease phospholipid hydroperoxide levels in red blood cells (responsible for carrying oxygen to the brain and throughout the nervous system) by 40 to 50 percent.

FORTIFYING BONES AND JOINTS

A bevy of salmon's nutrients benefits your bone and joint health, including protein, amino acids, and vitamin D. Atlantic salmon contains about 20 grams of protein per 100-gram serving, and a host of amino acids. Several studies have found that protein molecules in salmon, called peptides, help balance collagen in bones, support joint cartilage, and control inflammation in the digestive tract.

Salmon is rich in vitamin D, a well-known nutrient that the body can synthesize from exposure to the sun. Vitamin D is not a solo purveyor of bone health, instead it works closely with calcium by promoting its absorption

in the right locations. If you're taking calcium supplements for bone health, you may want to consider including salmon in your diet. Recent research shows that calcium may be ineffective and even dangerous if taken without its absorption encouragers like vitamin D.

SWIMMING AWAY FROM INFLAMMATION

Salmon prefer to swim in cool water, and they'll help you cool off too—by dousing the fires of inflammation in your body. According to the National Institutes of Health, EPA and DHA fight acute inflammation, regenerate cell tissue, and normalize inflammatory markers like C-reactive protein. EPA also soothes inflammation by decreasing the production of cytokines and other pro-inflammatory compounds. Omega-3s are thought to dampen symptoms of rheumatoid arthritis and other inflammatory diseases. One study found that regular intake of Atlantic salmon for 8 weeks reduced symptoms of ulcerative colitis.

Yet again, omega-3 fatty acids try to steal the show, but other nutrients found in salmon also contribute to your health. Vitamin D and astaxanthin join EPA and DHA's anti-inflammatory regime, making salmon a potent solution to reducing unwanted redness, swelling, and pain. If only supplementing with omega-3s, you'd be missing out on these other formidable reinforcements to your health.

"SAVING" SALMON

It's hard to argue against the nutritional value of salmon, and attempts have been made to satiate our growing hunger for it—aquaculture being chief among them.

Aquaculture is the farming and harvesting of salmon under controlled conditions, and the practice began in the United States in the 1970s. Today, roughly two thirds of salmon eaten by Americans is farmed and 94 percent is imported, mainly from Chile and Norway. The Food and Agriculture Organization of the United Nations (FAO) anticipates increasing demand for the fish and suggests aquaculture is the

only way it can be met.

While the FAO may be set in its thinking, there are significant drawbacks to salmon farming. Farmed fish is not as nutritious as wild salmon, containing less protein and essential fatty acids. The astaxanthin they consume is synthetic, harming their antioxidant potential. Farmed salmon may even experience pain upon slaughter. Then there are environmental concerns to consider.

The FDA recognizes some potential consequences of salmon farming, such as infectious outbreak among enclosed spaces, environmental damage from waste, and unconsumed feed accumulating on the ocean floor. Additionally, a study published in the ICES Journal of Marine Sciences suggests salmon farming risks include proliferation of salmon lice and transfer of inferior genetic information to wild salmon populations.

That last point is particularly ominous because—despite the outcry of 1.8 million—the FDA recently approved production of genetically engineered (GE) AquAdvantage salmon. It's the first GE fish sanctioned by the FDA "as safe to eat as nongenetically engineered salmon, and also as nutritious." Dubbed "frankenfish," it grows much faster than natural salmon, thanks to DNA from Chinook salmon and an entirely different breed of fish—the ocean pout. Labeling is still not required for these products.

This, of course, comes with its own set of concerns. Aside from being a gateway GE animal that could pave the way for future mutations, GE salmon concerns include escape and potential harm to human health. If the fish does escape captivity—despite contingencies like induced infertility—there's no telling what harm could come to the marine ecosystem and wild populations of salmon. It comes as no surprise that grocery giants Costco and Trader Joe's are refusing to sell the product.

NO, REALLY, LET'S SAVE THEM

Not all hope is lost for our water-dwelling friends (and our hearts, brains, immune systems, and cells). Many efforts have rallied to the cause of these fretted fish. For example, the outlaw of

commercial fishing of Atlantic salmon offers them some reprieve; the \$320 million removal of the Elwha River dam restored the natural habitat for many fish; and the removal of the Columbian River dam cleared major blockage for salmon hoping to migrate farther than 3 miles up the conjoining White Salmon River.

Many resources are poured into the conservation of Lonesome Larry's descendants to keep Snake River sockeye from total annihilation. Organizations such as the Pure Salmon Campaign and the Center for Food Safety have sought to establish responsible farming practices and prevent the use of GE salmon, respectively.

Luckily, you don't have to be versed in demolition of marine obstructions to lend a helping hand to fish in need. It's easy to get involved with organizations such as Save Our Wild Salmon and the National Atmospheric and Oceanic Administration. Also, we can all play a small part by exercising shopping smarts to ensure we eat healthy fish and that there are healthy fish to eat. 🐟

→ **Purchase** from a store with a high reputation for selling seafood.

→ Get to know a **fishmonger** (person who sells fish) for peace of mind and to buy with confidence.

→ Because of sustainability and contamination issues, **buy wild-caught Alaskan salmon** when available.

→ Buy **troll-caught salmon**, which are caught with hook and bait rather than a large net that could snag by-catch (unintended capture of other species) in the process.

→ Look for the **Marine Stewardship Council's "certified sustainable seafood"** ecolabel on product packaging, indicating that it was caught responsibly by a certified sustainable fishery.