Fighting salmon fly dark flag to surrender

When young Atlantic salmon squabble over a patch of river, the one that's getting the worst of the tussle says "uncle" by darkening its skin and eye ring.

The winner then eases off, report Kirstine I. O'Connor and her colleagues at the University of Glasgow in Scotland. They present this rare decoding of a fish signal, based on an analysis of 40 fish contests, in the December Animal Behaviour.

The vast majority of earlier research on color signals in fish focused on "flamboyant" cichlids, says coauthor Neil B. Metcalfe. These fish flash bright colors and can make dramatic changes, like suddenly developing a dark spot. For color-change signaling in the majority of other fish, "there's very little known," Metcalfe says. "I would imagine that it happens, but we just haven't spotted it yet."

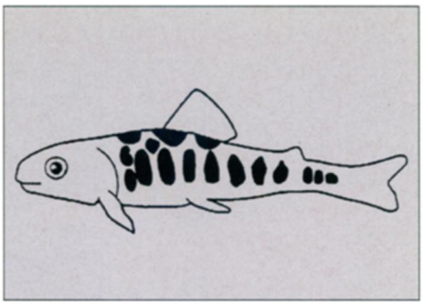
The salmon pale and flush with far more subtlety than a cichlid. The brown-and-gray young bear dark ovals on their backs and 7 to 12 patches on their sides. Earlier descriptions of salmon noted that these patches can darken in minutes in subordinate fish. Also, tissue around the eye develops a dark stripe, which can eventually expand into a black ring.

At fish farms, checking for unusual numbers of fish bearing the dark markings might give workers an early warning of extra aggression in certain tanks, Metcalfe speculates.

To test links between aggression and color change, the researchers paired young salmon of equal weight in laboratory tanks and nudged one into the other's half of the space. The scenario mimicked spats in the wild when juvenile salmon defend their feeding territories along a river against would-be usurpers.

As researchers watched, a fish darkened its body patches and eye rings in 22 of the 40 confrontations. "It doesn't always happen," Metcalfe explains. In many of the cases with no darkening, "the fish didn't really compete," he says.

The more aggressively the dominant fish attacked, the darker the submissive fish was likely to become, say the researchers.



Adapted from Animal Behaviour

A young salmon that's had enough of a fight can change color submissively, darkening its body splotches and eye ring.

In none of the cases, even among the liveliest encounters, did researchers have to intervene to keep fish from harming each other.

That's part of the beauty of signaling during a fight, comments salmon biologist John E. Thorpe of Pitlochry, Scotland. A color change lets fish work out their differences without physical injury. The loser may slink away for the time being, but it will get other chances to take over territories as the dominant fish grow big enough to head out to sea.

Atlantic salmon typically leave for the open waters when they reach about 20 grams in weight, after spending 1 to 3 years in freshwater streams. The abundance of open-ocean prey, particularly in zones where chill polar water clashes with warm southern currents, then fatten the fish in 1 to 4 years. When they head back to their natal rivers to breed and bury their eggs in gravel, the adults are roughly 100 times the weight they were when they left.

The Atlantic salmon population "at many places isn't in too healthy a state," Thorpe frets. The past decade has seen declines across a broad range of the salmon that breed on the eastern side of the Atlantic.

"We don't quite know why," Thorpe says. A concern he finds particularly worrying is that large-scale changes in the ocean may be diminishing the salmon's food supply.

On the other side of the Atlantic, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service reported in October that unless conservation efforts increase, the wild Atlantic salmon that breed in Maine's rivers face extinction. Development along rivers, pollution (SN: 5/8/99, p. 293), diseases, and competition and interbreeding with escaped farm-raised fish are taking their toll. The decline shows up as both a smaller number of adults returning to their rivers of origin and fewer young salmon surviving.

In November, the two services proposed listing Maine's Atlantic salmon as an endangered species. The comment period for the proposal ends in February, and a decision could come next year. —*S. Milius*

Better butter? This one may fight cancer

Butter could become something of a health food, a new study suggests.

In recent years, nutritionists have been haranguing adults to cut their intake of red meats and dairy products because of the artery-clogging fats these foods bring to the dinner table. Lost in this campaign has been an emerging wealth of data on the benefits of an unusual animal fat—conjugated linoleic acid (CLA)—in the meat and milk of ruminants.

Identified first in hamburgers (SN: 1/9/88, p. 24) and later in dairy products (SN: 2/11/89, p. 87), some types of CLA are potent anticancer agents, at least in animals (SN: 2/15/92, p. 104). Another type, in mice, seems to melt away fat, researchers have just learned.

Amounts of CLA in the people's diets typically fall well below those that have proved beneficial in animal studies. So, Dale E. Bauman and his colleagues at Cornell University have worked out a way to naturally augment CLA in milk.

They supplement a cow's diet with sunflower oil. CLA then accounts for some 4.5 percent of the fat in butter made from this milk—eight times the normal amount.

Clement Ip of the Roswell Park Cancer Institute in Buffalo, N.Y., and his colleagues incorporated fat from this Cornell butter into the diets of young rats. They fed other rats a diet augmented with the same amount of butterfat but containing the usual proportion of CLA.

One month later, the scientists injected the animals with a chemical carcinogen. Cancer developed in 93 percent of the rats on the normal diet but in only half of those given the CLA-enriched diet. The researchers report their results in the December Journal of Nutrition. The finding "demonstrates for the first time that the natural CLA in foods is biologically active" and that its levels can be naturally enhanced, concludes Bauman.

Ip has found that a high-CLA diet in rats reduces the number of terminal end buds, the structures in which mammary tumors form. CLA seems to target rapidly dividing cells and "increases programmed cell death," he says, stopping would-be cancers in their tracks.

This research, while "important and well done," focuses on only the predominant CLA, observes Michael W. Pariza, a nutritional biochemist at the University of Wisconsin-Madison. He notes that the fat comes in several forms, or isomers, possessing differing benefits.

Depending on the type of bonds linking its string of 18 carbon atoms, CLA can assume different shapes and functions. In the butter, Bauman's team increased the most abundant isomer, known as *cis*-9, *trans*-11, which is the form most strongly linked to anticancer benefits.

Pariza's group recently showed that in mice, another CLA—*trans*-10, *cis*-12—"reduces body fat and enhances lean body mass." He says, "This CLA makes big fat cells get little and stay that way."

On Dec. 1, Tilak R. Dhiman's team at Utah State University in Logan filed a patent for a new ruminant feeding regimen to increase 10-fold the concentration in meat of this slimming CLA. "We can't yet do that for the milk," he told Science News, "but we're working on it." —*J. Raloff*