

Sense of smell in salmon and dogs

A participant in my Life and Times of salmon course asked how the sensitivity of smell in a salmon compared with sense of smell in a dog. I said I would find out an answer and post on the Elder College course information site where the slides from my lectures were posted.

It turned out to be a more difficult question to answer than I thought.

Putting the question to Dr. Google returned an answer – the salmon's sense of smell was 1000 times more sensitive than a dogs. But these categorical statements did not come with any scientific sources for the statement. Putting the question to the scientific literature came back with titles of papers that did not in any way directly answer the question. Here are some bits of information related to the question.

The first important piece of information is it depends. It depends on the specific chemical or odorant being considered. Dogs and fish respond differently to different chemicals so dogs might detect some with their noses better than fish and vice versa.

The number olfactory neurons in the nose of a chum salmon is around 14 million whereas it is 200 million in the nose of a Beagle. This suggests that the Beagle might have a more sensitive nose than a fish. Beagles also have more specific olfactory receptor neuron types that salmon, which also suggests greater sensitivity. However, it has been shown that odour receptor neurons seldom work individually but that respond in various groupings to different odours so that with millions of receptor neurons both dogs and fish can theoretically have almost an infinite number of neuronal groupings for detection of different substances.

Electrophysiological measurement of the response of the nasal receptors of fish and dogs to different odorants show that both fish and dogs can detect some odorants at concentrations of 1 part in a billion. But measured in this way, both dogs and fish are shown to have widely different sensitivity to different odorants and that drawing any conclusion about relative sensitivity is completely dependent on which odorants your are concerned with.

So maybe the only conclusion is that both dogs and fish have extremely sensitive noses (compared with a human).