

Changed prevalence, not absence explains Antarctic toothfish status in McMurdo Sound

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Antarctic toothfish have been studied in McMurdo Sound, in the southern Ross Sea, Antarctica, for the past 50 years. Among many other findings, studies have shown that smaller (<100cm) toothfish lack the fat to attain buoyancy and thus remain on the ocean floor. Adding fat as they grow, they can eventually rise above the bottom to feed primarily on Antarctic silverfish.

There is ongoing debate over the potential ecosystem effects of the toothfish fishery in the Ross Sea. We previously reported a dramatic decline in the numbers, size, and condition of toothfish caught during a 39-year scientific fishing effort.

Subsequently, other authors have questioned the relevance of those findings because they were derived from a single location, and a more recent single-year effort was able to capture toothfish in the vicinity, but at deeper depths than the long-term study.

Additionally, it has been hypothesized that mega-

icebergs in the area from 2001-2005 altered the ecosystem in ways that were not favorable to toothfish, thus accounting for the decreases in fishing success.

We responded to these ideas in a 2016 article published in the journal *Antarctic Science*. Our response, based on thorough review of all available data, is to suggest that numbers of large (buoyant) toothfish became markedly reduced where bottom depths are <500 m, depths that had been previously targeted by the toothfish fishery (focused on the largest fish), as well as the depth which is regularly attainable by Weddell seals and Ross Sea killer whales – two major toothfish predators. We propose that the combination of these factors has resulted in the remaining toothfish now being found at greater depths in McMurdo Sound.

We also counter arguments that toothfish vanished during and following the presence of the icebergs. Available analyses reveal that toothfish movement into the Sound would not have been significantly affected, and

additionally that neither iceberg-related changes in ocean currents nor in primary productivity in McMurdo Sound would have been sufficient to impact toothfish presence.

Main Points

- Large Antarctic toothfish have disappeared from shallower depth ranges in the southern Ross Sea, but can still be found at depths >500m.
- We hypothesize that this is due to a combination of fishing by humans, killer whales, and Weddell seals.
- We find no evidence supporting a hypothesis that large icebergs decreased toothfish numbers.

Ainley, D.G., G. Ballard, J.T. Eastman, C.W. Evans, N. Nur, & C.L. Parkinson. 2016. Changed prevalence, not absence explains Antarctic toothfish status in McMurdo Sound. *Antarctic Science*. doi:10.1017/S0954102016000584