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TITLE: Effects of experimental otter trawling on benthic assemblages on Western Bank, northwest Atlantic Ocean

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ABSTRACT:

The effects of otter trawling on a hard-bottom ecosystem on Western Bank on Canada's Scotian Shelf were examined experimentally from 1997 to 1999 with an asymmetrical BACI design. The site was located within an area that had been closed to fishing since 1987 to protect juvenile haddock. An experimental line was trawled 12?14 times on three separate occasions over a 20 month period. The benthic macrofauna and megafauna were sampled before and after trawling on both impact and control lines with both a grab and a photographic system. The 100 grab samples collected contained 341 taxa, primarily polychaetes, amphipods and molluscs, the majority (60%) of which were epifaunal. Biomass was dominated by the horse-mussel Modiolus modiolus, a long-lived bivalve, while the tube-building amphipod Ericthonius fasciatus was the most abundant species. Through the study period the benthos on the control lines showed little qualitative or quantitative change in individual taxa or community metrics. However, the abundance of 24 individual taxa (polychaetes, amphipods, echinoderms and molluscs) changed significantly, with the majority of these increasing. This resulted in a significantly different relative abundance of taxa between years as detected through ANOSIM. A significant change in relative biomass amongst the taxa was also observed. Trawling had few detectable immediate effects on the abundance or biomass of individual taxa and none on community composition. A few taxa, primarily a mixture of polychaetes and amphipods, decreased significantly after trawling and data from fish stomachs collected during the experiment (Kenchington, E.L., Gordon Jr., D.C., Bourbonnais-Boyce, C., MacIsaac, K.G., Gilkinson, K.D., McKeown, D.L., Vass, W.P., 2005. Effects of experimental otter trawling on the feeding of demersal fish on Western Bank, Nova Scotia. Amer. Fish. Soc. Symp. 41, 391?409) showed that some of these were scavenged by demersal fish. Fifteen taxa showed significant decreases after trawling when the cumulative effects of trawling were considered. As in the analyses of individual years the species affected were primarily high turn-over species such as polychaetes and amphipods. Dominance curves prepared for both control and impact samples before trawling in 1997 and after trawling in 1999 showed a marked decrease in the biomass values of the highest ranking taxa, particularly of the first species, M. modiolus, only on the impact line at the conclusion of the experiment. The proportion of epifaunal biomass also declined significantly from 90% to 77% on the impact line by the conclusion of the experiment. These changes are in part due to trawl-induced damage and subsequent predation by demersal fish of the top ranking species. Analysis of the photographic images showed that the three top-ranking species in terms of biomass, M. modiolus, the tube-building polychaete Thelepus cincinnatus, and the brachiopod Terebratulina septentrionalis, were visibly damaged more than other species by the trawl gear. Two of these species, M. modiolus and T. cincinnatus, were preyed upon by scavenging demersal fish. The use of multiple sampling devices at the experimental site (grab, photographic system reported here and trawl and fish stomachs reported by Kenchington, E.L., Gordon Jr., D.C., Bourbonnais-Boyce, C., MacIsaac, K.G., Gilkinson, K.D., McKeown, D.L., Vass, W.P., 2005. Effects of experimental otter trawling on the feeding of demersal fish on Western Bank, Nova Scotia. Amer. Fish. Soc. Symp. 41, 391?409) enabled us to link trawl-induced changes to the benthos to predation by demersal fish.

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