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Diet of Norwegian coastal cod (*Gadus morhua*) studied by using citizen science

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Abstract

The Norwegian coastal cod (*Gadus morhua*) is a keystone species in the food web of northern Norwegian fjords. Their relatively stationary populations might specifically depend on local food resources, but the diet of cod has rarely been studied in fjord systems. Using a citizen science approach, where recreational anglers and tourists participated in the sampling, we studied small-scale differences in the diet composition of cod in a fjord system in northern Norway. We compared the cod diet from the MPA Saltstraumen, characterised by strong tidal currents and a highly diverse and abundant fauna, with the inner fjord area of Skjerstadfjord. The diet composition of cod significantly differed between both areas within the fjord. Although fish was the dominant prey in both areas, cod consumed more than 40% invertebrates in terms of weight, even in the cod size class of 70-99 cm. The invertebrate prey also caused the observed spatial differences. In Saltstraumen, brittle stars (Ophiuroidea), crabs (Brachyura) and sea cucumbers (Holothuroidea) were important food sources for cod, while sea urchins (Echinoidea), clams (Bivalvia), shrimps (Caridea) and krill (Euphausiacea) dominated the diet in the inner Skjerstadfjord. The high densities of sessile fauna in the dynamic environment of Saltstraumen, was only partly reflected in the diet of cod, with only Holothuroidea found in 17% of the stomachs. High rates of empty stomachs (24%), cannibalism as well as a higher proportion of low-energy prey in the diet of large cod, may indicate a shortage of high quality food in Skjerstadfjord. The samples for this study were collected through a citizen science campaign. This approach might provide opportunities to be used for coastal ecological monitoring with potential applications in local ecosystem management strategies through public involvement.

Keywords: food webs, sub-arctic fjords, benthos, stomach content, ecosystem management