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TITLE: Baleen whale ecology in arctic and subarctic seas in an era of rapid habitat alteration

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ABSTRACT:

Biophysical changes in marine ecosystems of the Arctic and subarctic sectors of the Atlantic and Pacific are now evident, driven primarily by sea ice loss, ocean warming and increases in primary productivity. As upper trophic species, baleen whales can serve as sentinels of ecosystem reorganization in response to these biophysical alterations, via changes in their ecology and physiological condition. This paper is the first to review baleen whale ecology in high-latitude marine ecosystems of both the north Atlantic and north Pacific. Oceanographically, these sectors offer four contrasting habitats to baleen whales: (i) a broad-deep-strait and deep-shelf inflow system in the Northeast Atlantic (NEA), (ii) a combination of inflow and outflow systems north of Iceland in the central North Atlantic (CNA), (iii) an outflow shelf and basin in the Northwest Atlantic (NWA), and (iv) a narrow-shallow-strait inflow shelf system in the Pacific sector. Information on baleen whale ecology from visual and passive acoustic surveys, combined with available telemetry and diet studies, show contrasting patterns of baleen whale occurrence among sectors. In brief, arctic and subarctic waters in the Atlantic sector support a far greater number of seasonally-migrant baleen whales than the Pacific sector. Thousands of humpback, fin and common minke whales occupy the diverse habitats of the Atlantic sector. These species all exhibit flexible diets, focused primarily on euphausiids (krill) and forage fishes (e.g., capelin, herring, sand lance), which are now responding to ecosystems altered by climate change. Conversely, the Pacific sector supports a far greater number of arctic-endemic bowhead whales than the Atlantic sector, as well as a large population of seasonally-migrant gray whales. Currently, differences in migratory timing and, to a lesser extent, foraging behaviors, serves to restrict prey competition between the arctic-endemic bowhead whale and seasonally migrant baleen whale species in both sectors. Regional aspects of changes in prey type and availability will likely impact future migratory timing, habitat selection, body condition and diet of baleen whales. Tracking variability in these attributes can provide valuable input to ecosystem models and thereby contribute the sentinel capability of baleen whales to forecasts of future states of high latitude marine ecosystems.

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