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Ecosystem structure and services in eelgrass *Zostera marina* and rockweed *Ascophyllum nodosum* habitats

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ABSTRACT: Marine vegetated habitats provide essential functions and services to ocean ecosystems and human well-being. It is unclear, however, how different habitat types compare. Using large-scale field surveys, we compared the canopy and community structure between eelgrass and rockweed beds in Atlantic Canada and assessed their nitrogen retention, carbon storage, and habitat services. We then used binary network models of predator–prey interactions to determine food-web structure and its robustness to species loss. Despite disparate 3-dimensional canopy structure, both habitats significantly enhanced overall abundance and diversity of associated flora and fauna, including several commercially important species. Significant differences occurred in the species assemblages within and between habitats and were attributed to different settlement opportunities, food availability, predation risk, and maneuverability. While eelgrass plants had higher nitrogen content, rockweed canopies maintained 8-fold greater biomass and, thus, 14-fold greater nitrogen and 8-fold greater carbon retention per unit area. Both rockweed and eelgrass food webs showed similarities to other temperate and tropical seagrass webs, yet their robustness to the loss of most connected species including primary producers was among the lowest; underscoring their vulnerability to disturbances affecting the functionally dominant primary producers. The present study demonstrates that marine vegetation provides important habitat, nitrogen, and carbon storage services, yet the extent of these services depends on the foundation species and its architecture. Changes in canopy structure will therefore have profound effects on associated food webs and ecosystem services. Thus, as increasing human pressures on coastal ecosystems threaten the continued supply of essential functions and services, the protection of marine vegetated habitats should be a management priority.

KEY WORDS: Canopy structure · Nitrogen retention · Carbon storage · Juvenile habitat · Diversity · Food-web structure · Species extinction · Human impacts

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Supplementary material

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