**Application of satellite derived size-fractionated primary production estimates to improve models of fisheries production potential in the Northeast US Continental Shelf Large Marine Ecosystem**

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Advancements in satellite derived phytoplankton size class and primary production models, in addition to updated trophic transfer efficiency models, allow for key improvements to fisheries production potential estimates. In our simplified food web approach, two pathways are recognized for the transfer of primary production to higher trophic levels; direct grazing by mesozooplankton, principally on diatoms (microplankton); and transfer of nano-picoplankton production through the microbial food web. Here we use satellite remote sensing models of phytoplankton size classes and an empirical relationship derived from *in situ* measurements to estimate size-fractionated primary production in multiple regions of the Northeast US Continental Shelf (NES), including the Gulf of Maine, Georges Bank and Mid-Atlantic Bight. The fractions of microplankton and nano-picoplankton production are then traced through a simplified food web to determine the production potential at multiple trophic levels. Total primary production in the NES ranges from 200-300 gC m-2 yr-1 and total production of the ecosystem is ~1700x106 metric tonnes. While the fraction of nano-picoplankton production in the NES is often greater than 75%, inefficiencies in the transfer of carbon through the microbial food web results in less than 5% of this production being available at harvestable trophic levels. Accordingly, the primary production derived from microplankton, 20-30%, ultimately controls fish production and sets constraints on the amount of production available to be extracted from the ecosystem at sustainable levels.

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