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TITLE: Calcification morphotypes of the coccolithophorid Emiliania huxleyi in the Southern Ocean: changes in 2001 to 2006 compared to historical data

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ABSTRACT:

We conducted a scanning electron microscopic survey of morphological variations in the calcareous nanoplankton species Emiliania huxleyi in Southern Ocean surface water samples collected along a transect from 43 to 64°S and 141 to 145°E during November 2001, October to February 2002/2003, 2003/2004, 2004/2005 and 2005/2006.The results were compared with historical data from a similar transect occupied in December to January 1983/1984 and January to February 1994 and 1995.While E. huxleyi was absent or extremely sparse (0.1 to 1 cells ml -1 ) south of 60°S in 1983/1984 and 1994/1995, this species was consistently present at about 100 cells ml -1 between 60 and 65°S during 2002 to 2006.The extended geographic range and/or increased southward abundance of this keystone species suggests a significant shift in Southern Ocean ecology over the past 2 decades, analogous to an observed recent range extension into the Bering Sea.Morphotype A 'overcalcified' mainly occurred north of the Subantarctic Front and was replaced by the weakly calcified Morphotype B/C between the Subantarctic Front and Southern Antarctic Circumpolar Current Front.This north-south shift in E. huxleyi calcification morphotypes closely tracked the north-south decline in the calcite saturation state as calculated from carbonate system measurements.Based on current evidence, no significant changes are apparent in the calcification status of E. huxleyi in the Southern Ocean during the past 12 yr.All cultured isolates from north of the Polar Front belonged to Morphotype A, while all strains isolated south of the Polar Front belonged to Morphotype B/C and their morphologies appeared conservative in culture.The north-south trend of decreased calcification of E. huxleyi in the Southern Ocean thus reflects the shift in dominance of one ecotype to another, rather than the environmental effect of decreased carbonatre ion concentrations and calcite saturation state on a single, 'apparently cosmopolitan', population.

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