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TITLE: Expansion of oxygen minimum zones may reduce available habitat for tropical pelagic fishes

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ABSTRACT:

One of the impacts of ocean warming is a decrease in dissolved oxygen, with implications for valuable pelagic fish species. A study shows that the oxygenated upper ocean layer in the tropical northeast Atlantic thinned at a rate of around one metre per year between 1960 and 2010, and, by tracking individually tagged fish, demonstrates that this contraction in the oxygenated layer limited the movement of blue marlin. Climate model predictions<sup>1,2</sup> and observations<sup>3,4</sup> reveal regional declines in oceanic dissolved oxygen, which are probably influenced by global warming<sup>5</sup>. Studies indicate ongoing dissolved oxygen depletion and vertical expansion of the oxygen minimum zone (OMZ) in the tropical northeast Atlantic Ocean<sup>6,7</sup>. OMZ shoaling may restrict the usable habitat of billfishes and tunas to a narrow surface layer<sup>8,9</sup>. We report a decrease in the upper ocean layer exceeding 3.5 ml l<sup>-1</sup> dissolved oxygen at a rate of 1 m yr<sup>-1</sup> in the tropical northeast Atlantic (0°25° N, 12°30° W), amounting to an annual habitat loss of 5.95×10<sup>13</sup> m<sup>3</sup>, or 15% for the period 1960–2010. Habitat compression and associated potential habitat loss was validated using electronic tagging data from 47 blue marlin. This phenomenon increases vulnerability to surface fishing gear for billfishes and tunas<sup>8,9</sup>, and may be associated with a 10–50% worldwide decline of pelagic predator diversity<sup>10</sup>. Further expansion of the Atlantic OMZ along with overfishing may threaten the sustainability of these valuable pelagic fisheries and marine ecosystems.

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