

Integrated Science for Atlantic Tarpon Conservation in the Florida Keys

Lucas P. Griffin¹, Jacob W. Brownscombe², Grace A. Cassleberry³, Aaron J. Adams^{4,5}, Steven M. Lombardo^{5,6,7}, Oliver N. Shipley⁸, Jérôme Servonnat⁹, Steven J. Cooke¹⁰, Andy J. Danylchuk³

¹University of South Florida, Tampa, FL USA

²Fisheries and Oceans Canada, Burlington, ON Canada

³University of Massachusetts Amherst, Amherst, MA USA

⁴Harbor Branch Oceanographic Institute, Fort Pierce, FL USA

⁵Bonefish & Atlantic tarpon Trust, Miami, FL, USA

⁶CSS Inc., Fairfax, VA USA

⁷NOAA/NOS/NCCOS/MSE, Silver Spring, MD USA

⁸Stony Brook University, Stony Brook, NY, USA

⁹Laboratory for Climate and Environmental Sciences, Gif-sur-Yvette France

¹⁰Carleton University, Ottawa, ON Canada

Atlantic tarpon (*Megalops atlanticus*) are a culturally and economically important gamefish across Florida and a flagship species, particularly in the Florida Keys. However, their conservation in this region faces mounting challenges from habitat loss, climate-driven stressors, boater and angling pressure, and the interconnectivity of disparate ecosystems. Drawing from multiple scientific approaches, including from electronic telemetry, predator-prey research, foraging landscape modeling, interviews with fishing guides, and climate projections, this synthesis provides a comprehensive overview of tarpon ecology and conservation needs in the Florida Keys. Telemetry data reveal consistent site fidelity and repeatable timing of individual tarpon during the spawning season and to overwinter. Furthermore, these data identify the Florida Keys as a mixing zone for two distinct migratory contingents: one that migrates up Florida's west coast (Eastern Gulf of Mexico Contingent) and another along the east coast (Eastern US Seaboard Contingent), each reaching summer foraging areas outside of Florida that are managed with different fishing regulations. As depredation intensifies across all fisheries, these nearshore pre-spawning aggregations, particularly in channels like Bahia Honda, face high shark depredation rates. Approximately 15% of tarpon fought at this site are lost each day during peak fishing activity, underscoring the need for improved fishing guidelines and targeted outreach. When combined with stable isotope analyses, telemetry data highlight not only the importance of the Florida Keys as a pre-spawning aggregation site but also the role of distant foraging ecosystems, spanning thousands of kilometers away. Expert fishing guide interviews reveal a 62% reduction in large tarpon habitat since the early 1980s, potentially attributed to rising wet season water temperatures (+2°C since 1982) and intensifying vessel traffic. Incorporating the estimated optimal temperature range for tarpon (20–29°C) and climate projections via CMIP6, our findings suggest a shortening of the tarpon fishing season in the Florida Keys, with major consequences for the cultural and economic vitality of this iconic fishery. This integrated synthesis highlights the urgent need for targeted habitat restoration and protection, water quality improvements, refined catch-and-release practices, and enhanced boater use management within the Florida Keys National Marine Sanctuary to mitigate disturbance, habitat loss, and depredation risk, thereby supporting the sustainability of tarpon populations and the fisheries they support. It also highlights key research gaps, including spawning locations and larval retention, genetic composition, prey availability, post-release mortality, behavioral responses to environmental variability, and inter-ecosystem connectivity, that must be addressed to ensure the long-term resilience of the tarpon fishery in the face of ongoing ecosystem change.