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### Direct Assessment of Juvenile Atlantic Bluefin Tuna: Integrating Sonar and Aerial Results in Support of Fishery-Incident Surveys

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**DIRECT ASSESSMENT OF JUVENILE ATLANTIC BLUEFIN  
TUNA: INTEGRATING SONAR AND AERIAL RESULTS IN SUPPORT OF  
FISHERY-INDEPENDENT SURVEYS**

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There is a clear need for direct assessment approaches for Atlantic bluefin tuna (*Thunnus thynnus*, ABFT), including formulation of experimental designs and pilot surveys for abundance estimation. In the western Atlantic, aerial surveys are highly feasible for juvenile ABFT because of their surface availability in summer and autumn on the mid-Atlantic shelf. Our goals are to design, implement, and analyze a fisheries-independent survey of juvenile ABFT and to assess the feasibility of biomass estimation in the Gulf of Maine (USA). From initial field trials using sonar and aerial mapping we demonstrated feasibility of determining size, area, and total biomass of schools as well as sizes of individuals within schools. We used aerial imagery to determine the school's surface shape and to enumerate bluefin tuna visible in the upper few meters of the water column. The sonar data provided information on school height and number of individuals not captured in aerial photographs. By integrating sonar and aerial data we can estimate school biomass, number and sizes of individuals in schools, and aggregation behavior. In 2015 we plan to use a marine hexacopter to obtain more highly resolved aerial images of schools, with improved geo-rectification required for automated target recognition and objective counts of individuals. Current bluefin surveys rely primarily on observer and spotter pilot estimates of school metrics. Although not without challenges, the analytical techniques we're developing will provide more objective, multi-dimensional information on ABFT schools and less biased estimates of biomass. Direct assessment also offers a means of tracking shifts in coastal distribution of highly mobile ABFT, especially as traditional indices of abundance may no longer be appropriate.