

The Use of Information from Electronic Tags for Stock Assessment of Northeast Fishery Resources

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Several research projects in the northeast U.S. are using various types of electronic tags to study fish behavior, and results are contributing to fishery stock assessments in a variety of ways. The primary use of electronic tags has been to track movements of individuals, leading to inferences of stock structure, supporting the estimation of mixing rates between adjacent stocks, and potentially contributing to estimates of stock size. The application of electronic tagging for fisheries science has traditionally been to illustrate basic aspects of life history, such as juvenile and adult habitat, vertical and horizontal movements, and home range. Such descriptive information can be used to determine appropriate structure of population dynamics models and associated sampling designs. Information from electronic tags can also be used more directly for stock assessment and fishery management. For example, electronic tags have been used to evaluate mortality rates (Figure 1), 'round-trip' movements across management boundaries (Figure 2), effectiveness of Marine Protected Areas, and the effect of environmental variables on seasonal movements. One of the challenges of using electronic tags for stock assessment is the prohibitive cost of deploying tags on a representative sample of fish populations (Figure 3). As the technology advances and becomes more cost-effective, the role of electronic tagging in stock assessment is expected to expand.

Figure 1. Estimates of Atlantic salmon smolt survival derived from ultrasonic telemetry receiver arrays (VEMCO VR2 units) that monitored migration through the Dennys River (Maine, USA) into the Bay of Fundy/Gulf of Maine. Hatchery-reared smolts with surgically inserted ultrasonic pingers were released into the Dennys River (open filled circle) during 2001 (n=70), 2002 (n=150) and 2003 (n=150). VR2s units (solid circles) were placed throughout the system to monitor migratory dynamics and estimate migration success. Telemetry array sharing with a Canadian Department of Fisheries and Oceans telemetry study (Gilles LaCroix, St. Andrews, Canada) allowed for array coverage into the Bay of Fundy (solid lines, 2001-2002). Lower boxes represent numbers and percents of smolts assumed dead within each zone.

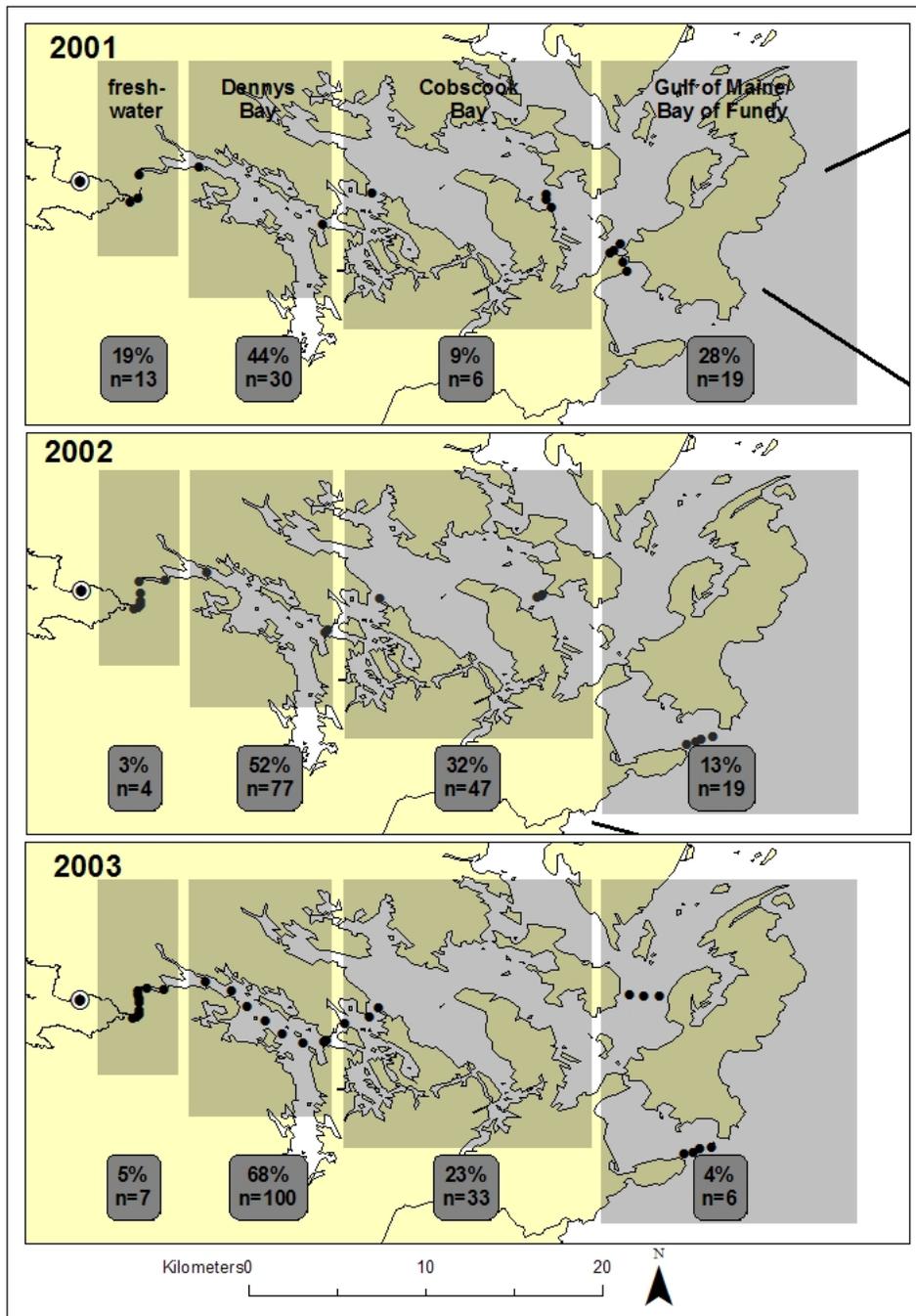


Figure 2. Inferred trajectory of a yellowtail flounder based on depth, tidal amplitude and time of high tide derived from archival tag data, local predictions from a tidal model, and a search algorithm with distance constraints (from Gröeger et al. in prep). Release and recapture positions are indicated by green and red circles, respectively. Stock area boundaries are indicated in red, and fishing closure areas are indicated in pink.

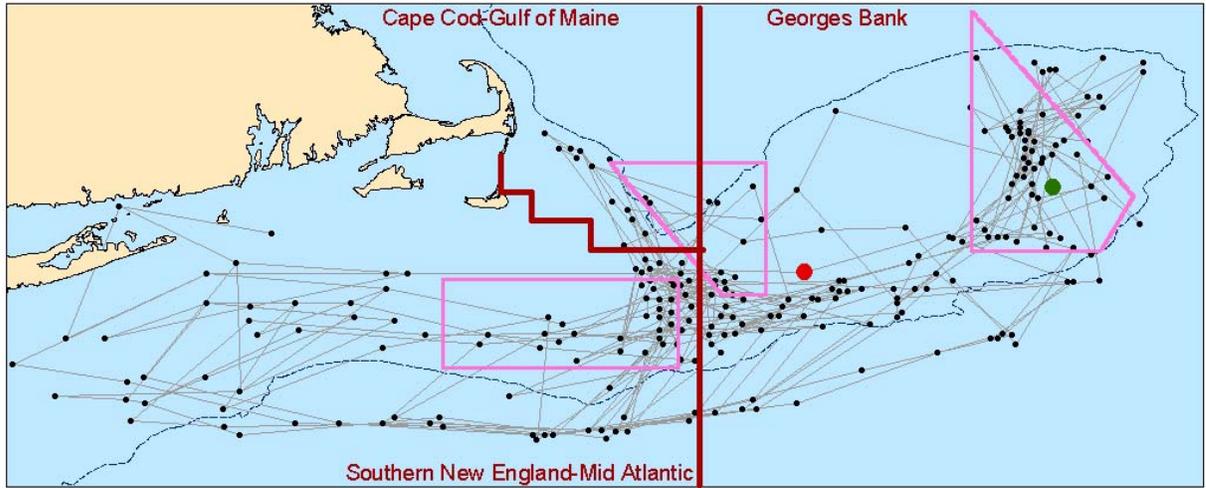
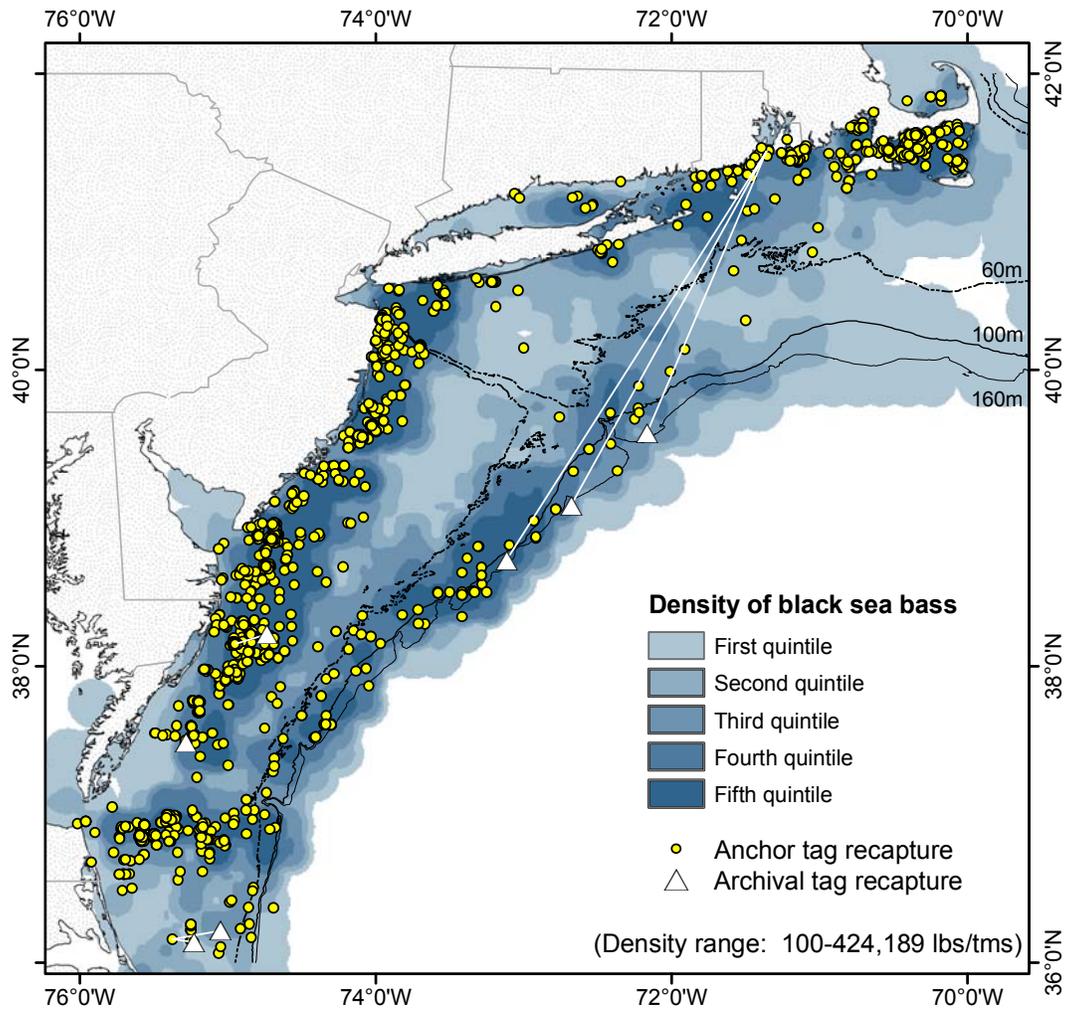


Figure 3. A comparison of recaptures of many traditional tags and several archival tags related to the population distribution. Density of black sea bass was derived from catch data reported on vessel trip reports (2002-2004). Internal anchor tag and electronic data storage tag recapture locations are shown with linear paths connecting release and recapture locations of electronic tags.



Related Publications

Cadrin, S.X. and A.D. Westwood. 2004. The use of electronic tags to study fish movement: a case study with yellowtail flounder off New England. ICES CM 2004/K:81 (available online <http://www.ices.dk/products/CMdocs/2004/K/K8104.pdf>)

Gröger, J.P., R. Rountree, S.X. Cadrin, A. Westwood and S. Kubis. 2006. The use of digital storage tags and tidal information to study migration patterns of yellowtail flounder (*Limanda ferruginea*) off New England. Can. J. Fish Aquat. Sci., (in prep.)

Northeast Fisheries Science Center. 2004. Assessment of the Northern Stock of Black Sea Bass. In 39th Northeast Regional Stock Assessment Workshop (39th SAW) assessment summary report. NEFSC Ref. Doc. 04-10a: 9-86 (available online at <http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0410/bass.pdf>)

Sheehan, T.F., G. Lacroix and J.F. Kocik. 2004. Atlantic salmon hatchery smolt emigration dynamics determined through ultrasonic telemetry: Dennys River Maine, USA. U.S. Atlantic Salmon Assessment Committee Annual Report 2004/16: 66-67

Tallack, S., Rago, P., T. Brawn, S. Cadrin, J. Hoey, and L. Taylor Singer. 2005. Proceedings of a workshop to review and evaluate the design and utility of fish mark - recapture projects in the northeastern United States. NEFSC Ref. Doc. 05-02. (available online <http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0502>)