

Shallow-water residency and limited dispersal of Atlantic halibut in the Gulf of Maine

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Introduction

- Atlantic halibut (*Hippoglossus hippoglossus*), once abundant in the Gulf of Maine (GOM) on the northeast coast, were overfished until the stock collapsed in the 1940s.
- In 2007, a three-year tagging study using electronic tags was done by the Maine Dept. of Marine Resources.
- The objective of the study was to determine if GOM halibut migrate to spawning grounds on the Scotian Shelf and mix with Canadian halibut stocks



Figure 1: Atlantic halibut tagged with DST (1a) and PSAT tags (1b,1c) Photos by J.K.Kanwit

Methods

- 33 adult Atlantic halibut were tagged and released in the near-shore waters of the Gulf of Maine.
- Two types of electronic tags were used...
- Data Storage Tags (DST's) log depth and temperature data at user-programmed intervals for up to one year (Fig. 1a).
- Pop-up Satellite Archival Transmitting tags (PSAT's) record depth, temperature, and ambient light levels which are used to estimate geoposition (Figs.1b,1c).
- Tags were programmed to record data at intervals that varied from every 15 mins to every 1.5 hrs.
- In this study, depth profiles were used to identify spawning activity and longitude was used as a proxy for east-west movement

References

Loher, T., and A. Seitz. 2008. Characterization of active spawning season and depth for eastern Pacific halibut (*Hippoglossus stenolepis*), and evidence of probable skipped spawning. *J. Northw. Atl. Fish. Sci.*, 41: 23–36.

Seitz, A., Norcross, B.L., Wilson, D., and J.L. Nielsen. 2005. Identifying spawning behavior in Pacific halibut, *Hippoglossus stenolepis*, using electronic tags. *Environ. Biol. Fishes* 73: 445–451

Acknowledgements

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Results

- Data was retrieved from 12 tags. The fish they monitored ranged in size from 97-148 cm.
- All tags recorded depth and temperature data. Position data was retrieved from one of the PSATs (Fig. 2).
- The data collection periods ranged from 14 days to over one year, with six tags recording data during the spawning season.
- Nearly all fish had returned to the GOM close to their release locations, one to within 2 km. One fish was recovered outside of the Gulf (Fig. 5).
- No fish went deeper than 248 m (Fig. 4). Most spent extended periods of time above 100 m (Fig. 3).

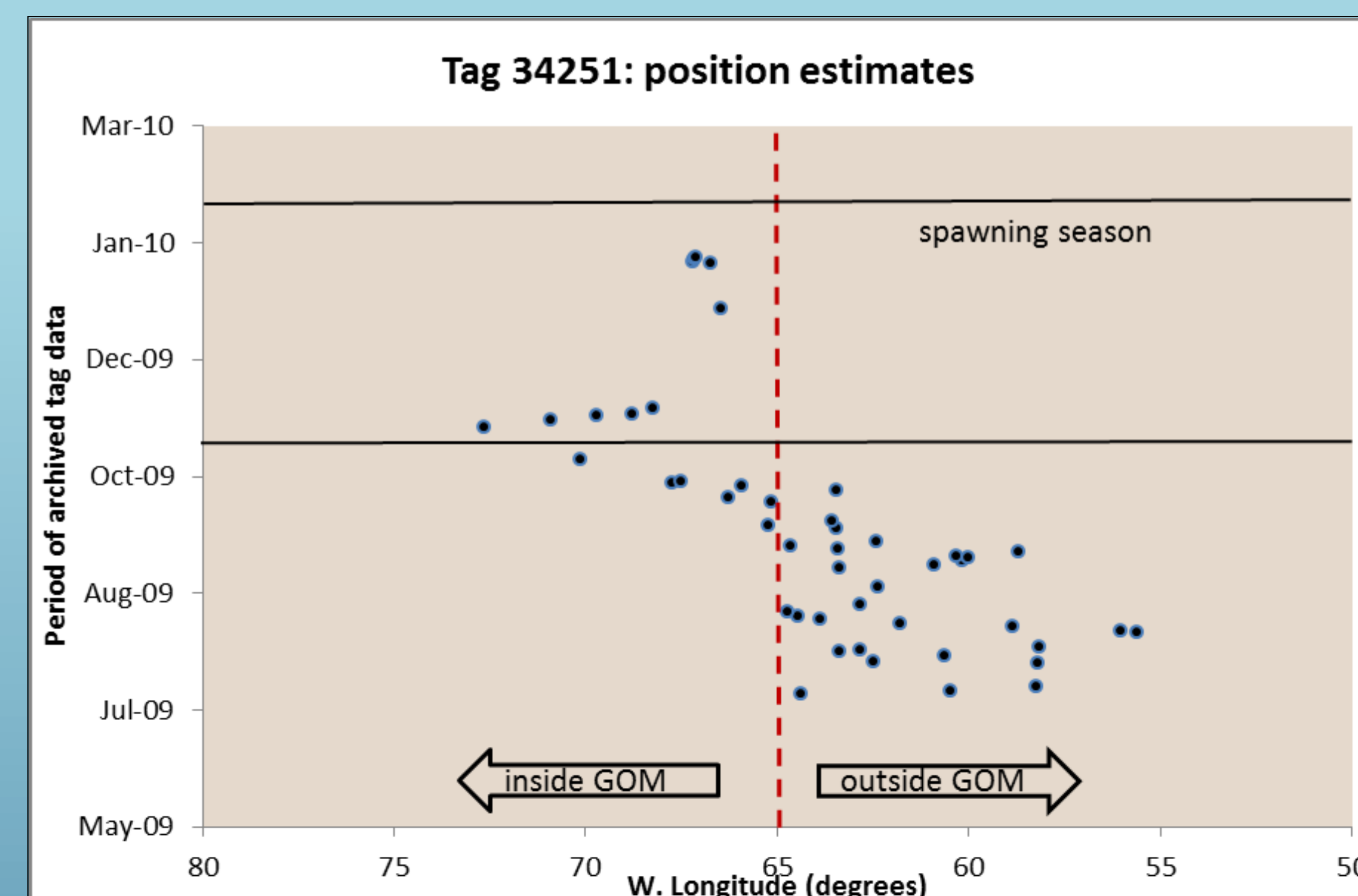


Figure 2: Longitude estimates recorded for this 114 cm fish indicate that it left the GOM at some point during its six months at-liberty, but during spawning season (bordered by the two horizontal solid lines), it did not venture east of 60° W. Longitude (indicated by the vertical dashed line), suggesting that it was in the GOM or south along the coast.

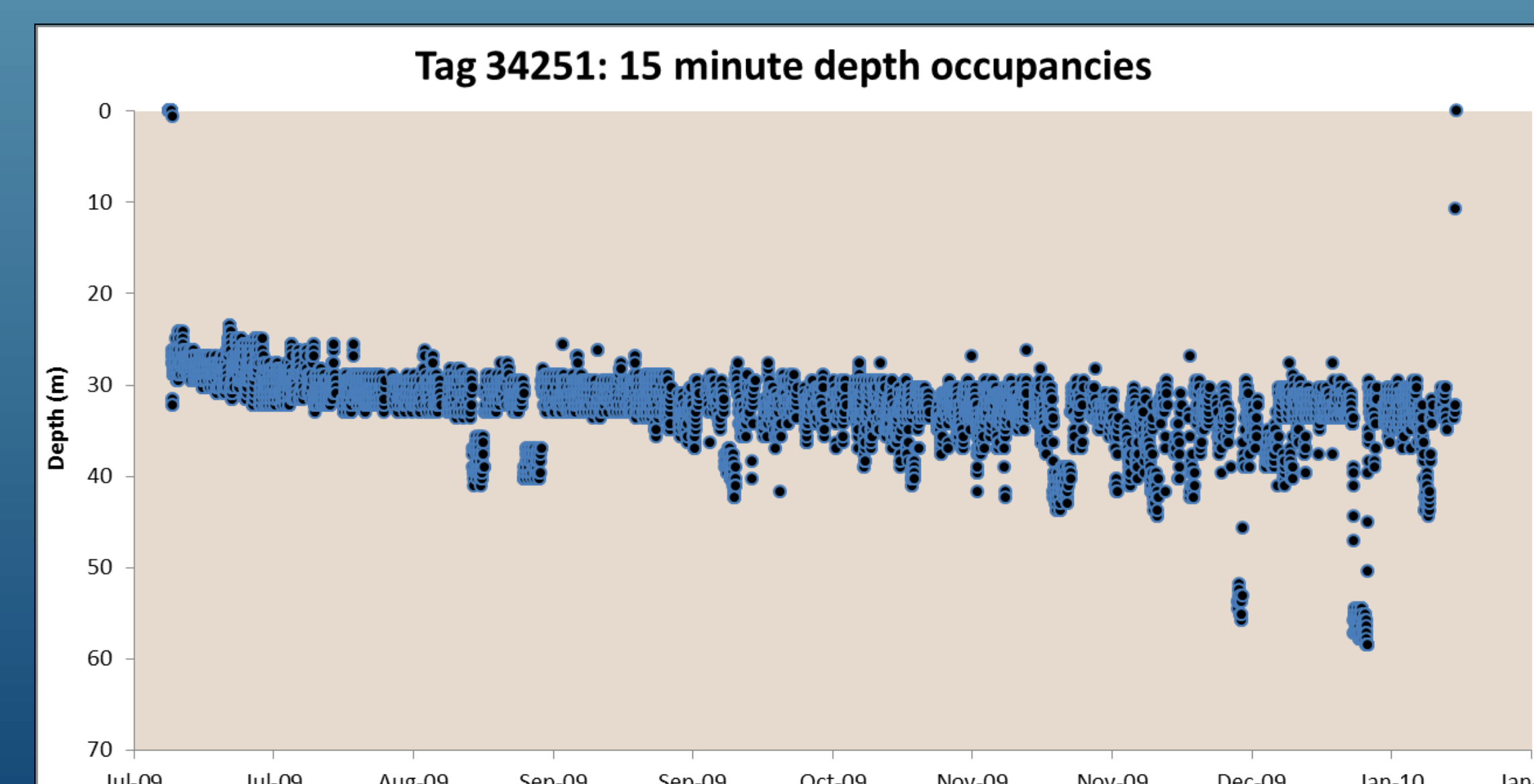


Figure 3: Depth occupancy profile of 114 cm fish at-liberty for 184 days. Depths were recorded every 15 minutes. In six months, the fish never went deeper than 60 m.

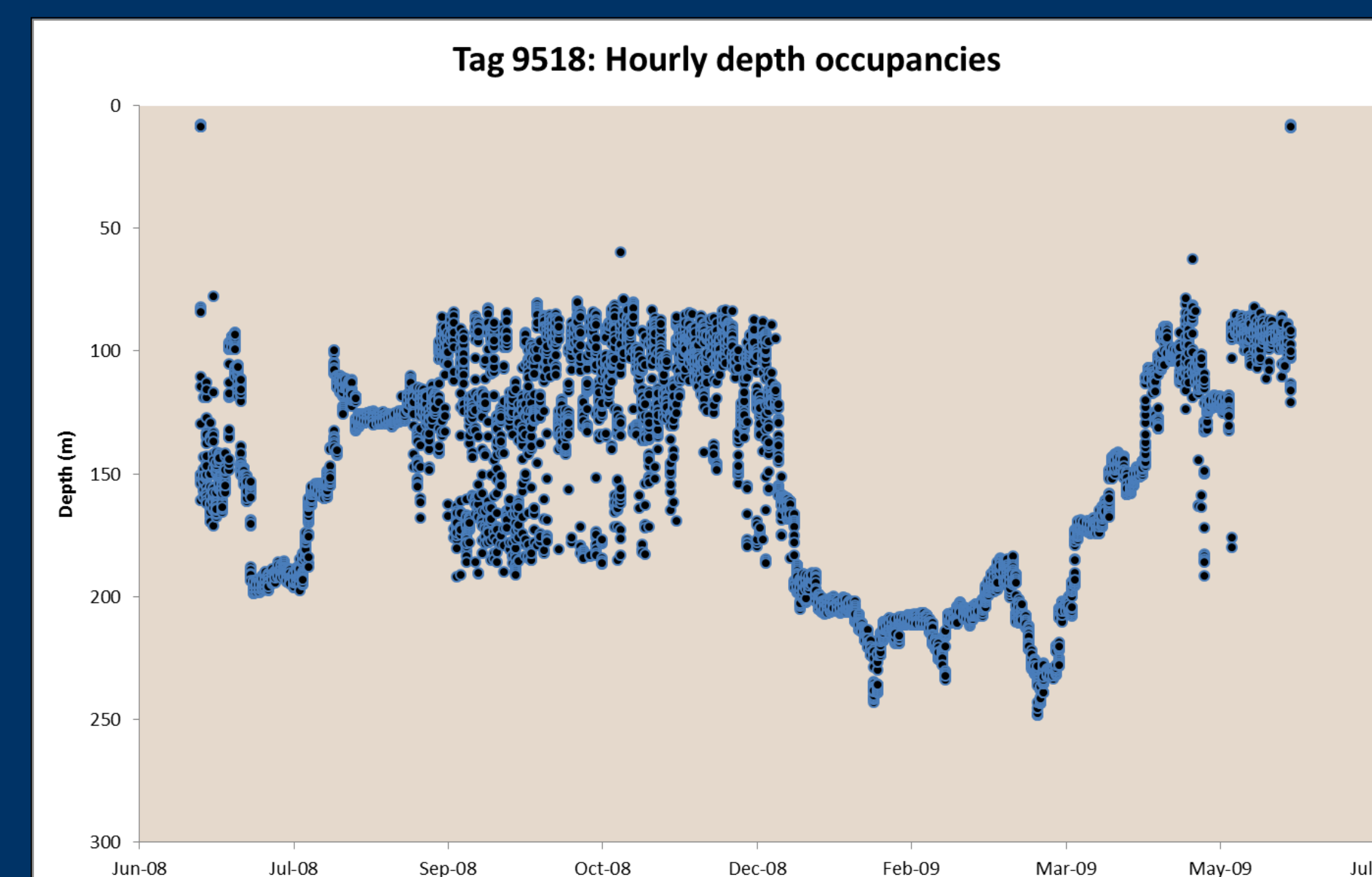


Figure 4: Depth profile of 104 cm fish at-liberty for 353 days. Depths were recorded hourly. This fish recorded the deepest depth (248 m) of all the data retrieved. The profile shows high vertical activity Sept.-Oct., decreased vertical movements and shallow occupancy Nov.-Dec., and deep occupancy with limited vertical excursions during Jan. Feb. and March.

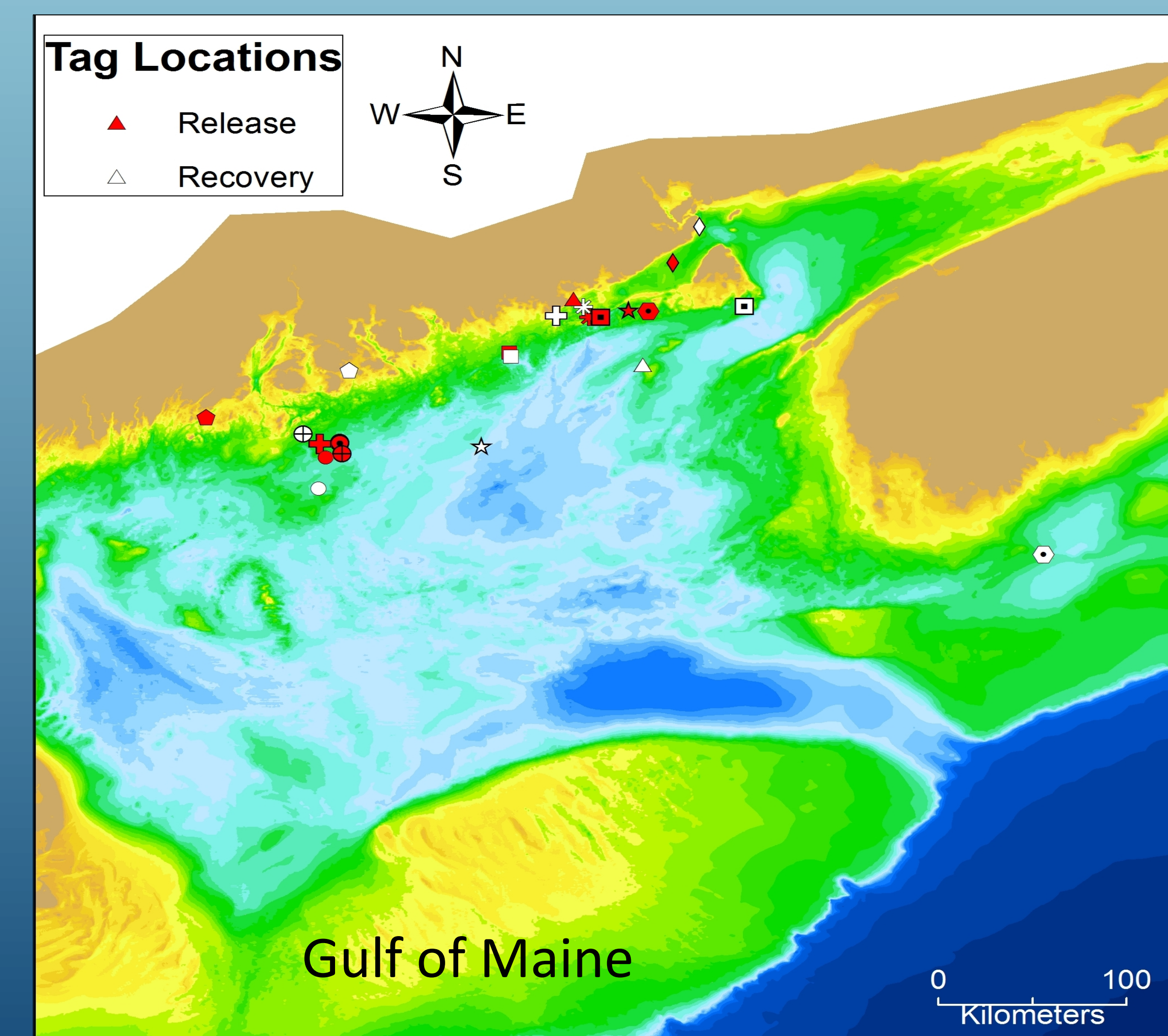


Figure 5: The Gulf of Maine, showing release and recovery locations of the 12 electronic tags. Each symbol identifies a different tag. Red symbols denote release locations and white symbols indicate where the fish was recovered or where the archived data were transmitted from.

Conclusions

- Atlantic halibut in the GOM occupy shallower winter depths than other large flatfish. Pacific halibut (*H.stenolepis*) migrate to offshore depths of 500-600 m prior to spawning (Seitz *et al.*, 2005). Atlantic halibut in Norwegian fjords have been found to winter as deep as 900 m (Michalsen, unpublished data).
- Based on the depth data, none of the mature, adult fish in this study participated in the seasonal spawning aggregations off the Scotian Shelf.
- Atlantic halibut are assumed to spawn annually but recent studies of Pacific halibut have provided evidence of skipped spawning among mature adults (Loher and Seitz, 2008). It is possible that GOM halibut spawn in the northeast with other populations, but these tagged individuals did not do so at the time of the study.
- Alternatively, GOM halibut might spawn within the confines of the Gulf, at shallower depths and at different times than other western Atlantic halibut.
- A reproductively isolated sub-population of halibut in the GOM has implications for management policies seeking to rebuild the stock and merits further study.