

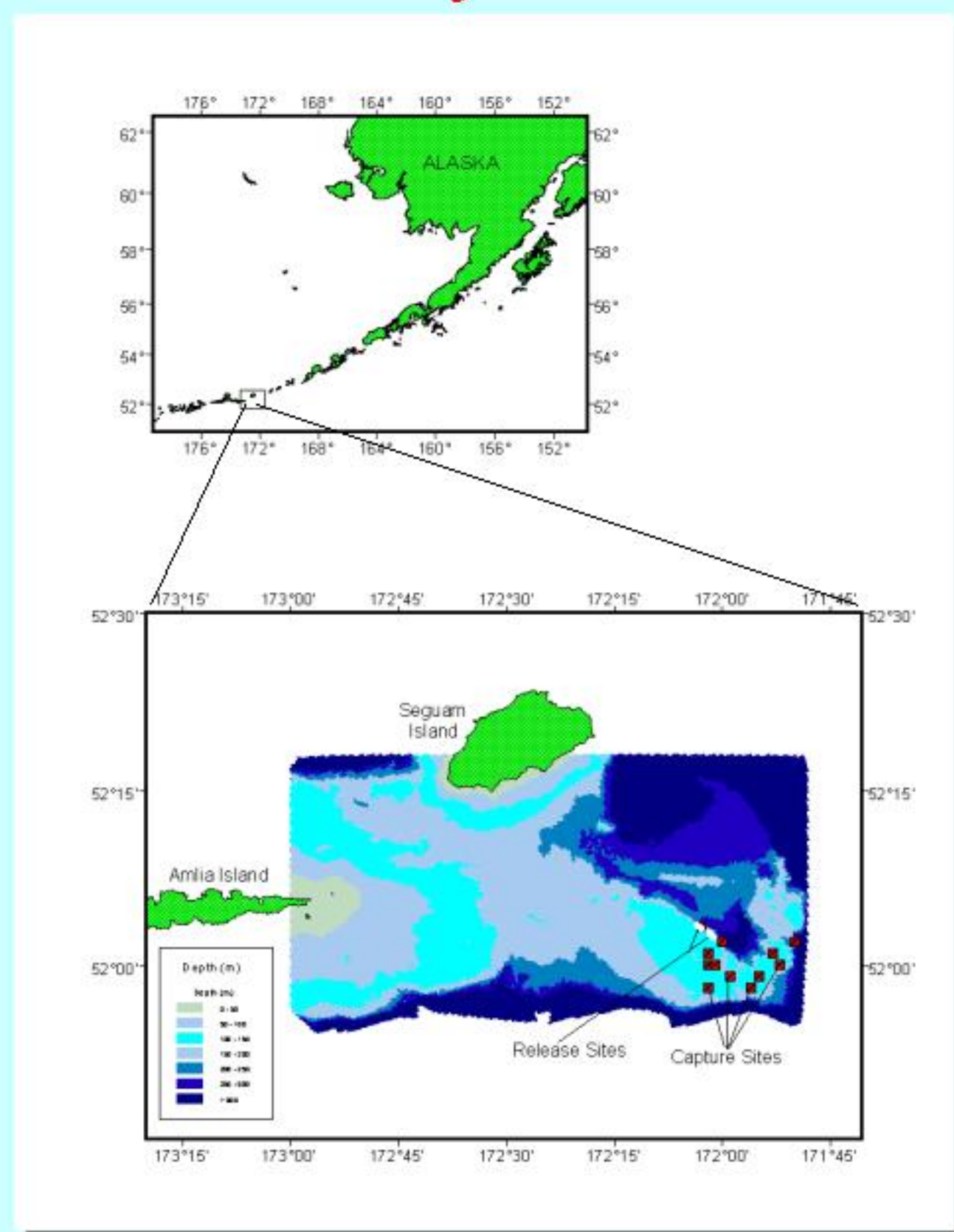
# Seasonal Change in Vertical Migration Behavior of Atka Mackerel in Seguam Pass, Alaska

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## Methods

### Study Site



A total of 117 Atka mackerel *Pleurogrammus monopterygius* were tagged in July of 2000, with 13 tags recovered thus far. Fish were initially captured with bottom trawl gear at bottom depths ranging from 110 to 119 m. We have relied upon the commercial bottom trawl fishery for the tag returns, where capture depths ranged from 102 to 143 m. Fish were at liberty from 42 to 407 days.



### The Tag



The tag is a data storage tag or “Archival tag”. The tags stored depth and temperature readings at intervals from 7.5 minutes to 1 hour.

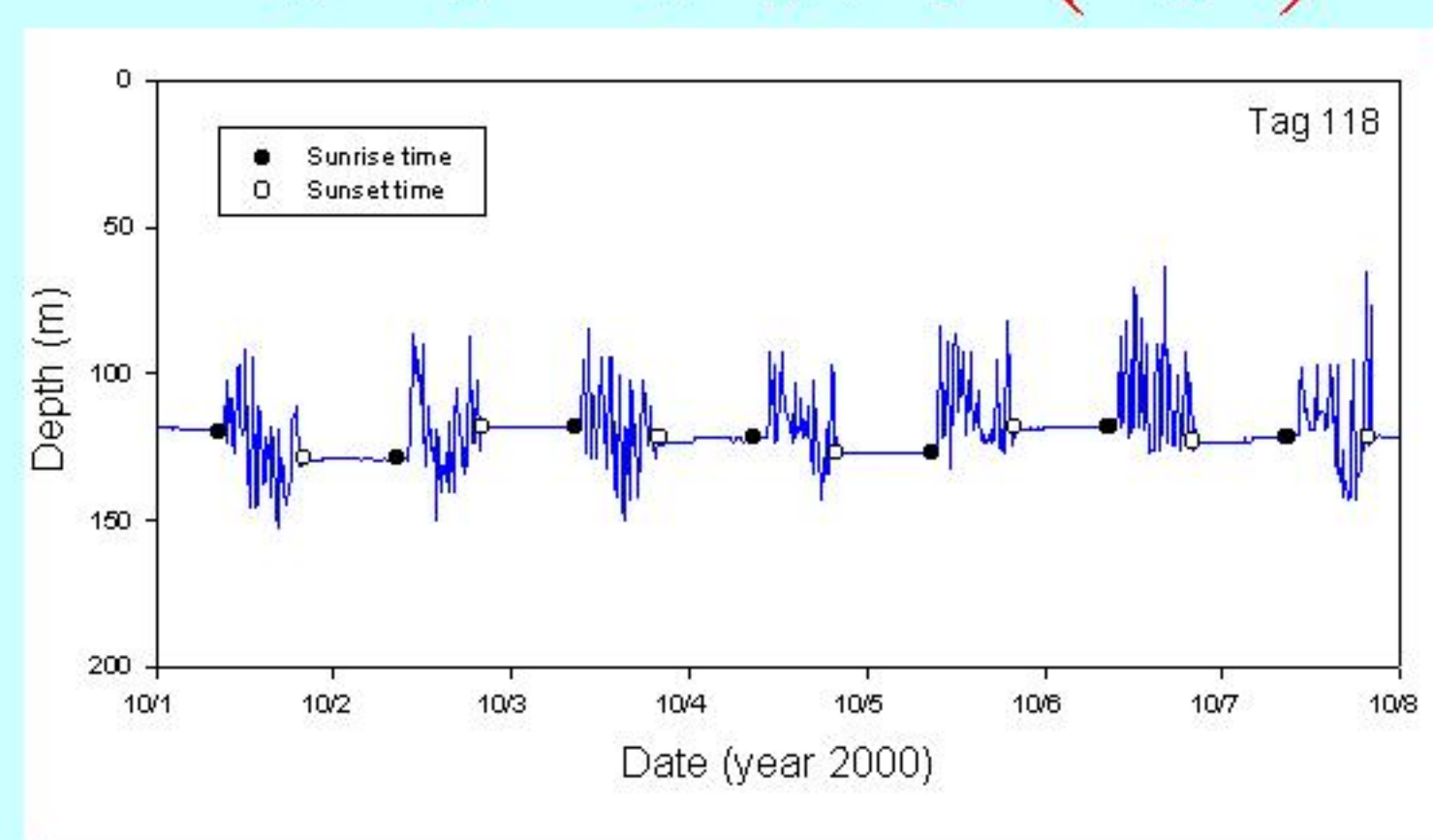
The tags have the following specifications:

- Depth (pressure) range to 320 m, accuracy of +/- 1.3 m
- Temperature range -5 to 35°C, 0.2°C resolution
- 16,384 samples each of temperature and pressure
- Three year battery life
- Dimensions 8 × 16 × 27 mm
- Weight, 5 g in air, 1.8 g in water

Archival tags were externally attached just below the dorsal fin.

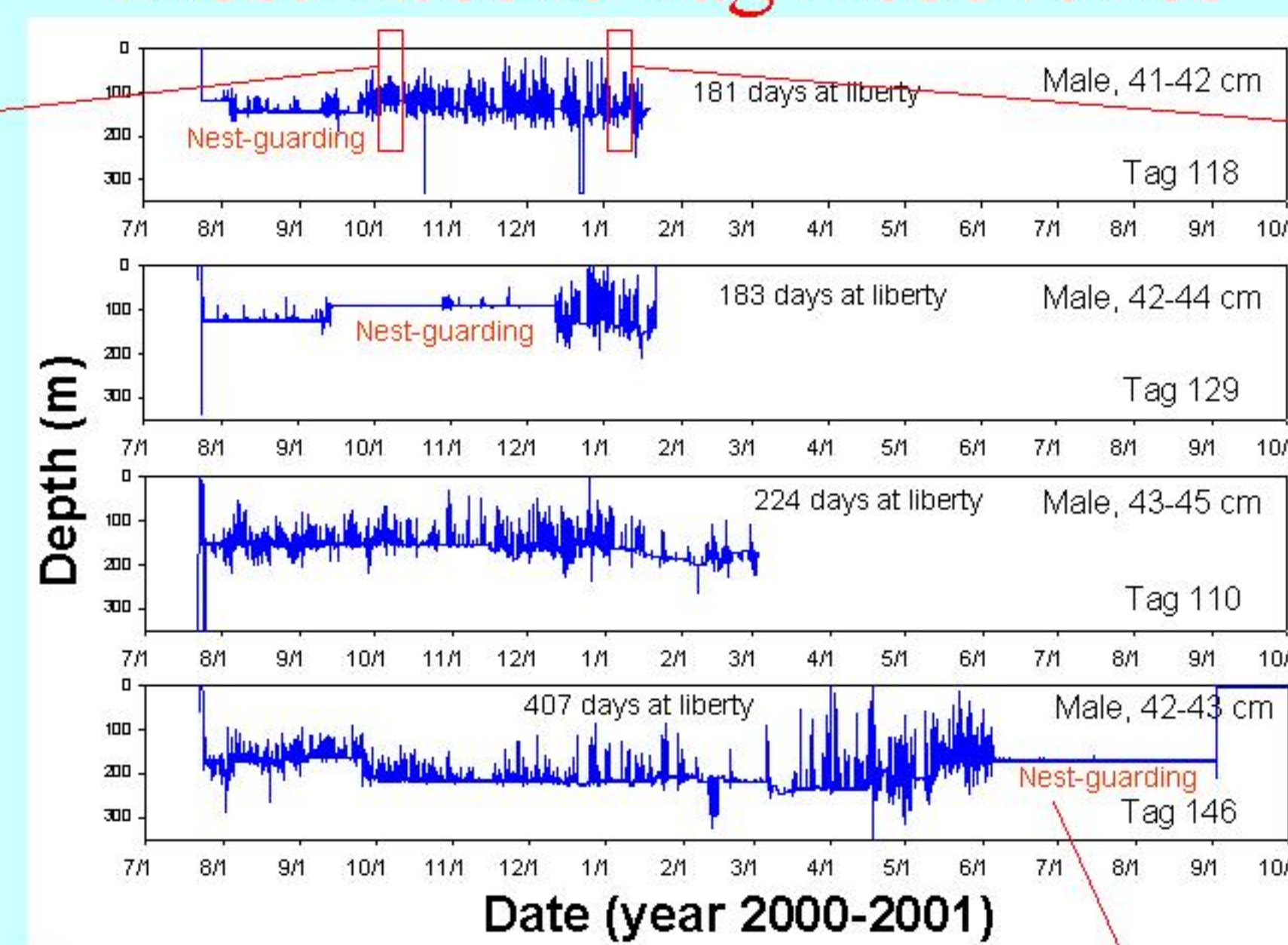
## Results

### Diurnal Behavior (Fall)



All fish displayed distinct diurnal behavior, with all vertical movements away from the bottom (excursions) occurring only during daylight hours (Nichol & Somerton 2002). Fish were completely inactive and on the bottom during night-time periods. Depths at which fish remained on the bottom during nighttime ranged from 90.7 to 246.7 m. Daytime vertical excursions, however, ranged from below 320 m to the surface.

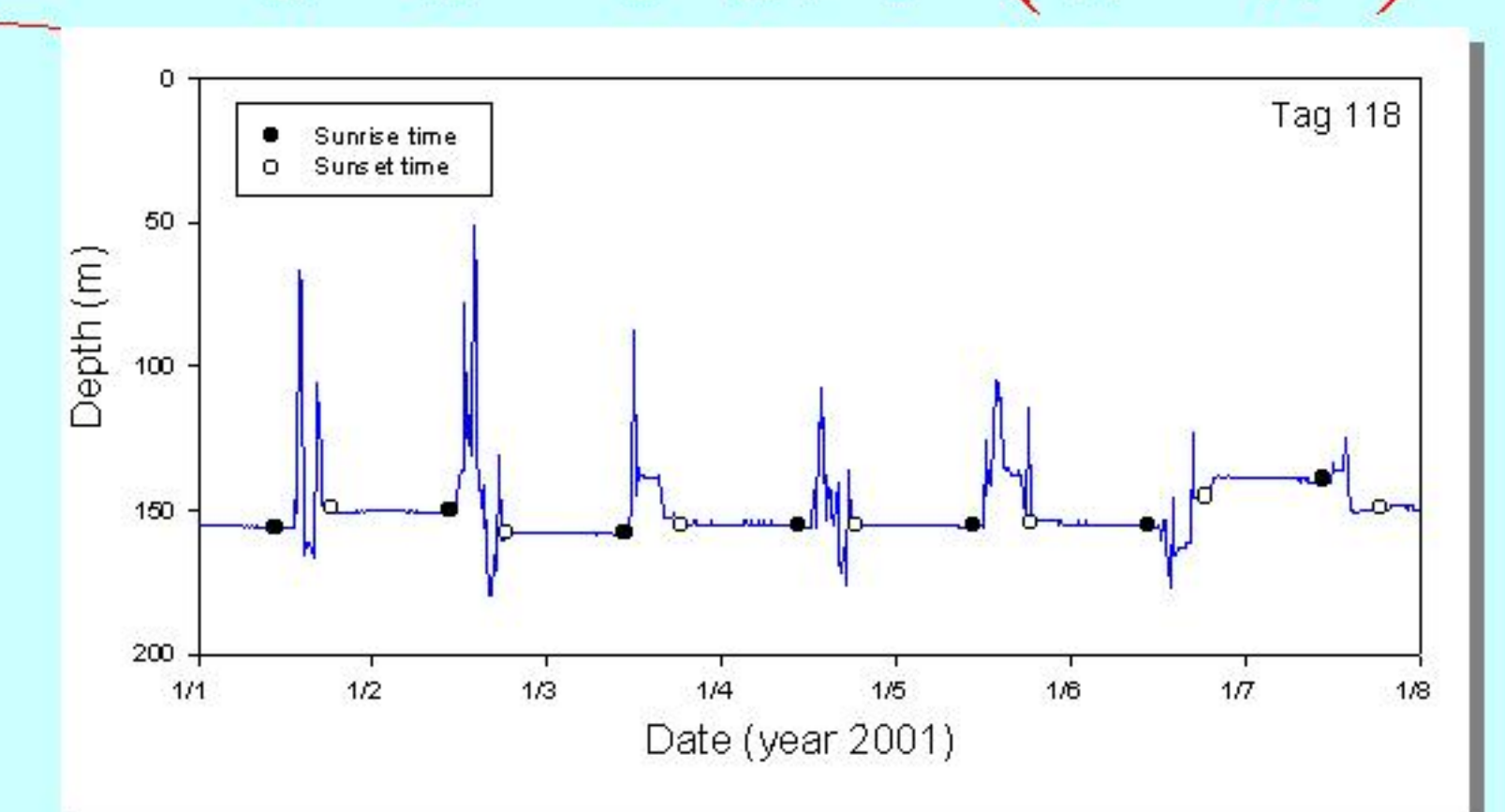
### Most Recent Tag Recoveries



### Nest-guarding Periods

Five of the 13 fish were males that displayed nest-guarding behavior. One male (tag 129) spent more than 4 months with limited vertical movements away from the bottom. Nest-guarding periods began as early as June 4 (tag 146) and ended as late as December 12 (tag 129), with depths ranging from 99 to 151 m.

### Diurnal Behavior (Winter)

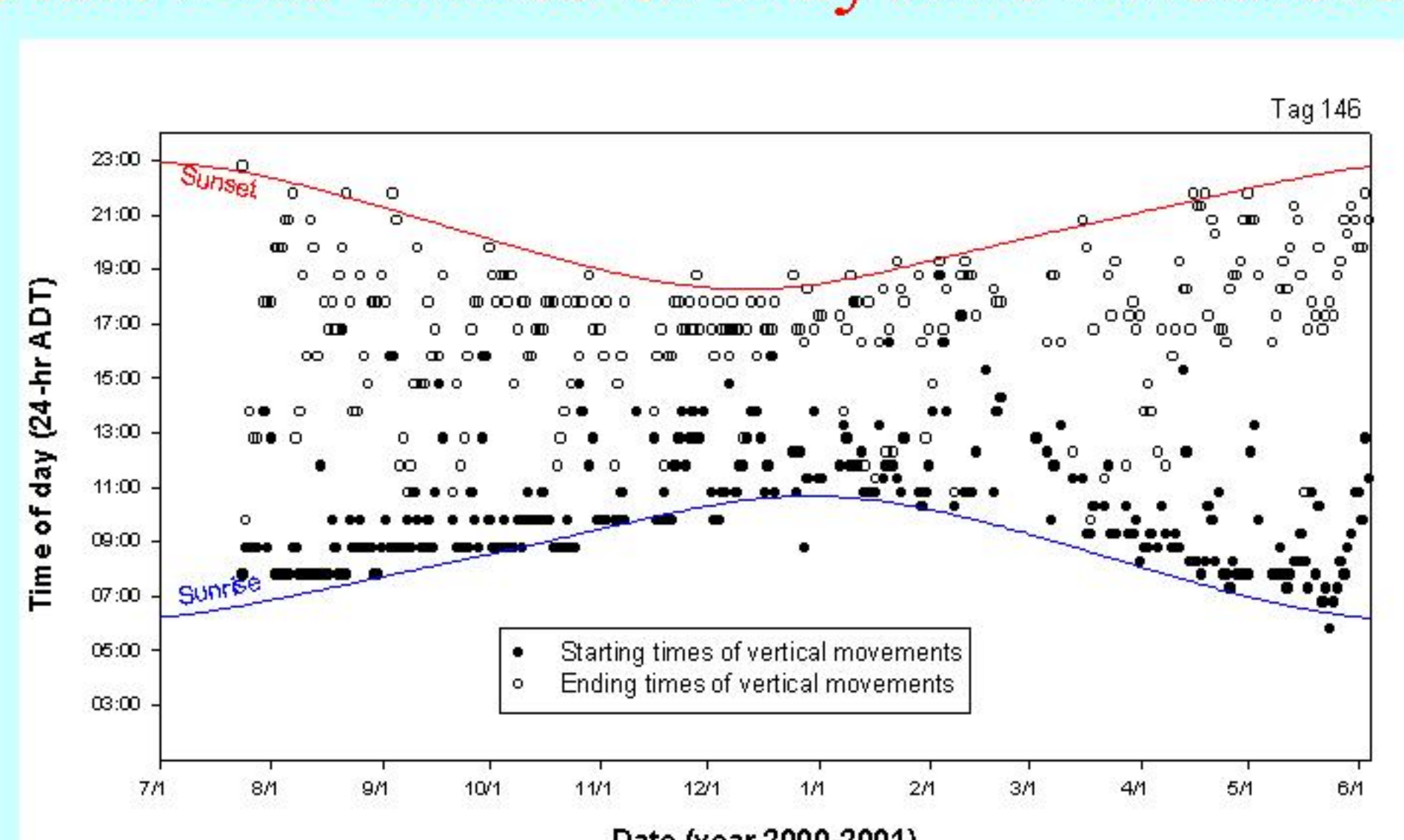


Because vertical excursions away from the bottom occur only during daylight hours (e.g., between sunrise and sunset), vertical excursions during winter occur within a narrower time period compared to other times of the year.

## Discussion

Starting and ending times of daily vertical movements change with season. Due to shorter day-length periods during winter months, Atka mackerel spend longer periods on the bottom than at other times of the year. This seasonal change in the amount of time that Atka mackerel spend on the bottom may explain why Atka mackerel decrease in importance as a prey for Steller sea lions during winter months. Atka mackerel are the primary prey of Steller sea lion in the central and western Aleutian Islands throughout the year, however, their importance relative to other prey items declines during winter (Fritz & Lowe 1998, Sinclair & Zeppelin 2002). One explanation for this is that Atka mackerel may be more vulnerable to Steller sea lion predation during daylight hours, when they migrate up in to the water column. If this is true, then the shorter day length during winter would offer fewer opportunities for Steller sea lions to encounter Atka mackerel.

### Start-End Times of Daytime Excursions



Fritz LW, Lowe SA (1998). Seasonal distributions of Atka mackerel (*Pleurogrammus monopterygius*) in commercially-fished areas of the Aleutian Islands and Gulf of Alaska. NOAA Tech. Memo NMFS-AFSC-92. US Dept. of Commer., Seattle, WA.

Nichol DG, Somerton DA (2002). Diurnal vertical migration of the Atka mackerel *Pleurogrammus monopterygius* as shown by archival tags. Mar Ecol Prog Ser 239: 193-207.

Sinclair EH, Zeppelin TK (2002). Seasonal and spatial differences in diet in the western stock of Steller sea lions (*Eumetopias jubatus*). J Mammal 83: 973-990.

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