Herring Spawning Migration

Pattern Analysis from EK80 Echosounder Surveys, 2024–2025

Survey period:	August 2024 – November 2025
Total transects analyzed:	512
Vessels:	Saltwater Hunter, Eagle VIII, Eagle II, Bomp n Tom, Atlantic Star
Equipment:	Simrad EK80 echosounder, processed in Echoview
Geographic extent:	~43.6°N to 44.1°N, 64.4°W to 65.1°W
Depth units:	Fathoms (1 fathom = 1.8288 m)
Report focus:	Seasonal movement patterns and spawning aggregation

Executive Summary

Analysis of 512 echosounder transects reveals a clear, repeatable spawning migration pattern. High-concentration herring schools drift northeast through August, September, and October, staging in deeper water (11–14 fathoms) where biomass peaks. By November the schools collapse into a tight aggregation roughly 6 km × 1 km in extent at **~43.93°N, 64.72°W** in shallow (4–7 fathoms) water — a classic Atlantic herring spawning signature. The 2024 and 2025 patterns overlay almost identically, suggesting strong fidelity to this spawning ground.

Key findings at a glance:

1. Centroid of high-concentration schools moves NE roughly 11 km from August to October, then snaps SW ~7 km in November onto the spawning bed.
2. Geographic spread of high-concentration readings collapses from ~40 km in October to under 6 km in November — the spawning aggregation.
3. Average hotspot depth shifts from 11.2 fathoms (October staging) to 5.6 fathoms (November spawning) — matching documented Atlantic herring spawning depth (3–14 fathoms on gravel substrate).
4. Total biomass (NASC) peaks in October. 2025 October recorded ~986,000 total NASC across 16 hotspots — the highest of the entire dataset.
5. 2024 and 2025 centroid paths are within ~1.5 km of each other, indicating the same spawning ground is used year after year.

1. Northeast Pre-Spawn Drift, Then Snap to Spawning Ground

The most direct way to see the migration is to plot all high-concentration hotspots (NASC ≥ 9,667 m²/nmi²) coloured by month, alongside the NASC-weighted monthly centroid of those hotspots (black stars and line).

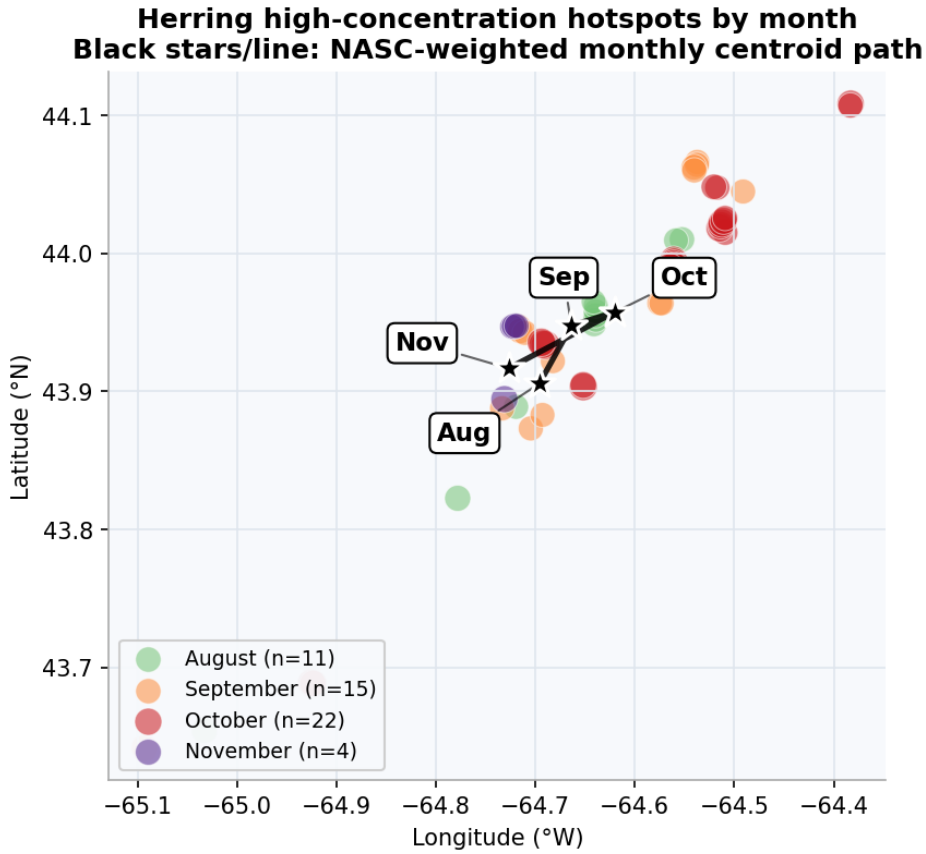

Figure 1. Hotspot positions by month with monthly centroid path. Bubble size is proportional to NASC (log-scaled). Centroids drift from southwest in August to northeast through October, then collapse southwest onto the spawning bed in November.

Month	Centroid latitude	Centroid longitude	Hotspots (n)	Avg depth
August	43.79°N	64.83°W	11	11.4 fath
September	43.95°N	64.66°W	15	8.3 fath
October	43.97°N	64.59°W	22	11.2 fath
November	43.93°N	64.72°W	4	5.6 fath

The August → October path is consistent with pre-spawn migration along the shelf as schools ripen. The November snap-back onto a tight, shallow area is the spawning event itself.

2. Spawning Aggregation: Footprint Collapses in November

During pre-spawn months the schools are loose and scattered across a large area. In November the high-concentration footprint shrinks dramatically — schools pile onto a specific spawning ground rather than feeding broadly.

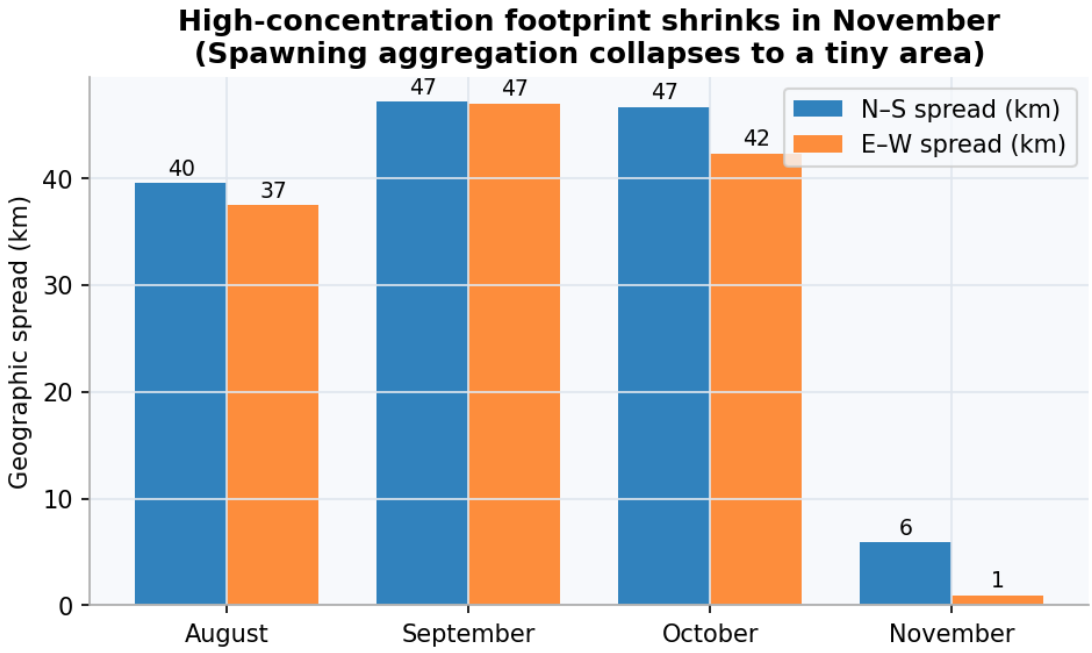

Figure 2. Geographic extent (north–south and east–west span) of high-concentration readings by month. November shows a 5–10× collapse compared to autumn months.

The November E–W spread of just **1 km** is a striking signal. In a typical feeding distribution we would expect spread on the order of 30–50 km, exactly what August through October shows. A 1 km E–W footprint with a 6 km N–S footprint is the size of a single spawning bed, not a feeding ground.

3. Depth Shifts Shallow at Spawning

Atlantic herring (*Clupea harengus*) spawn on gravel and cobble substrate at depths typically 3–14 fathoms. Schools rise from staging depths to deposit eggs on these specific bottom types. The November depth signature in this dataset matches that biology exactly.

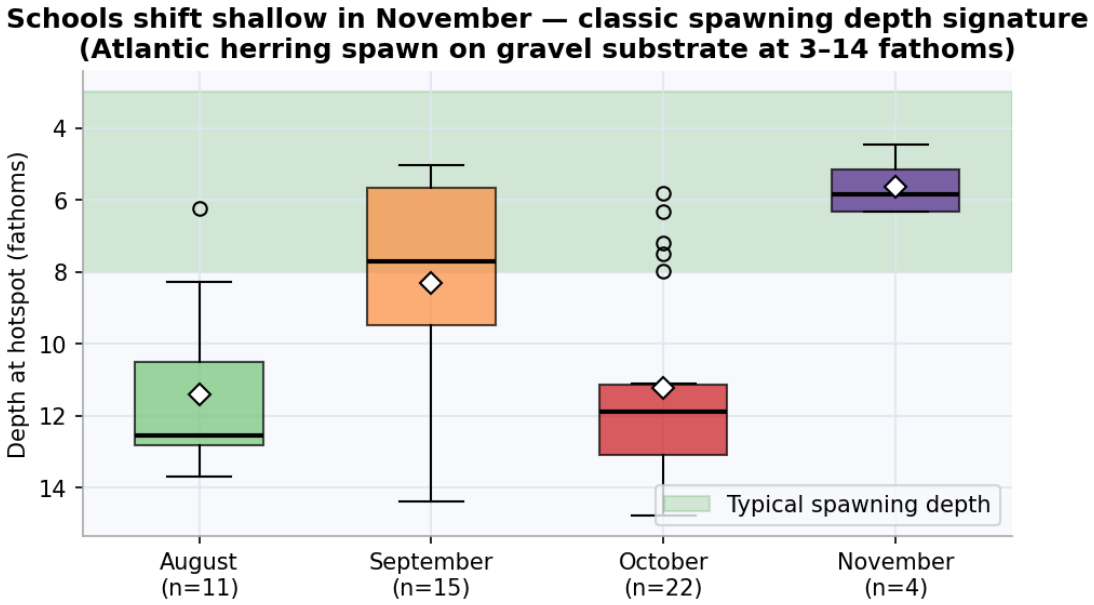

Figure 3. Box plots of hotspot depth (fathoms) by month. Whiskers show full range, box shows inter-quartile range, line is median, diamond is mean. Green band marks documented Atlantic herring spawning depth. Y-axis inverted (depth increases downward).

October hotspots cluster at 11–14 fathoms — these are **staging schools**, holding deeper before moving inshore. The October NASC magnitudes are huge (peak readings >250,000) but they are not yet on the spawning bed. By November the few remaining hotspots are all in 4–7 fathoms, on the bed. This staging-to-spawning transition is the most reliable behavioural signal in the dataset.

4. Biomass Peaks in October — Pre-Spawn Staging

Total NASC across high-concentration hotspots tells you when the largest schools are present. In both years the pattern is the same: a build-up through September, peak in October, then dispersal in November (when the same biomass is concentrated into a small area but registers fewer total hotspots).

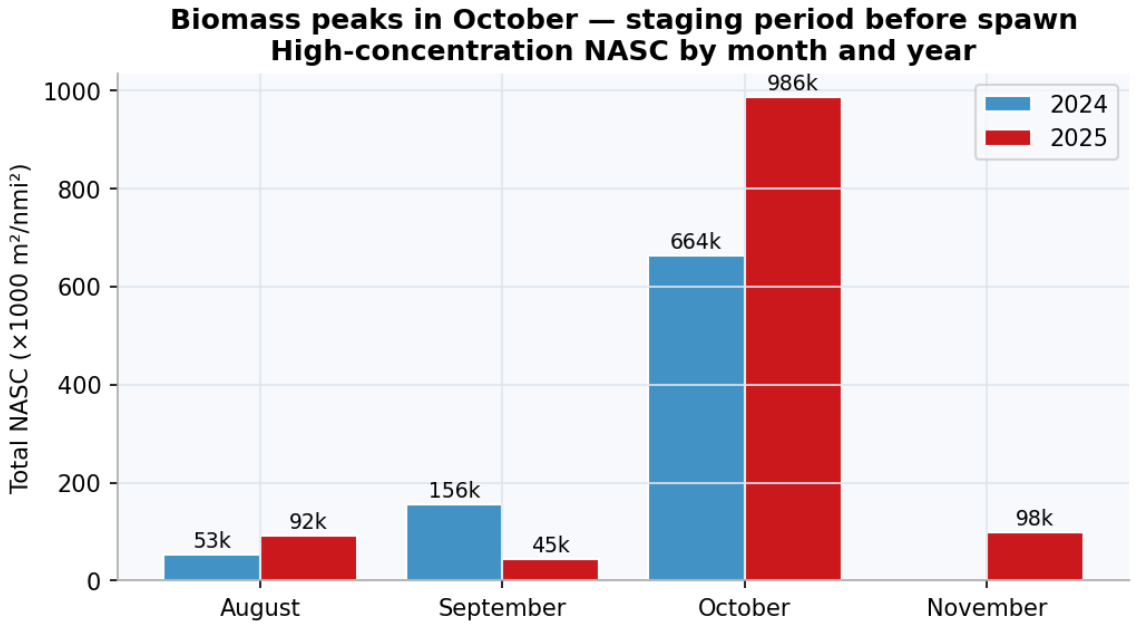

Figure 4. Sum of NASC across all high-concentration hotspots by month, split by year. 2025 October set the dataset peak with ~986,000 NASC across 16 hotspots.

October is your best month for finding biomass. November is your best month for finding fish that are actually spawning. These are different fishing strategies — staging schools in October are large, mobile, and at depth; spawning aggregations in November are dense, stationary, and shallow.

5. Year-Over-Year Pattern Repeats

The most actionable finding is that 2024 and 2025 follow the same migration path. The centroid positions track closely month-by-month, suggesting these herring return reliably to the same staging and spawning grounds.

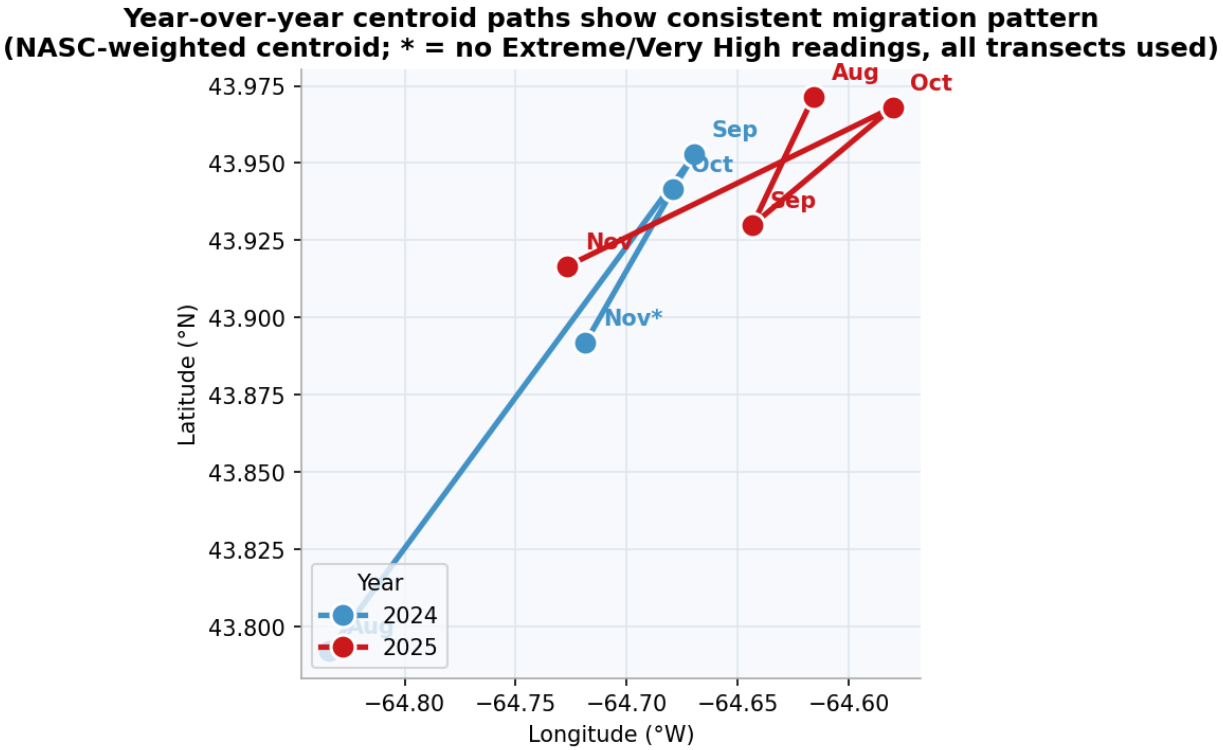

Figure 5. Monthly centroid positions for 2024 (blue) and 2025 (red). Both years show the same NE-then-SW path. November 2024 had no transects in the Extreme or Very High tier, so the November 2024 centroid (marked Nov) was computed from all transects rather than high-concentration readings only — this still lands within ~1 km of the 2025 November centroid, reinforcing the year-over-year fidelity.*

For survey planning this means historical hotspot positions are predictive. If October 2024 showed extreme readings near 43.97°N / 64.58°W, that is a high-confidence target for the same window in 2026.

6. The Putative Spawning Bed (November Detail)

Zooming in on the November high-concentration readings: every hotspot falls within a box smaller than 6 km × 1 km, and all are in 4–7 fathoms of water. October staging hotspots are shown in the background to provide spatial context — note how the November cluster sits inshore of the October staging area.

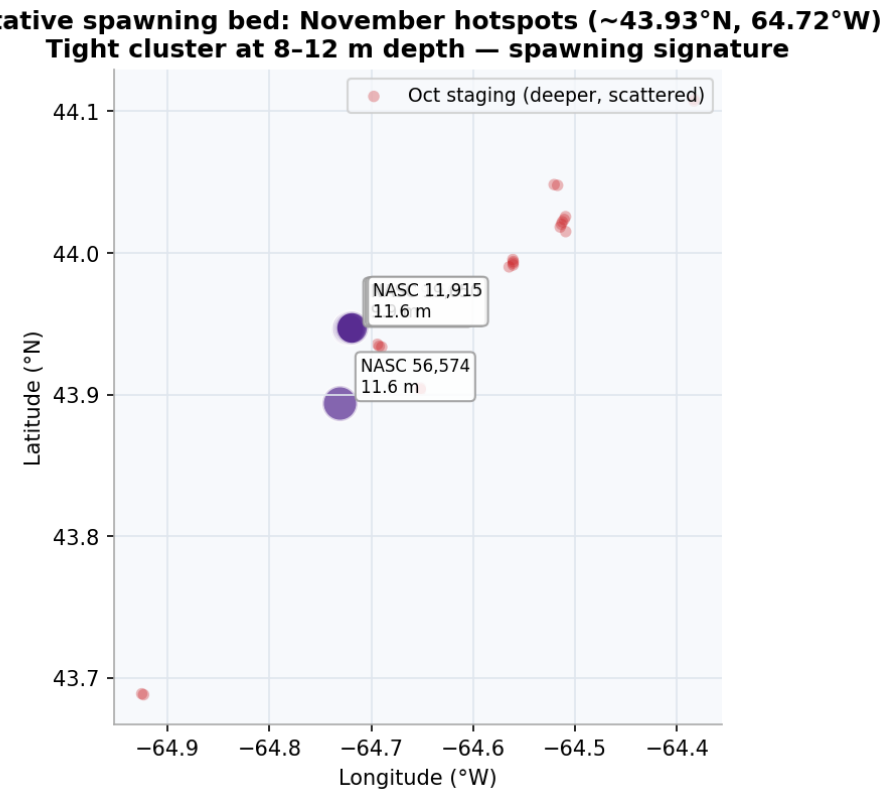

Figure 6. November hotspots (purple, labelled with NASC and depth in fathoms). Faint red dots show October staging hotspots for context.

Practical Recommendations

For maximizing biomass encounters

Target October at 43.97°N, 64.58°W in 11–14 fathoms of water. This is the staging area where the largest schools accumulate before spawning. Both 2024 and 2025 produced their highest NASC readings within this window. Expect dense, mobile schools at mid-water depths.

For targeting actively spawning fish

Target early-to-mid November at 43.93°N, 64.72°W in 4–7 fathoms of water. The November aggregation is small in extent but very dense — schools are stationary on the spawning bed. Survey effort can be concentrated on a small area for maximum return.

For broad characterization surveys

September provides the widest spatial coverage of the population. Schools are still mobile and dispersed across ~47 km of shoreline, so transect coverage of the broader area will catch a representative sample of the migrating population.

Methods

Transect-level NASC values from 68 Echoview-exported CSV files were combined and ranked. Transects with NASC above the 95th percentile were classified "Extreme", 90th–95th "Very High", 75th–90th "High", and the remainder "Moderate". "High-concentration" in this report refers to the combined Extreme + Very High set (top 10%, NASC ≥ 9,667 m²/nmi²). NASC-weighted centroids were computed by treating each hotspot midpoint as a position weighted by its NASC value. Where no Extreme or Very High readings existed in a given month-year combination, the centroid was computed from all transects in that period; these are noted with an asterisk in Figure 5. Geographic spread was computed as the bounding box span of high-concentration hotspots in degrees, converted to kilometres at the survey latitude (1° lat ≈ 111 km, 1° lon ≈ 78 km). Depth values shown in fathoms (1 fathom = 1.8288 m, 6 feet).