Supplementary material

Table S1. Overview of releases and recaptures divided by month. Note that the differences in recapture numbers are likely due to seasonal variation in fishing pressure

	January	February	March	April	May	June	July	August	September	October	November	December
Releases	2,478	2,594	3,652	974	1,388	590	96	312	423	995	2,242	1,625
Recaptures	1,357	1,752	2,056	2,248	2,358	1,838	1,186	950	862	963	908	891

Table S2. Advection (mean movement vector) for each ICES area. Note that for visualisation, the advection was used to calculate vector angle and distance and was scaled to half a year on Figure 2, 4-7. For the results of the bootstrap accuracy analyses, see the small points at the end of each advection arrow on Figure 2, 4-7. Note that decadal values may differ from total due to exclusion of decadal subsets for individual analyses

	Overall	<1960	1960-1970	1971-1980	1981-1999	2000-2020
Kattegat-Skagerrak (SD 20-21)	(0.01, 0.07)	-	-	(0.02, 0.09)	(-0.01, 0.05)	-
Belt Sea (SD 22)	(0.05, 0.05)	(0.03, 0.02)	(0.08, 0.11)	-	(0.06, 0)	-
The Sound (SD 23)	(-0.02, 0.02)	(-0.01, -0.03)	(0.01, -0.01)	(-0.04, 0.03)	(-0.10, 0.14)	-
Arkona Sea (SD 24)	(0.04, 0.03)	-	(0.04, 0.02)	(-0.03, 0.02)	-	(0.16, 0.08)
Bornholm Sea (SD 25)	(-0.04, -0.02)	(0.03, 0.03)	(-0.07, -0.02)	(-0.04, -0.04)	(0.04, -0.07)	(0, -0.02)
South-eastern Baltic Sea (SD 26)	(-0.34, 0.15)	(-0.54, 0.19)	(-0.37, 0.17)	(-0.17, 0.07)	-	(-0.23, 0.15)
The Western Gotland Basin (SD 27)	(-0.17, -0.52)	-	(-0.17, -0.54)	-	-	-
Gotland Sea (SD 28.2)	(-0.19, -0.42)	-	(-0.20, -0.48)	(-0.16, -0.31)	-	-
The Archipelago Sea (SD 29)	(-0.16, -0.53)	(-0.14, -0.77)	(-0.14, -0.29)	-	(-0.20, -0.52)	-
The Bothnian Sea (SD 30)	(0.01, -0.30)	-	-	-	(0.04, -0.32)	-
Gulf of Finland (SD 32)	(-0.10, 0.09)	-	-	(-0.14, 0.12)	(-0.03, 0.04)	-
Northern North Sea (Div. 4.a)	(0.09, -0.06)	-	-	(0.10, -0.05)	-	-
Central North Sea (Div. 4.b)	(-0.01, 0.42)	-	-	(0.02, 0.21)	(-0.15, 1.33)	(0.03, 0.68)
Southern North Sea (Div. 4.c)	(0.02, 0.90)	-	(0.04, 0.61)	(0.15, 0.99)	(-0.04, 0.98)	(0.06, 0.91)

Table S3. Diffusion (variance) for each ICES area. Note that for visualisation, the diffusion coefficient was used to calculate circle radius (kilometres) and was scaled to half a year on Figure 3-7. Parenthesis values indicate 2.5% and 97.5% confidence intervals, respectively. Note that decadal values may differ from total due to exclusion of decadal subsets for individual analyses.

	Overall	<1960	1960-1970	1971-1980	1981-1999	2000-2020
Kattegat-Skagerrak (SD 20-21)	4.17 (3.08, 5.48)	-	-	3.92 (2.79, 5.31)	8.65 (3.14, 16.15)	-
Belt Sea (SD 22)	5.47 (4.68, 6.31)	2.36 (1.69, 3.11)	11.01 (9.23, 12.99)	-	1.38 (1.04, 1.78)	-
The Sound (SD 23)	10.08 (7.72, 13.1)	6.45 (3.35, 10.14)	12.27 (6.82, 20.25)	4.40 (2.87, 6.31)	23.89 (18.62, 29.04)	-
Arkona Sea (SD 24)	19.55 (17.14, 22.15)	-	20.86 (17.65, 24.27)	17.90 (12.75, 23.88)	-	13.36 (10.45, 16.43)
Bornholm Sea (SD 25)	17.54 (16.19, 18.97)	20.47 (15.9, 25.64)	18.60 (16.79, 20.55)	15.86 (13.37, 18.7)	5.66 (3.62, 7.91)	11.82 (9.01, 14.89)
South-eastern Baltic Sea (SD 26)	38.25 (34.25, 42.42)	45.39 (35.19, 56.4)	40.03 (35.18, 45.15)	16.92 (12.32, 22.76)	-	20.30 (7.16, 40.04)
The Western Gotland Basin (SD 27)	132.01 (93.08, 177.05)	-	136.05 (94.8, 181.91)	-	-	-
Gotland Sea (SD 28.2)	33.33 (29.57, 37.22)	-	33.20 (29.04, 37.67)	31.29 (24.2, 38.83)	-	-
The Archipelago Sea (SD 29)	76.50 (51.32, 106.75)	95.69 (57.27, 141.47)	28.56 (14.87, 40.45)	-	88.07 (30.87, 166.9)	-
The Bothnian Sea (SD 30)	79.51 (30.23, 155.04)	-	-	-	87.27 (29.37, 180.74)	-
Gulf of Finland (SD 32)	13.92 (10.17, 18.03)	-	-	14.88 (10.77, 19.41)	0.79 (0.49, 1.13)	-
Northern North Sea (Div. 4.a)	18.64 (13.76, 24.28)	-	-	18.01 (13.04, 23.66)	-	-
Central North Sea (Div. 4.b)	51.78 (48.35, 55.32)	-	-	36.14 (32.36, 40.22)	66.06 (57.59, 75.06)	19.65 (13.24, 26.49)
Southern North Sea (Div. 4.c)	58.38 (54.41, 62.6)	-	46.35 (39.86, 53.17)	74.60 (62.84, 88.35)	50.63 (46.49, 55.14)	148.87 (99.29, 192.38)

Table S4. Advection (mean movement vector) and diffusion (variance) for the case studies. The values in the diffusion parenthesis indicate 2.5% and 97.5% confidence intervals for the diffusion, respectively. Note that for visualisation, the advection was used to calculate vector angle and distance, and the diffusion coefficient was used to calculate circle radius (kilometres); both were scaled to a month on Figure 8. For the results of the bootstrap accuracy analyses for advection, see the small points at the end of each advection arrow on Figure 8

	Advection	Diffusion
Aabenraa Fjord	(0.03, 0.01)	1.40 (0.78, 2.22)
Southern Belt Sea (SBS)	(0.13, 0.19)	13.57 (10.93, 16.32)
The Gulf of Finland	(-0.10, 0.09)	13.92 (10.17, 18.03)
South-eastern Baltic Sea (SEBS)	(-0.34, 0.15)	38.25 (34.25, 42.42)

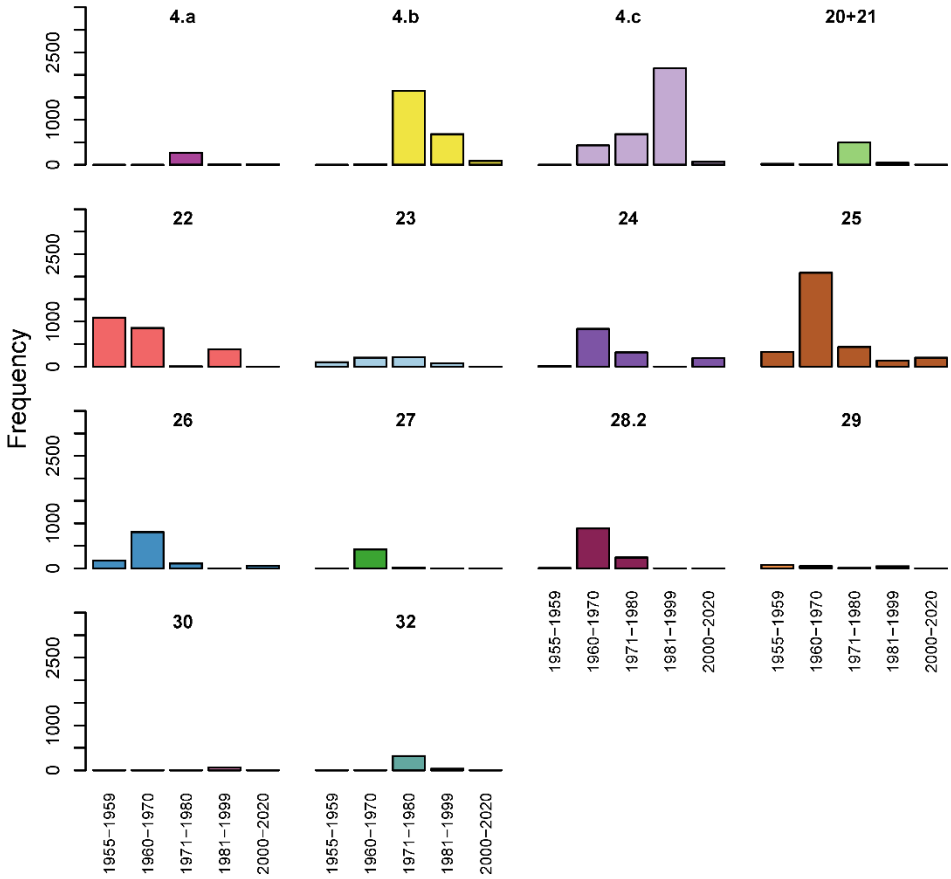

Fig. S1. Overview of number of recaptures across decades per release area. Recaptures are grouped by release ICES area and recapture decade and were not necessarily recaptured in the same ICES area. Note that ICES area 20 and 21 have been combined.

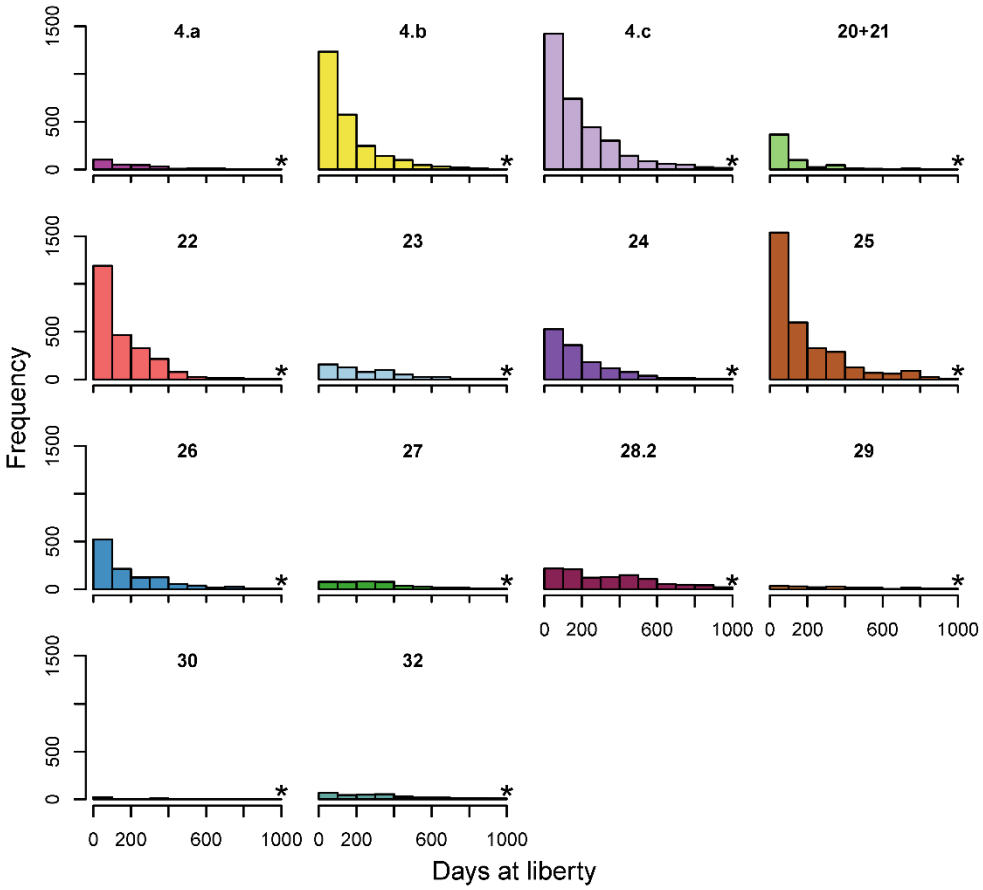

Fig. S2. Days at liberty for recaptures per release area. Note that ICES area 20 and 21 have been combined. Asterisks (*) indicate values above 1,000.

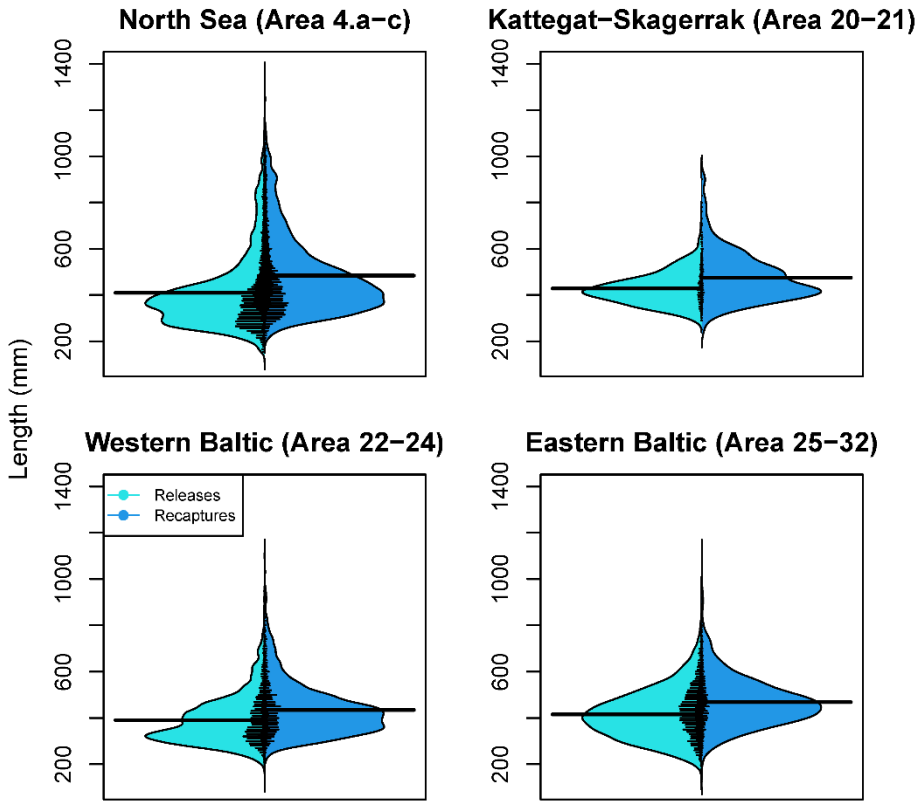

Fig. S3. Bean plots for release and recapture lengths across areas. Shaded areas depict density distributions, individual small lines indicate observations, and the horizontal thick lines represent the medians.

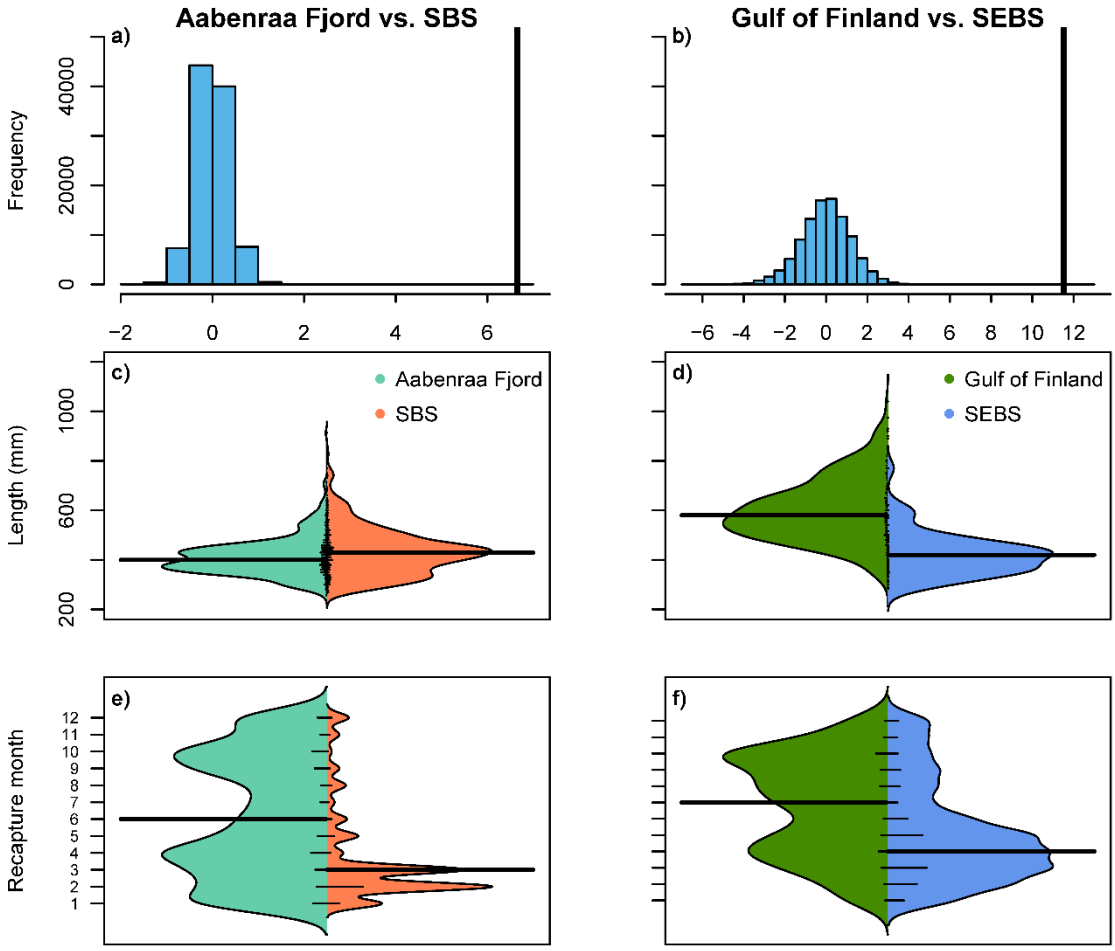

Fig. S4. Distributions of bootstrapped median differences for swimming distances (km month^{-1}) between locations, and recapture lengths and months for recaptures released in Aabenraa Fjord, the southern Belt Sea (SBS), the Gulf of Finland, and the south-eastern Baltic Sea (SEBS). a-b) Comparisons of bootstrapped median differences (n = 100,000), c-d) bean plots of recapture lengths, and e-f) bean plots of recapture months. For each median difference comparison, new bootstrap datasets were created for each population to calculate the median differences. Bean plots of recapture months and lengths were not bootstrapped but included to show distributions. Thick black lines indicate true median values for respective populations. Shaded areas in bean plots depict density distributions and individual small lines indicate observations.