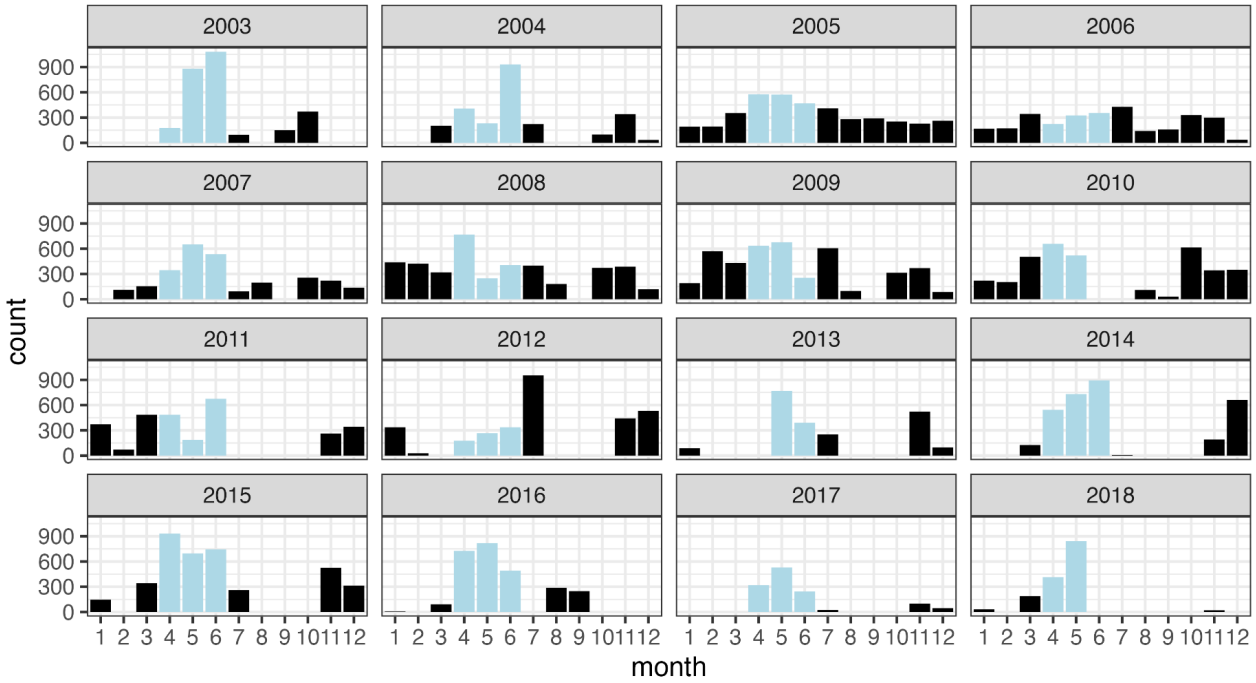

Figure S1. Count of humpback whale surveys in each grid cell in each year and month for the selected grids. April, May and June (blue) were the only months that were consistently sampled each year.

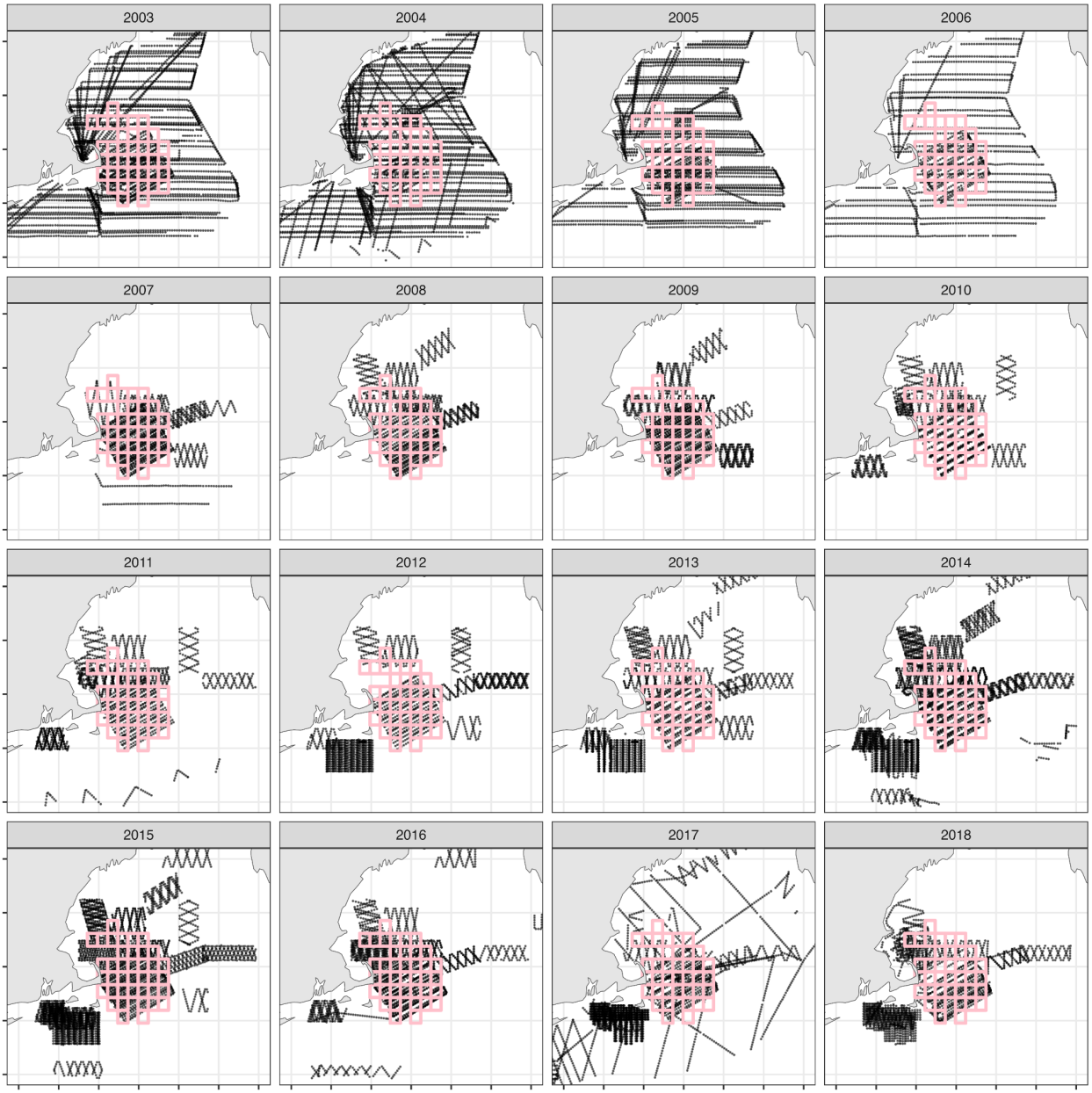

Figure S2. Whale survey transects in April May and June in consistently sampled grid cells (pink)

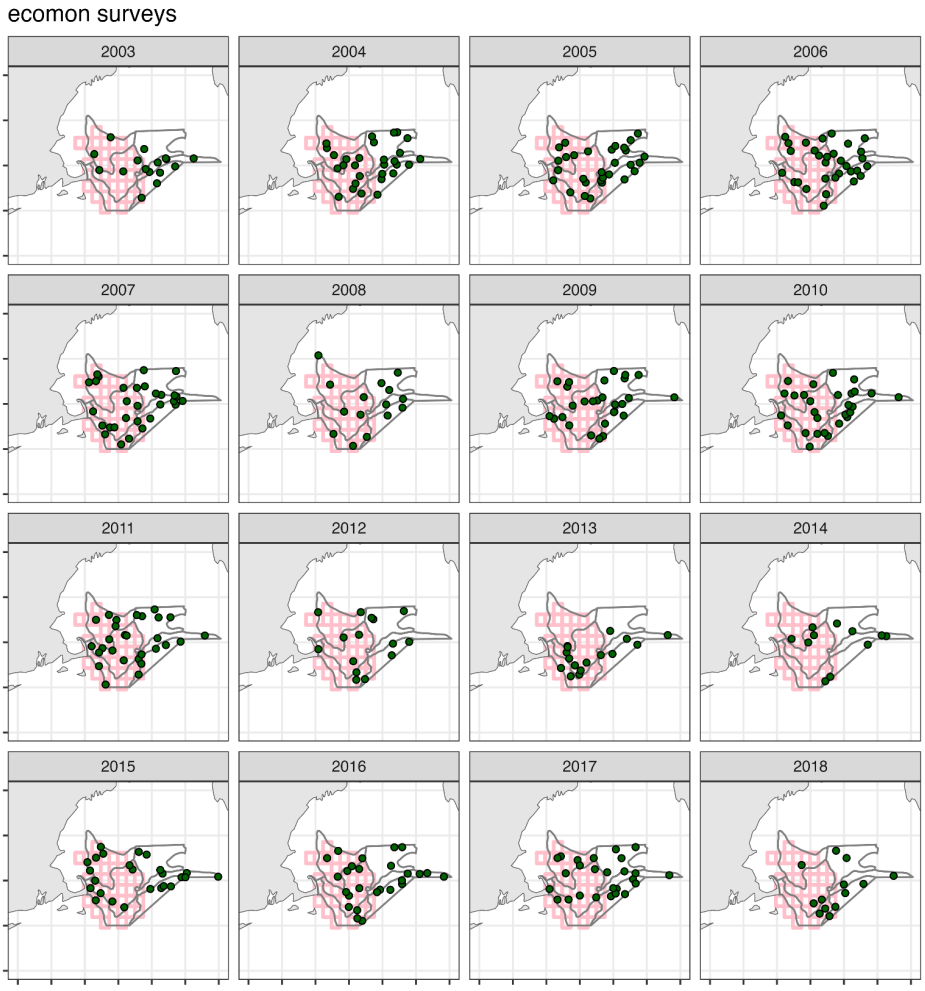

Figure S3. EcoMon strata (gray) and surveys in April May and June (green) in consistently sampled grid cells (pink)

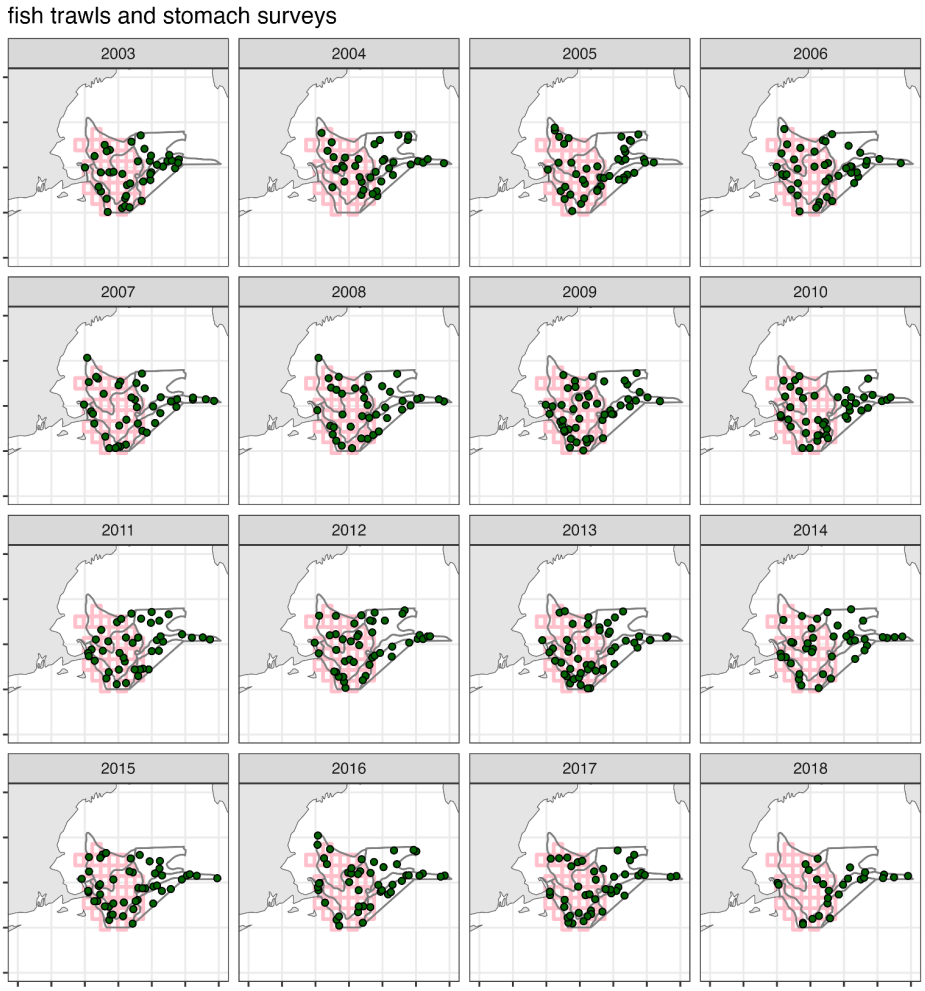

Figure S4. NEFSC bottom trawl and stomach content strata (gray) and surveys in April May and June (green) in consistently sampled grid cells (pink)

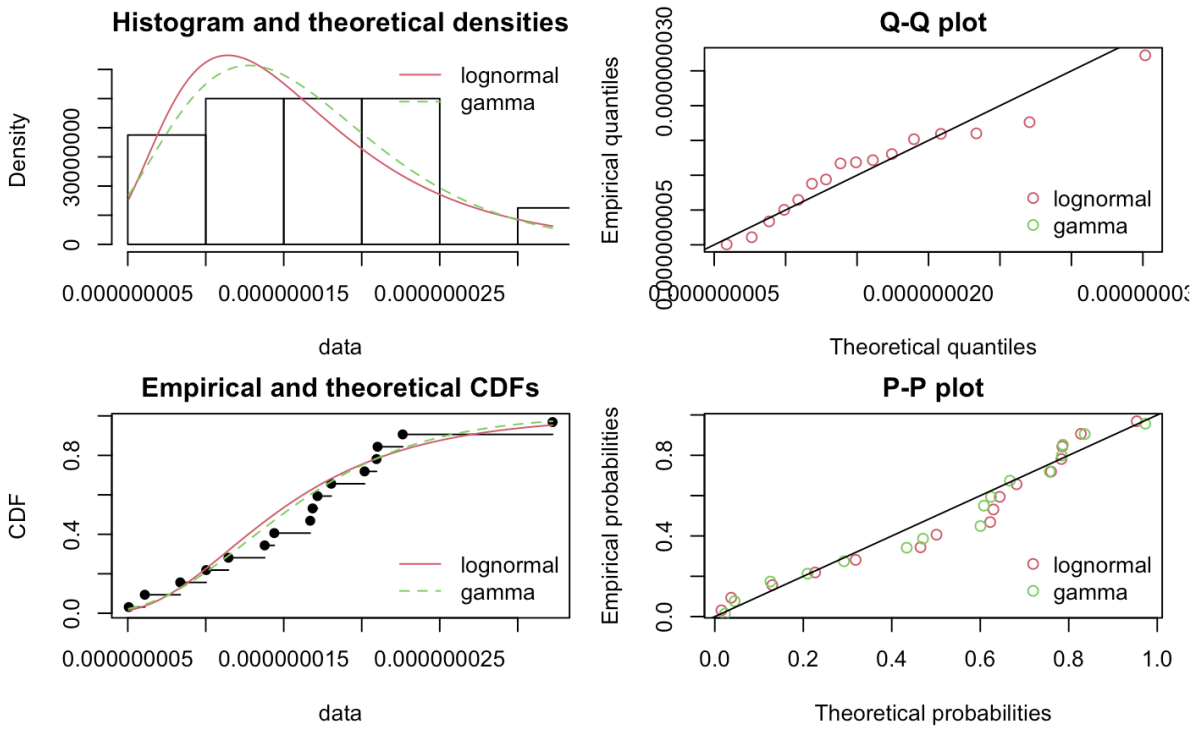

Figure S5. Comparing lognormal and gamma distributions. Density plot representing the density function of the fitted distribution along with the histogram of the empirical distribution, a CDF plot of both the empirical distribution and the fitted distribution, a Q-Q plot representing the empirical quantiles against the theoretical quantiles , a P-P plot representing the empirical distribution function evaluated at each data point against the fitted distribution function.

Figure S6. Number of humpback surveys in each two-week period in the Gulf of Maine used to calculate a central tendency of humpback density.

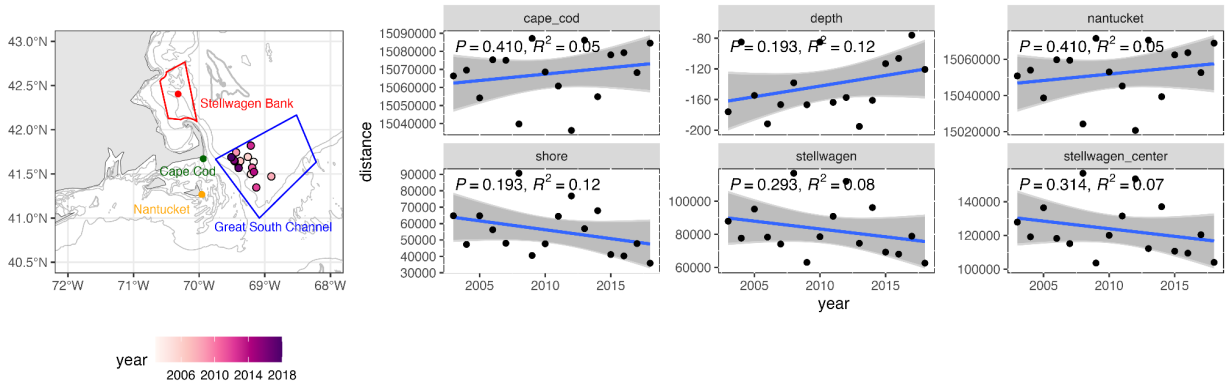

Figure S7. Mean centroids of humpback whale densities distance to selected geographic locations and depths over time. We did not observe any significant shifts over time.

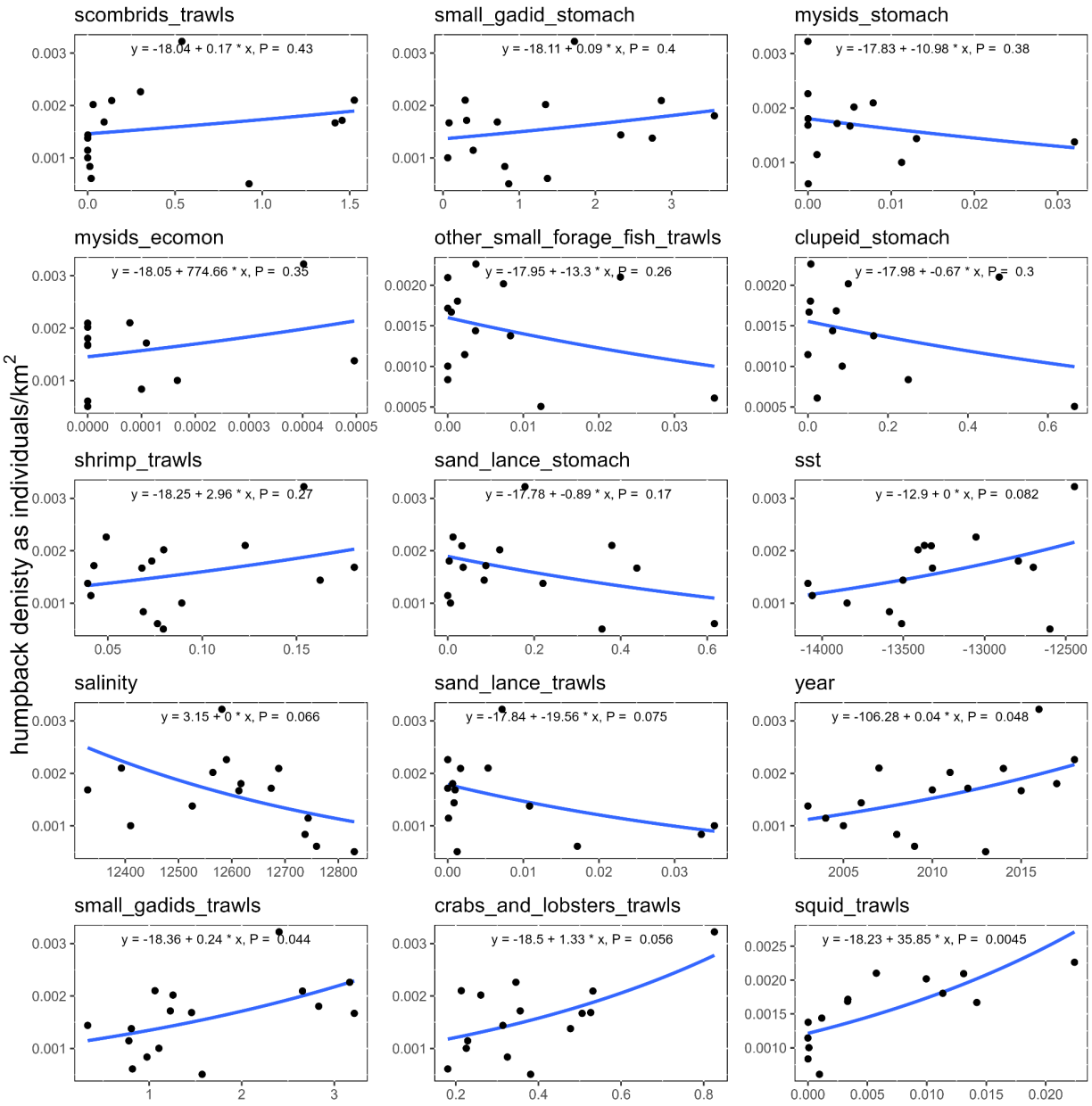

Figure S8. GLM results when relating humpback whale density to fish and invertebrate density and environmental conditions. Results shown for the top fifteen variables that explain the highest deviance in humpback whale density.

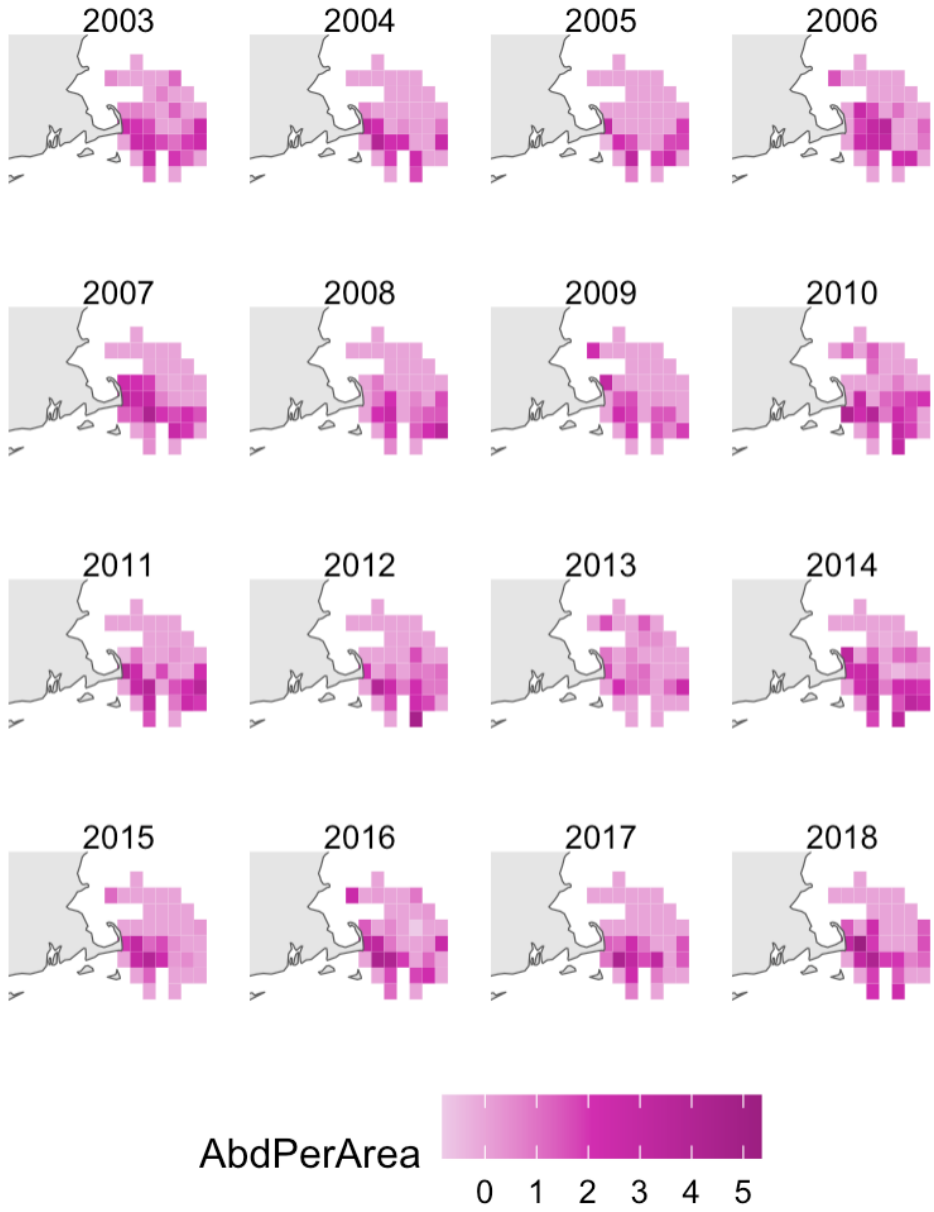

Figure S9. Spring humpback whale density for each year in consistently sampled grid cells.

Table S1. EcoMon categories and average annual swept area abundance (individuals/km^2) of each species within each category for the strata and months used for this analysis.

Category	Name	Average swept area abundance
Copepods	*Calanus finmarchicus*	580643.9
Copepods	*Pseudocalanus* spp.	159099
Copepods	Copepoda	82004.34
Copepods	*Metridia lucens*	48046.54
Copepods	*Oithona* spp.	41720.07
Copepods	*Centropages hamatus*	28699.27
Copepods	*Temora longicornis*	17631.34
Copepods	*Centropages typicus*	13436.65
Amphipods	Hyperiidea	9806.05
Euphausiids	Euphausiacea	6604.08
Copepods	*Clausocalanus arcuicornis*	1457.7
Amphipods	Gammaridea	1333.16
Copepods	*Acartia longiremis*	1216.14
Copepods	*Calanus* spp.	973.77
Copepods	*Paracalanus parvus*	626.66
Ichthyoplankton	Pisces	424.13
Copepods	*Acartia* spp.	359.66
Copepods	*Tortanus discaudatus*	332.85

Mysids	Mysidacea	185.29
Copepods	*Oncaea* spp.	128.21
Ichthyoplankton	*Sebastes*	26.18
Euphausiids	*Meganyctiphanes norvegica*	25.62
Copepods	*Temora* spp.	18.76
Ichthyoplankton	*Ammodytes*	15.28
Ichthyoplankton	*Pseudopleuronectes americanus*	8.88
Ichthyoplankton	*Melanogrammus aeglefinus*	7.21
Ichthyoplankton	*Scophthalmus aquosus*	5.22
Copepods	*Paracalanus* spp.	4.51
Euphausiids	*Thysanoessa longicaudata*	4.37
Euphausiids	Thysanoessa	3.9
Ichthyoplankton	*Gadus morhua*	2.98
Ichthyoplankton	*Limanda ferruginea*	2.85
Euphausiids	*Thysanoessa inermis*	2.51
Ichthyoplankton	*Enchelyopus cimbrius*	2.29
Ichthyoplankton	*Hippoglossoides platessoides*	1.7
Euphausiids	*Thysanoessa raschii*	1.63
Ichthyoplankton	*Myoxocephalus octodecemspinosus*	1.44
Ichthyoplankton	*Myoxocephalus aenaeus*	0.72
Ichthyoplankton	*Scomber scombrus*	0.48

Ichthyoplankton	*Tautogolabrus adspersus*	0.44
Ichthyoplankton	*Merluccius bilinearis*	0.33
Ichthyoplankton	*Pollachius virens*	0.27
Ichthyoplankton	*Clupea harengus*	0.15
Ichthyoplankton	*Brevoortia tyrannus*	0.04
Ichthyoplankton	*Pholis gunnellus*	0.04
Ichthyoplankton	*Glyptocephalus cynoglossus*	0.03
Ichthyoplankton	*Benthosema* spp.	0.03
Ichthyoplankton	*Urophycis* spp.	0.02
Ichthyoplankton	*Lophius americanus*	0.01
Ichthyoplankton	*Cyclothone* spp.	0.01
Ichthyoplankton	*Hippoglossina oblonga*	0

Table S2. Stomach content categories and average annual biomass (g/tow) of each prey species within each category for the strata and months used for this analysis.

Category	Name	Average biomass (g/tow)
small gadid	*Merluccius bilinearis*	1.2875
clupeid	*Clupea harengus*	1.0776
shrimp	Crustacean shrimp	0.9199
euphausiids	Euphausiacea	0.7561
shrimp	Pandalidae	0.5352
shrimp	Decapoda shrimp	0.4769
crabs and lobsters	Decapoda shrimp	0.4769
small gadid	Gadidae	0.3994
crabs and lobsters	Cancridae	0.3832
crabs and lobsters	Decapoda crab	0.3162
sand lance	*Ammodytes* spp.	0.3051
clupeid	Clupeidae	0.2519
small gadid	*Urophycis* spp.	0.2426
amphipods	Gammaridea	0.241
small gadid	*Urophycis tenuis*	0.1019
small gadid	Macrouridae	0.0988
shrimp	Crangonidae	0.0559
crabs and lobsters	Paguroidea	0.0512

clupeid	*Alosa pseudoharengus*	0.0363
squid	*Loligo* spp.	0.0349
shrimp	Stomatopoda	0.0344
copepod	Copepoda	0.0334
small gadid	*Urophycis chuss*	0.0329
shrimp	Penaeidae	0.0287
small gadid	*Enchelyopus cimbrius*	0.0193
mysids	Mysidacea	0.019
squid	Cephalopoda	0.0182
crabs and lobsters	*Homarus americanus*	0.0174
amphipods	Hyperiidae	0.0021
amphipods	Caprellidae	0.0011
squid	Sepiolidae	0.001
shrimp	Cumacea	0
crabs and lobsters	Decapoda larvae	0

Table S3. Fish trawl categories and average annual swept area biomass (mt/km^2) of each species within each category for the strata and months used for this analysis.

Category	Species	Biomass
clupeids	Atlantic herring	0.8493
small gadids	White hake	0.6462
other small forage fish	Atlantic argentine	0.6213
small gadids	Silver hake	0.5347
small gadids	Red hake	0.3733
scombrids	Atlantic mackerel	0.3594
crabs and lobsters	American lobster	0.2063
clupeids	Alewife	0.082
clupeids	American shad	0.0717
clupeids	Blueback herring	0.0683
shrimp	Shrimp unclassified	0.0657
shrimp	Bristled longbeak	0.0191
shrimp	Northern shrimp	0.0191
crabs and lobsters	Jonah crab	0.0182
sand lance	Northern sand lance	0.0157
small gadids	Offshore hake	0.0084
shrimp	Pink glass shrimp	0.008
squid	Longfin squid	0.0078

crabs and lobsters	Northern stone crab	0.0033
small gadids	Fourbeard rockling	0.003
crabs and lobsters	Swimming crab unclassified	0.0024
small gadids	Grenadier unclassified	0.002
crabs and lobsters	Atlantic rock crab	0.002
small gadids	Longfin hake	0.002
squid	Northern shortfin squid	0.0014
other small forage fish	Striated argentine	0.0011
shrimp	Sevenspine bay shrimp	0.0006
crabs and lobsters	Lady crab	0.0006
shrimp	Norwegian shrimp	0.0003
squid	Bobtail unclassified	0.0003
squid	Shield bobtail	0.0003
shrimp	Brown rock shrimp	0.0003
shrimp	Aesop shrimp	0.0002
small gadids	Spotted hake	0.0001
shrimp	Friendly blade shrimp	0.0001
shrimp	Polar lebbeid	0
small gadids	Hake unclassified	0
other small forage fish	Atlantic silverside	0
clupeids	Herring unclassified	0

squid	Squid cuttlefish and octopod unclassified	0
crabs and lobsters	Galatheid unclassified	0
small gadids	Codlings	0
shrimp	Spiny lebbeid	0
clupeids	Atlantic herring	0.8493

Table S4. GLM model results for the Great South Channel. Deviance represents deviance explained versus the null model.

Variable	**Deviance**	**p-value**	**Coefficient**	**Direction**
Squid (trawls)	0.45	0	35.85	positive
Crabs and lobsters (trawls)	0.26	0.06	1.33	positive
Small gadids (trawls)	0.23	0.04	0.24	positive
Year	0.21	0.05	0.04	positive
Sand lance (trawls)	0.2	0.08	-19.56	negative
Salinity	0.18	0.07	0	negative
SST	0.16	0.08	0	positive
Sand lance (stomach)	0.11	0.17	-0.89	negative
Shrimp (trawls)	0.09	0.27	2.96	positive
Clupeid (stomach)	0.08	0.3	-0.67	negative

Other small forage fish (trawls)	0.08	0.26	-13.3	negative
Mysids (EcoMon)	0.07	0.35	774.66	positive
Mysids (stomach)	0.06	0.38	-10.98	negative
Small gadid (stomach)	0.05	0.4	0.09	positive
Scombrids (trawls)	0.04	0.43	0.17	positive
Squid (stomach)	0.03	0.53	22.77	positive
Amphipods (EcoMon)	0.02	0.56	-6.9	negative
Copepods (EcoMon)	0.01	0.6	0.24	positive
Amphipods (stomach)	0.01	0.66	-0.39	negative
Euphausiids (stomach)	0.01	0.66	-0.1	negative
Euphausiids (EcoMon)	0.01	0.7	3.7	positive
Shrimp (stomach)	0	0.78	-0.06	negative
Ichthyoplankton (EcoMon)	0	0.83	-407.82	negative
Crabs and lobsters (stomach)	0	0.87	0.06	positive
Chl *a*	0	0.9	-0.04	negative
Copepod (stomach)	0	0.92	0.6	positive
Clupeids (trawls)	0	0.99	0	positive