

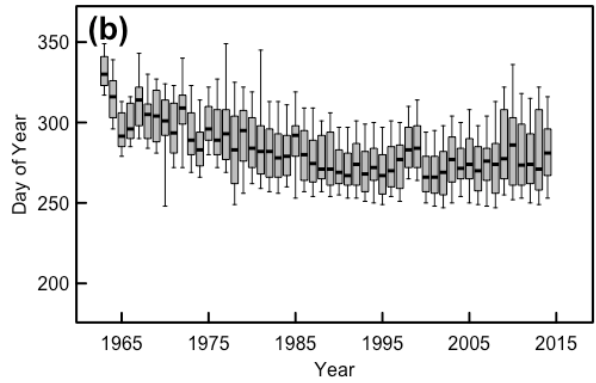
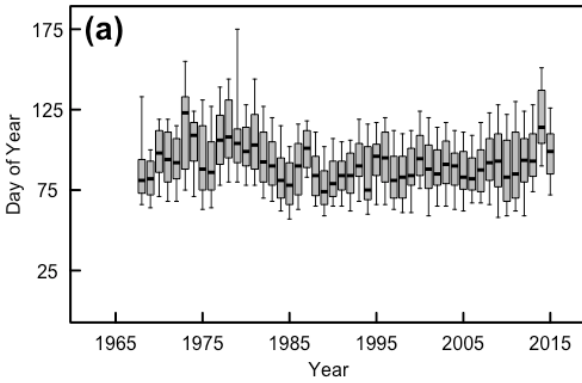
Ecography

ECOG-03961

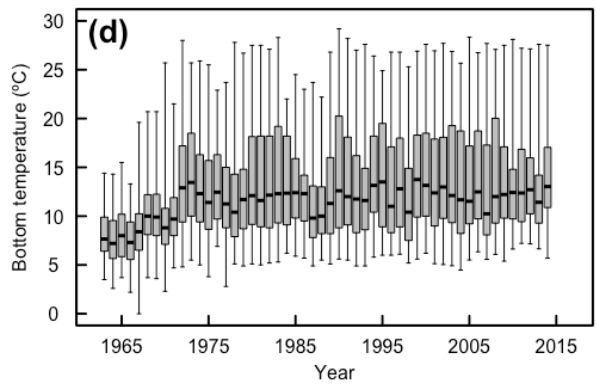
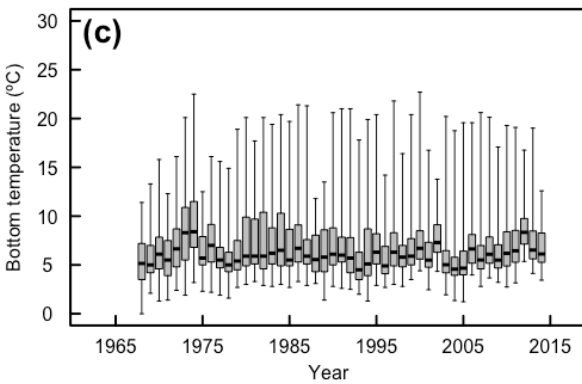
Flanagan, P. H., Jensen, O. P., Morley, J. W. and Pinsky, M. L. 2019. Response of marine communities to local temperature changes. – *Ecography* doi: 10.1111/ecog.03961

Supplementary material

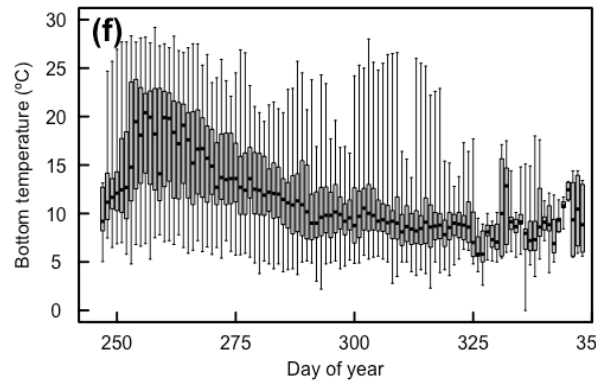
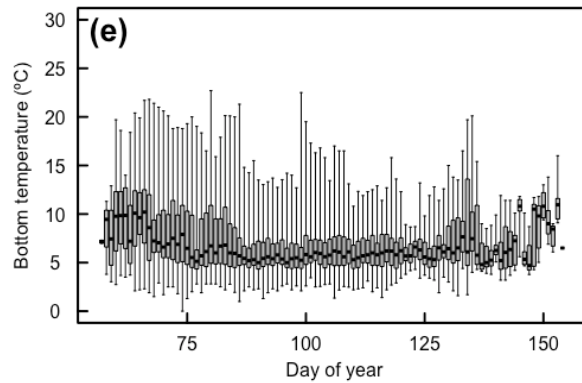
Appendix 1



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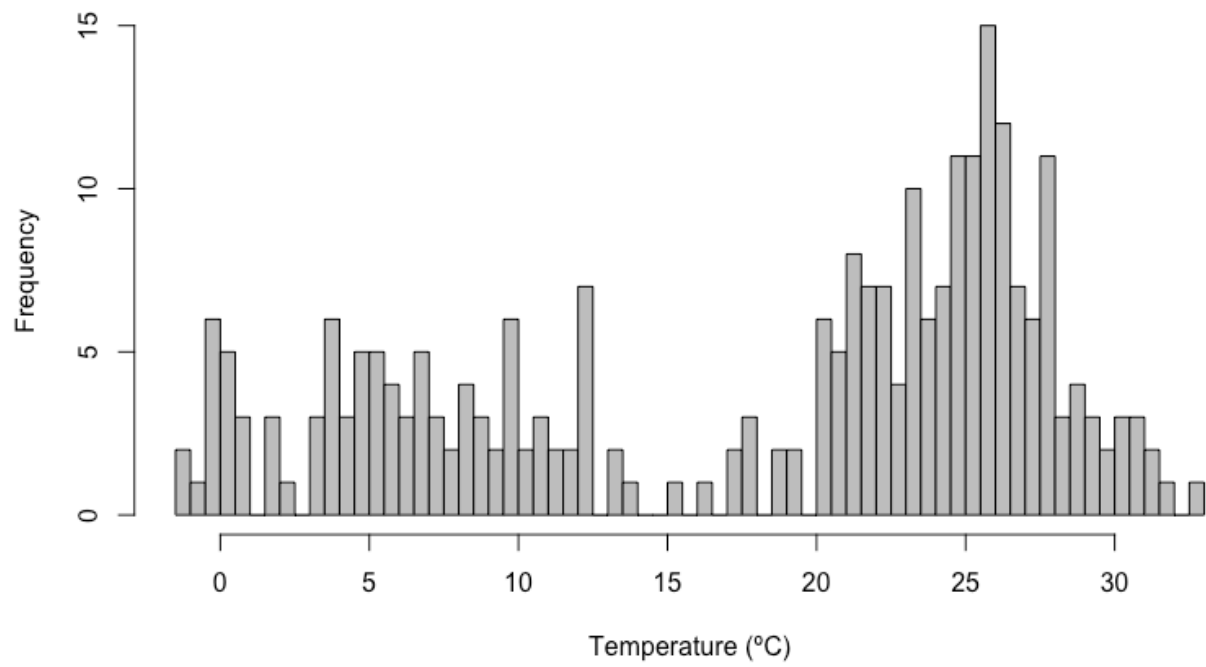


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6 Figure A1. Boxplots of annual survey sampling days per year in spring (a) and fall (b), bottom
7 temperature measurements per year in spring (c) and fall (d), and bottom temperatures per day of
8 year in spring (e) and fall (f) time series. Black bars indicate mean, gray boxes include 95% of
9 range, and whiskers include entire range of data points.

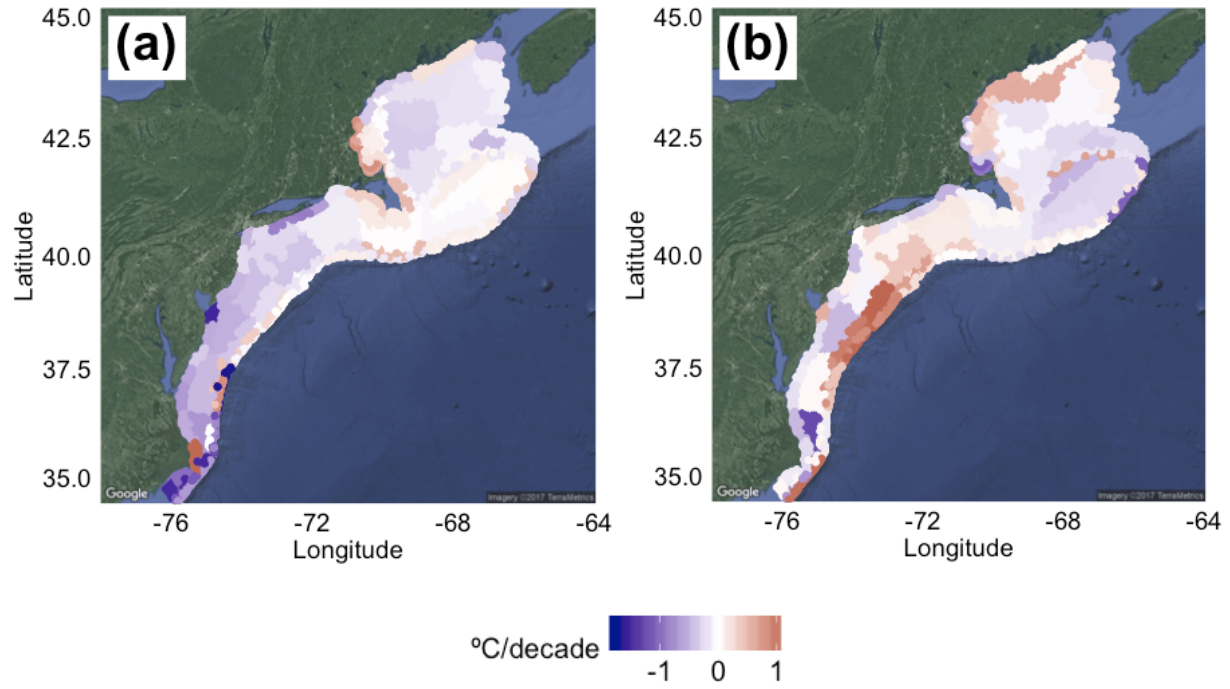
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12 Figure A2. Histogram of Species Thermal Index values for the 246 demersal fish and invertebrate

13 species found in the Northeast U.S. Continental Shelf ecosystem and used in this study.

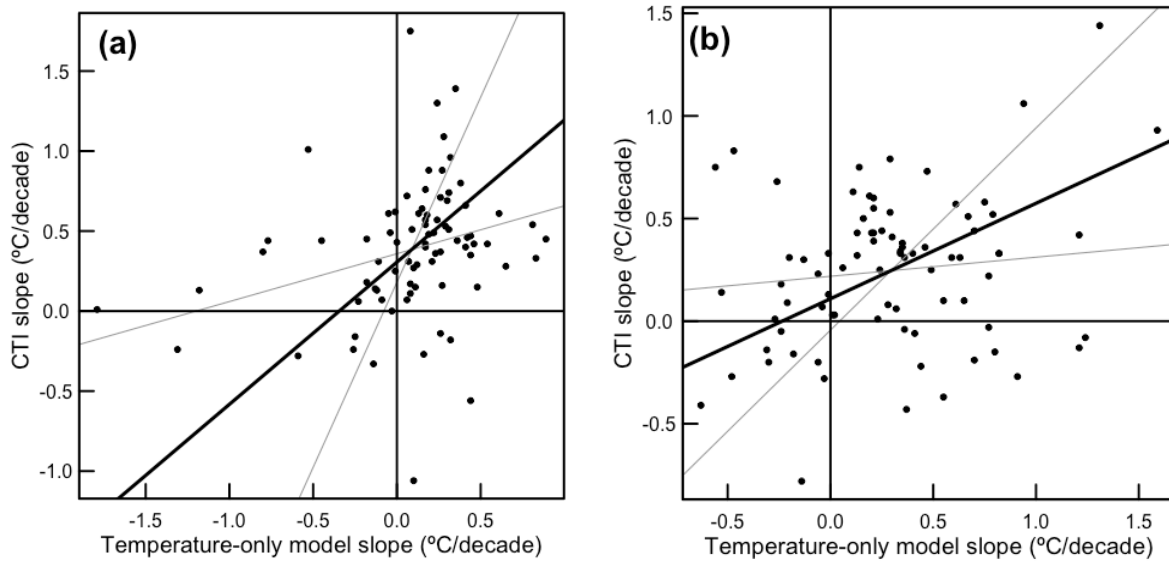


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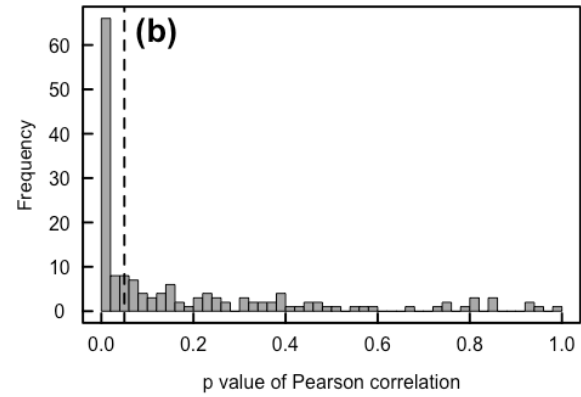
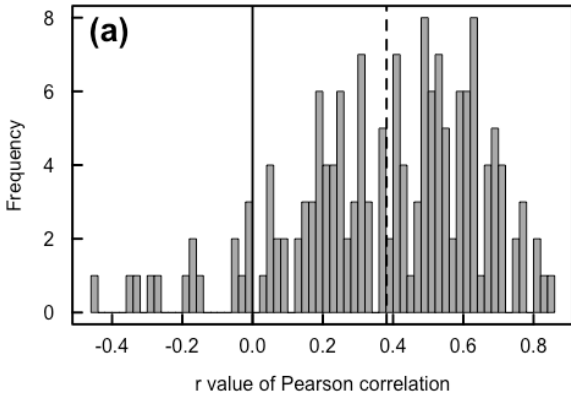
16 Figure A3. Maps of the difference in slopes of long-term trends (bottom temperature slope minus

17 CTI slope) in (a) spring and (b) fall strata.

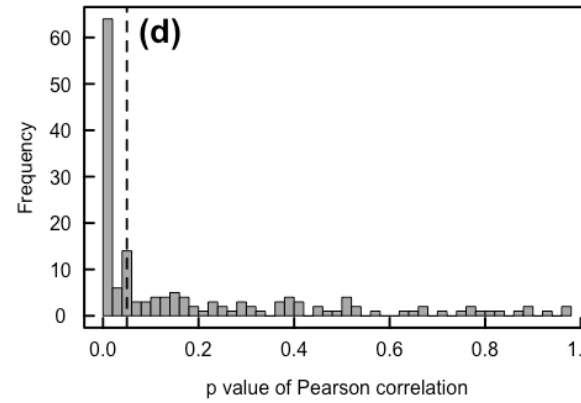
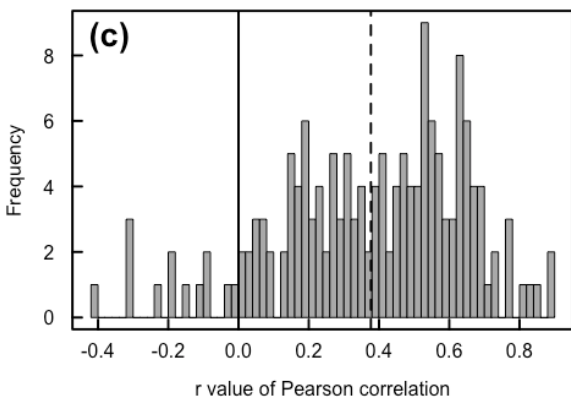


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19 Figure A4. Model II major axis linear regression between change in temperature-only model CTI
 20 and change in observed CTI in spring (a) and fall (b) communities. Spring slope = 0.88, $r^2 =$
 21 0.066, $P = 0.0223$; fall slope = 0.465, $r^2 = 0.062$, $P = 0.026$.



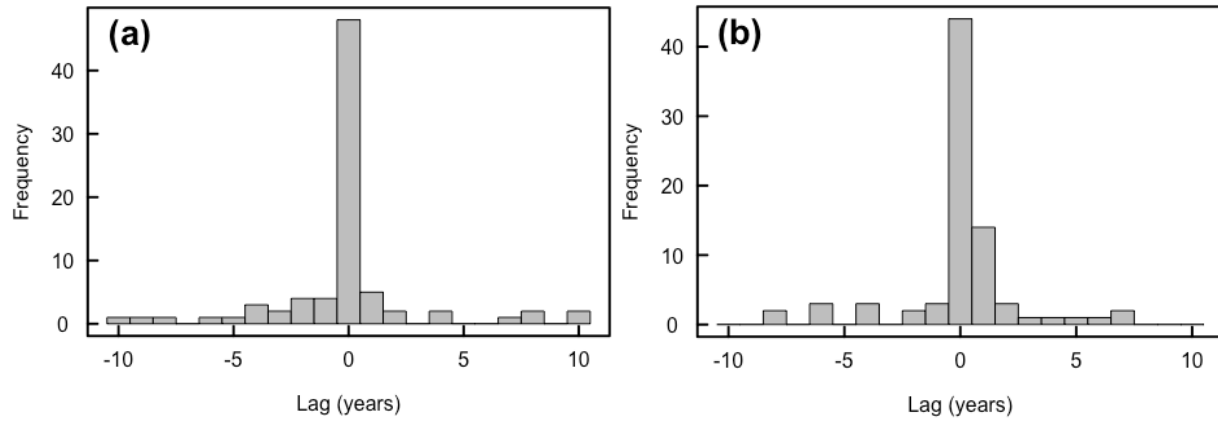
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25 Figure A5. Pearson's correlations between interannual values of bottom temperature or null
 26 model CTI and observed CTI in each stratum and season. (a) Histogram of r values between
 27 bottom temperature and observed CTI, with dashed line denoting mean ($n = 160$, mean $r =$
 28 0.381). (b) Histogram of P values between bottom temperature and observed CTI, with dashed
 29 line denoting $P = 0.05$ ($n = 160$, $n(P \leq 0.05) = 77$). (c) Histogram of r values between null model
 30 and observed CTI, with dashed line denoting r of 0.5 ($n = 160$, mean $= 0.377$). (d) Histogram of
 31 P values between null model and observed CTI, with dashed line denoting $P = 0.05$ ($n = 160$,
 32 $n(P \leq 0.05) = 75$).



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34 Figure A6. Histograms of the lag with the highest cross-correlation between detrended time

35 series. Frequency of lags between bottom temperature and observed CTI in (a) spring and (b) fall

36 time series.

37 Table A1. Species temperature index (STI) values for 260 fishes and invertebrates found on the
 38 Northeast U.S. continental shelf. STI is the median of the GAM-modeled probability of presence
 39 at each temperature from the training dataset (Gulf of Mexico to Labrador). “Trawls” indicates
 40 the number of trawls in the testing dataset (Northeast U.S. 1990-2014) where that species was
 41 present. Some species are included here because they were present in more than 250 trawls in the
 42 Northeast U.S. 1968-1989, even though they did not occur in the testing dataset.

Scientific name	Common name	STI (°C)	Trawls
<i>Merluccius bilinearis</i>	Silver hake	9.52	9141
<i>Loligo pealeii</i>	Longfin squid	13.22	7336
<i>Squalus acanthias</i>	Spiny dogfish	9.47	6726
<i>Leucoraja erinacea</i>	Little skate	9.17	6666
<i>Urophycis chuss</i>	Red hake	9.47	6450
<i>Peprilus triacanthus</i>	Butterfish	17.37	6205
<i>Clupea harengus</i>	Atlantic herring	6.77	6098
<i>Urophycis regia</i>	Spotted hake	14.22	4758
<i>Hippoglossina oblonga</i>	American fourspot flounder	11.12	4749
<i>Homarus americanus</i>	American lobster	11.67	4699
<i>Scophthalmus aquosus</i>	Windowpane	13.42	4381
<i>Alosa pseudoharengus</i>	Alewife	8.72	4286
<i>Leucoraja ocellata</i>	Winter skate	9.62	4270
<i>Myoxocephalus octodecemspinosus</i>	Longhorn sculpin	6.97	4071
<i>Pseudopleuronectes americanus</i>	Winter flounder	10.22	3951
<i>Illex illecebrosus</i>	Northern shortfin squid	10.37	3862
<i>Placopecten magellanicus</i>	Sea scallop	9.12	3835
<i>Paralichthys dentatus</i>	Summer flounder	21.62	3784
<i>Lophius americanus</i>	Goosefish	9.62	3759
<i>Hippoglossoides platessoides</i>	American plaice	4.52	3406
<i>Urophycis tenuis</i>	White hake	9.32	3274
<i>Melanogrammus aeglefinus</i>	Haddock	7.42	3253
<i>Limanda ferruginea</i>	Yellowtail flounder	5.72	3184
<i>Zoarces americanus</i>	Ocean pout	6.22	3122
<i>Gadus morhua</i>	Atlantic cod	4.87	3117
<i>Hemitripterus americanus</i>	Sea raven	7.02	3040
<i>Glyptocephalus cynoglossus</i>	Witch flounder	5.97	2858
<i>Prionotus carolinus</i>	Northern searobin	21.12	2744
<i>Citharichthys arctifrons</i>	Gulf stream flounder	10.87	2709
<i>Sebastes fasciatus</i>	Acadian redfish	7.72	2608
<i>Scomber scombrus</i>	Atlantic mackerel	10.07	2460
<i>Stenotomus chrysops</i>	Scup	14.52	2374

Scientific name	Common name	STI (°C)	Trawls
<i>Cancer borealis</i>	Jonah crab	10.52	2370
<i>Alosa aestivalis</i>	Blueback herring	6.27	2304
<i>Centropristis striata</i>	Black sea bass	20.57	1778
<i>Amblyraja radiata</i>	Thorny skate	5.07	1643
<i>Mustelus canis</i>	Smooth dogfish	17.12	1626
<i>Pomatomus saltatrix</i>	Bluefish	20.87	1589
<i>Alosa sapidissima</i>	American shad	9.62	1546
<i>Pollachius virens</i>	Pollock	7.07	1522
<i>Raja eglanteria</i>	Clearnose skate	18.27	1494
<i>Malacoraja senta</i>	Smooth skate	5.67	1424
<i>Dipturus laevis</i>	Barndoor skate	8.37	1337
<i>Ammodytes dubius</i>	Northern sand lance	2.87	1189
<i>Enchelyopus cimbrius</i>	Fourbeard rockling	6.47	1182
<i>Cynoscion regalis</i>	Weakfish	22.07	1170
<i>Bathypolypus arcticus</i>	Spoonarm octopus	15.62	1151
<i>Helicolenus dactylopterus</i>	Blackbelly rosefish	10.47	1148
<i>Prionotus evolans</i>	Striped searobin	27.27	1141
<i>Micropogonias undulatus</i>	Atlantic croaker	25.62	1113
<i>Pandalus borealis</i>	Northern shrimp	2.77	1111
<i>Lepophidium profundorum</i>	Fawn cusk-eel	11.67	1081
<i>Anchoa mitchilli</i>	Bay anchovy	25.12	1053
<i>Leiostomus xanthurus</i>	Spot	26.12	997
<i>Anchoa hepsetus</i>	Striped anchovy	25.42	791
<i>Etropus microstomus</i>	Smallmouth flounder	15.22	777
<i>Limulus polyphemus</i>	Horseshoe crab	17.52	728
<i>Menidia menidia</i>	Atlantic silverside	4.37	727
<i>Scyliorhinus retifer</i>	Chain dogfish	12.27	718
<i>Ovalipes ocellatus</i>	Lady crab	22.52	697
<i>Sphoeroides maculatus</i>	Northern puffer	19.47	612
<i>Aspidophoroides monoptyerygius</i>	Alligatorfish	2.32	606
<i>Leucoraja garmani</i>	Rosette skate	13.37	572
<i>Myxine glutinosa</i>	Atlantic hagfish	7.07	572
<i>Tautoglabrus adspersus</i>	Cunner	12.17	509
<i>Synodus foetens</i>	Inshore lizardfish	23.57	503
<i>Decapterus punctatus</i>	Round scad	24.02	476
<i>Selene setapinnis</i>	Atlantic moonfish	25.27	470
<i>Trachurus lathami</i>	Rough scad	20.57	470
<i>Menticirrhus saxatilis</i>	Northern kingfish	23.27	467
<i>Pasiphaea multidentata</i>	Pink glass shrimp	6.67	463
<i>Morone saxatilis</i>	Striped bass	9.57	453
<i>Chlorophthalmus agassizi</i>	Shortnose greeneye	11.12	451
<i>Maurollicus weitzmani</i>	Weitzmans pearlsides	11.97	444
<i>Pandalus montagui</i>	Aesop shrimp	0.77	441

Scientific name	Common name	STI (°C)	Trawls
<i>Atlantopandalus propinqvus</i>	N/A	4.22	436
<i>Menticirrhus americanus</i>	Southern kingfish	25.57	436
<i>Myliobatis freminwillii</i>	Bullnose ray	19.47	430
<i>Zenopsis conchifera</i>	Buckler dory	13.17	407
<i>Merluccius albidus</i>	Offshore hake	9.57	390
<i>Dasyatis say</i>	Bluntnose stingray	22.17	388
<i>Caranx crysos</i>	Blue runner	26.22	373
<i>Opisthonema oglinum</i>	Atlantic thread herring	26.12	354
<i>Brosme brosme</i>	Cusk	7.67	344
<i>Dasyatis centroura</i>	Roughtail stingray	21.57	338
<i>Lithodes maja</i>	Northern stone crab	6.37	332
<i>Hippoglossus hippoglossus</i>	Atlantic halibut	7.12	322
<i>Cryptacanthodes maculatus</i>	Wrymouth	4.97	307
<i>Gymnura altavela</i>	Spiny butterfly ray	21.17	307
<i>Triglops murrayi</i>	Moustache sculpin	1.97	302
<i>Ovalipes stephensoni</i>	Coarsehand lady crab	22.17	295
<i>Callinectes sapidus</i>	Blue crab	28.17	291
<i>Anarhichas lupus</i>	Atlantic wolffish	3.82	281
<i>Syngnathus fuscus</i>	Northern pipefish	7.42	276
<i>Squatina dumeril</i>	Atlantic angel shark	18.67	267
<i>Stephanolepis hispidus</i>	Planehead filefish	24.72	266
<i>Chaceon quinquegens</i>	Atlantic deep sea red crab	8.32	264
<i>Ophidion marginatum</i>	Striped cusk-eel	19.77	260
<i>Brevoortia tyrannus</i>	Atlantic menhaden	19.27	258
<i>Peristedion miniatum</i>	Armored searobin	12.12	256
<i>Orthopristis chrysoptera</i>	Pigfish	24.72	251
<i>Phycis chesteri</i>	Longfin hake	7.07	249
<i>Melanostigma atlanticum</i>	Atlantic soft pout	5.17	242
<i>Rhizoprionodon terraenovae</i>	Atlantic sharpnose shark	27.32	240
<i>Argentina silus</i>	Atlantic argentine	9.02	238
<i>Decapterus macarellus</i>	Mackerel scad	21.37	235
<i>Larimus fasciatus</i>	Banded drum	25.87	234
<i>Crangon septemspinosa</i>	Sevenspine bay shrimp	4.87	229
<i>Sardinella aurita</i>	Spanish sardine	25.12	225
<i>Polymixia lowei</i>	Beardfish	13.52	220
<i>Cyclopterus lumpus</i>	Lumpfish	1.07	218
<i>Conger oceanicus</i>	Conger eel	17.37	198
<i>Scomberomorus maculatus</i>	Spanish mackerel	26.92	183
<i>Bairdiella chrysoura</i>	Silver perch	21.12	175
<i>Trichiurus lepturus</i>	Atlantic cutlassfish	24.37	170
<i>Leptoclinus maculatus</i>	Daubed shanny	0.82	165
<i>Chionoecetes opilio</i>	Snow crab	2.52	153
<i>Lagodon rhomboides</i>	Pinfish	24.02	153

Scientific name	Common name	STI (°C)	Trawls
<i>Sphyraena borealis</i>	Northern sennet	25.47	149
<i>Balistes capriscus</i>	Gray triggerfish	26.47	146
<i>Engraulis eurystole</i>	Silver anchovy	21.27	145
<i>Gymnura micrura</i>	Smooth butterfly ray	23.17	143
<i>Sicyonia brevirostris</i>	Brown rock shrimp	22.27	141
<i>Trachinocephalus myops</i>	Snakefish	23.07	141
<i>Liparis atlanticus</i>	Atlantic seasnail	5.17	138
<i>Lumpenus lampretaeformis</i>	Snakeblenny	2.77	134
<i>Trinectes maculatus</i>	Hogchoker	25.62	125
<i>Rhinoptera bonasus</i>	Cownose ray	22.72	124
<i>Chilomycterus schoepfii</i>	Striped burrfish	23.77	121
<i>Scomber japonicus</i>	Chub mackerel	20.92	115
<i>Selar crumenophthalmus</i>	Bigeye scad	23.37	109
<i>Symphurus plagiusa</i>	Blackcheek tonguefish	21.37	109
<i>Pontophilus norvegicus</i>	Norwegian shrimp	4.92	104
<i>Carcharhinus plumbeus</i>	Sandbar shark	19.27	103
<i>Lolliguncula brevis</i>	Atlantic brief squid	25.07	102
<i>Scomberesox saurus</i>	Atlantic saury	8.87	99
<i>Lebbeus polaris</i>	Polar lebbeid	0.42	97
<i>Peprilus paru</i>	American harvestfish	26.32	96
<i>Chaetodipterus faber</i>	Atlantic spadefish	28.87	90
<i>Dasyatis americana</i>	Southern stingray	26.57	88
<i>Rachycentron canadum</i>	Cobia	26.42	82
<i>Nemichthys scolopaceus</i>	Slender snipe eel	7.42	81
<i>Octopus vulgaris</i>	Common octopus	22.07	72
<i>Syacium papillosum</i>	Dusky flounder	22.82	68
<i>Lebbeus groenlandicus</i>	Spiny lebbeid	0.17	66
<i>Priacanthus arenatus</i>	Bigeye	21.37	66
<i>Ulvaria subbifurcata</i>	Radiated shanny	4.02	66
<i>Prionotus alatus</i>	Spiny searobin	19.27	62
<i>Upeneus parvus</i>	Dwarf goatfish	21.57	62
<i>Synodus poeyi</i>	Offshore lizardfish	20.92	58
<i>Reinhardtius hippoglossoides</i>	Greenland halibut	3.12	56
<i>Pogonias cromis</i>	Black drum	20.47	55
<i>Caranx hippos</i>	Creville jack	23.77	53
<i>Porichthys plectrodon</i>	Atlantic midshipman	24.27	52
<i>Centropristis philadelphica</i>	Rock sea bass	22.87	50
<i>Selene vomer</i>	Lookdown	26.97	50
<i>Caretta caretta</i>	Loggerhead sea turtle	25.17	46
<i>Scomberomorus cavalla</i>	King mackerel	25.17	41
<i>Halieutichthys aculeatus</i>	Pancake batfish	22.22	40
<i>Hippocampus erectus</i>	Lined seahorse	22.47	40
<i>Prionotus rubio</i>	Blackwing searobin	24.87	40

Scientific name	Common name	STI (°C)	Trawls
<i>Lagocephalus laevigatus</i>	Smooth puffer	24.97	39
<i>Nezumia bairdii</i>	Marlin-spike	6.57	38
<i>Ophidion holbrookii</i>	Band cusk-eel	25.17	38
<i>Pontinus longispinis</i>	Longspine scorpionfish	17.42	38
<i>Serranus phoebe</i>	Tattler	21.02	36
<i>Mullus auratus</i>	Red goatfish	20.82	34
<i>Ophidion grayi</i>	Blotched cusk-eel	24.57	34
<i>Chauliodus sloani</i>	Viperfish	4.87	31
<i>Diplectrum formosum</i>	Sand perch	24.62	31
<i>Prionotus tribulus</i>	Bighead searobin	24.72	29
<i>Pristigenys alta</i>	Short bigeye	23.27	29
<i>Achelous spinimanus</i>	Blotched swimming crab	24.52	28
<i>Archosargus probatocephalus</i>	Sheepshead	19.62	27
<i>Haemulon aurolineatum</i>	Tomtate	26.62	27
<i>Rhomboplites aurorubens</i>	Vermilion snapper	22.97	26
<i>Scyllarides nodifer</i>	Ridged slipper lobster	21.32	25
<i>Seriola dumerili</i>	Greater amberjack	27.87	25
<i>Argopecten gibbus</i>	Atlantic calico scallop	24.02	24
<i>Centropristis ocyurus</i>	Bank sea bass	22.47	24
<i>Farfantepenaeus aztecus</i>	Northern brown shrimp	25.52	23
<i>Pagrus pagrus</i>	Red porgy	22.52	22
<i>Cynoscion nothus</i>	Silver seatrout	24.52	21
<i>Eucinostomus gula</i>	Silver jenny	26.72	21
<i>Chloroscombrus chrysurus</i>	Atlantic bumper	28.12	20
<i>Sphoeroides dorsalis</i>	Marbled puffer	21.62	20
<i>Kathetostoma albigutta</i>	Lancer stargazer	19.27	19
<i>Cyclopsetta fimbriata</i>	Spotfin flounder	24.92	17
<i>Pristipomoides aquilonaris</i>	Wenchman	20.22	17
<i>Bellator militaris</i>	Horned searobin	21.07	16
<i>Eucinostomus argenteus</i>	Spotfin mojarra	25.17	16
<i>Myoxocephalus scorpius</i>	Shorthorn sculpin	2.22	15
<i>Prionotus scitulus</i>	Leopard searobin	25.87	15
<i>Aluterus schoepfii</i>	NA	26.72	14
<i>Echeneis naucrates</i>	Sharksucker	25.22	14
<i>Etropus crossotus</i>	Fringed flounder	24.07	14
<i>Eualus fabricii</i>	Arctic eualid	0.07	14
<i>Alectis ciliaris</i>	African pompano	28.87	13
<i>Centroscyllium fabricii</i>	Black dogfish	4.97	13
<i>Chaetodon ocellatus</i>	Spotfin butterflyfish	23.92	13
<i>Gymnothorax saxicola</i>	Honeycomb moray	21.17	13
<i>Chlamys islandica</i>	Iceland scallop	0.77	12
<i>Prionotus stearnsi</i>	Shortwing searobin	19.87	12
<i>Scorpaena brasiliensis</i>	Barbfish	26.72	11

Scientific name	Common name	STI (°C)	Trawls
<i>Paralichthys squamilentus</i>	Broad flounder	23.77	10
<i>Pareques umbrosus</i>	Cubbyu	22.62	10
<i>Trachinotus carolinus</i>	Florida pompano	25.72	10
<i>Arctozenus risso</i>	White barracudina	6.02	9
<i>Arenaeus cribrarius</i>	Speckled swimming crab	26.32	9
<i>Sphoeroides spengleri</i>	Bandtail puffer	24.27	9
<i>Ancylosetta ommata</i>	NA	24.47	8
<i>Calamus leucosteus</i>	Whitebone porgy	24.87	8
<i>Citharichthys macrops</i>	Spotted whiff	25.22	8
<i>Saurida brasiliensis</i>	Largescale lizardfish	21.82	8
<i>Carcharhinus acronotus</i>	Blacknose shark	27.37	7
<i>Prionotus ophryas</i>	Bandtail searobin	24.82	7
<i>Antimora rostrata</i>	Blue hake	4.02	6
<i>Fowlerichthys radiosus</i>	Singlespot frogfish	19.82	6
<i>Lepophidium jeannae</i>	Mottled cusk-eel	20.82	6
<i>Neomerinthe hemingwayi</i>	Spinycheek scorpionfish	19.07	6
<i>Paralichthys lethostigma</i>	Southern flounder	22.67	6
<i>Prionotus roseus</i>	Bluespotted searobin	24.62	6
<i>Stellifer lanceolatus</i>	Star drum	27.27	6
<i>Urophycis floridana</i>	Southern hake	18.67	6
<i>Eumicrotremus spinosus</i>	Atlantic spiny lump sucker	-0.28	5
<i>Hepatus epheliticus</i>	Calico box crab	26.42	5
<i>Lutjanus campechanus</i>	Red snapper	25.02	5
<i>Mallotus villosus</i>	Capelin	1.42	5
<i>Ogcocephalus parvus</i>	Roughback batfish	21.52	5
<i>Acanthostracion quadricornis</i>	Scrawled cowfish	25.97	4
<i>Citharichthys spilopterus</i>	Bay whiff	26.67	4
<i>Lutjanus synagris</i>	Lane snapper	26.52	4
<i>Scorpaena calcarata</i>	Smoothhead scorpionfish	23.97	4
<i>Serranus atrobranchus</i>	Blackear bass	21.37	4
<i>Dasyatis sabina</i>	Atlantic stingray	20.52	3
<i>Monacanthus ciliatus</i>	Fringed filefish	22.02	3
<i>Diplectrum bivittatum</i>	Dwarf sand perch	25.07	2
<i>Farfantepenaeus duorarum</i>	Pink shrimp	23.52	2
<i>Menticirrhus littoralis</i>	Gulf kingfish	24.57	2
<i>Paralichthys albigutta</i>	Gulf flounder	25.77	2
<i>Sphyraena guachancho</i>	Guaguanche	24.42	2
<i>Symphurus civitatum</i>	Offshore tonguefish	23.92	2
<i>Symphurus diomedeanus</i>	Spottedfin tonguefish	22.77	2
<i>Ancylosetta dilecta</i>	Three-eye flounder	18.67	1
<i>Ariopsis felis</i>	Hardhead catfish	28.82	1
<i>Gymnothorax nigromargiatus</i>	Blackedge moray eel	22.77	1
<i>Anchoa lyolepis</i>	Dusky anchovy	25.47	0

Scientific name	Common name	STI (°C)	Trawls
<i>Bagre marinus</i>	Gafftopsail catfish	30.52	0
<i>Calamus proridens</i>	Littlehead porgy	28.02	0
<i>Calappa flammea</i>	Flame box crab	25.87	0
<i>Calappa sulcata</i>	Yellow box crab	23.57	0
<i>Epinephelus morio</i>	Red grouper	28.07	0
<i>Equetus lanceolatus</i>	Jackknife-fish	26.42	0
<i>Haemulon plumierii</i>	White grunt	29.77	0
<i>Lycodes reticulatus</i>	Arctic eelpout	0.47	0
<i>Macrourus berglax</i>	Roughhead grenadier	3.72	0
<i>Ophidion welschi</i>	Crested cusk-eel	25.07	0
<i>Prionotus longispinosus</i>	Bigeye searobin	24.02	0
<i>Sphyrna tiburo</i>	Bonnethead shark	28.12	0
<i>Syacium gunteri</i>	Shoal flounder	25.32	0

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