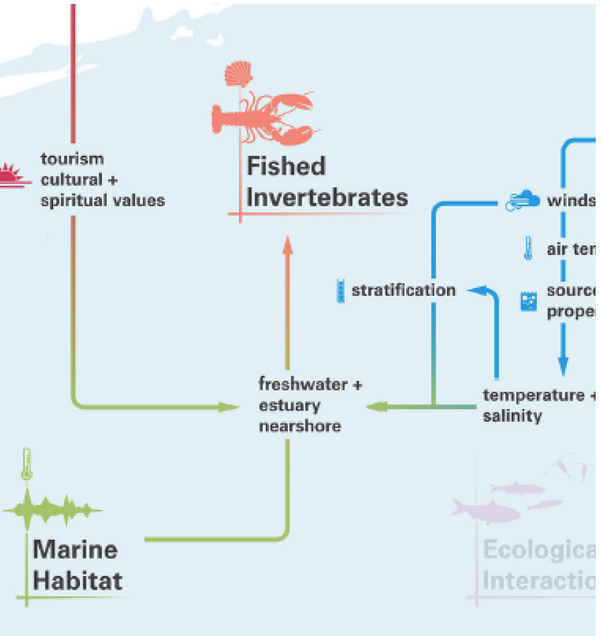
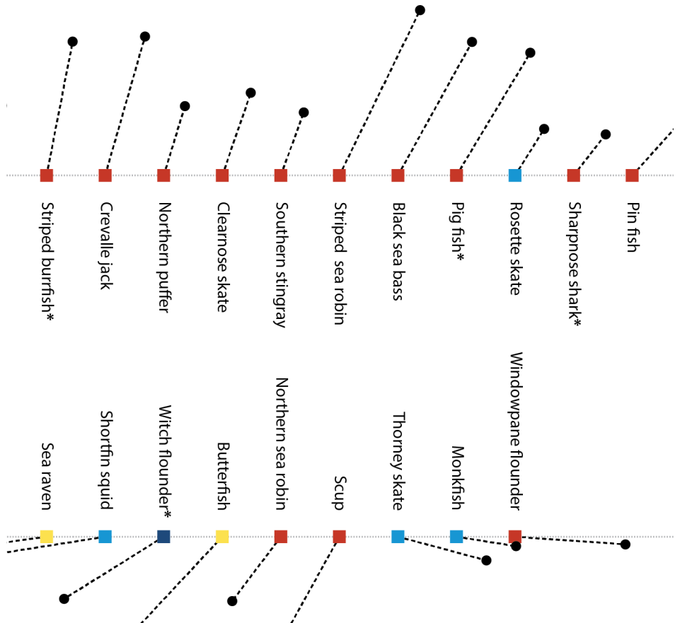
Skye Morét

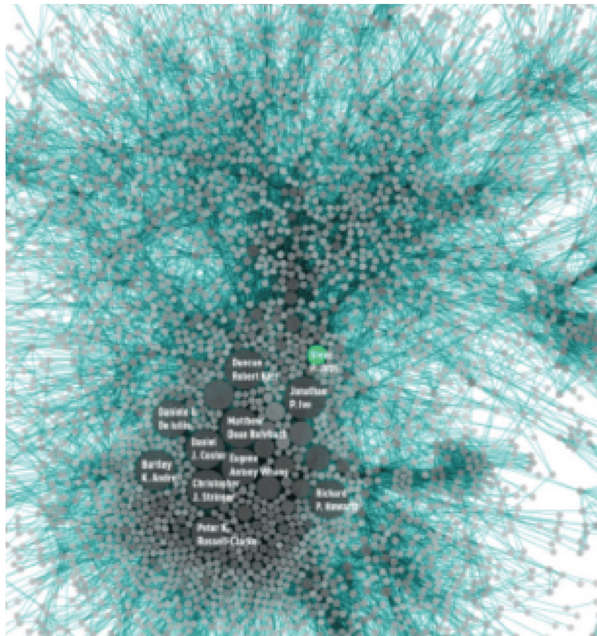
Improving the knowledge of our oceans
and seas and bringing them closer to citizens
Brussels, 5.2.2020

The Impact of Data Visualization on Science and Society

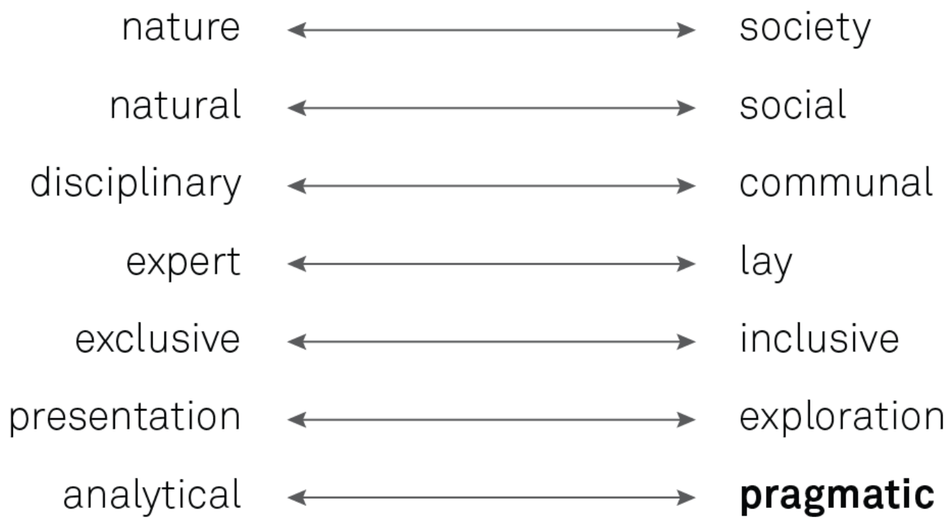
a paradigm for actionable engagement







KNOWLEDGE DICHOTOMIES



inform**ation**

who
why

information

what
how

information

who is your audience?
why do they need this information?

information

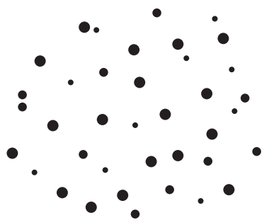
what form is best?
how will audience engage?

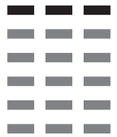
communicators

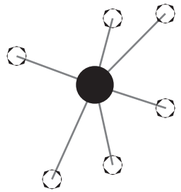
outer world

audience

unstructured information → data → structured information → knowledge ↔ wisdom



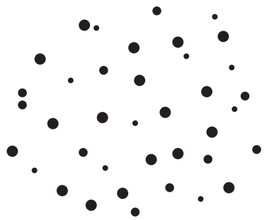


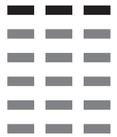


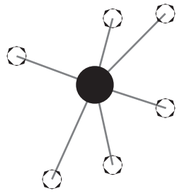
communicators

outer world

unstructured information → data → structured information → knowledge ↔ wisdom







visualization

context → three categories of practice

scientific

journalistic

artistic

P. Hall, 2011 || “Bubbles, Lines, and String: How Information Visualization Shapes Society”

visualization

context → three categories of practice

scientific
tool of discovery
data exploration
no bias

journalistic
simplify + explain
accessible
some bias

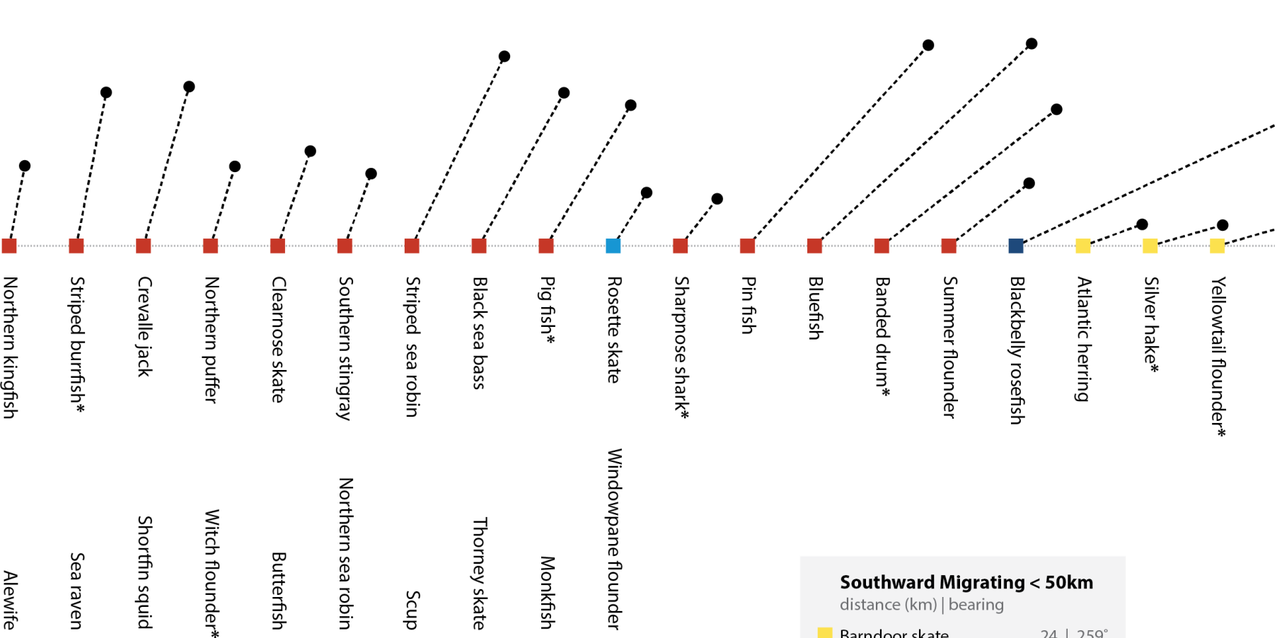
artistic
reflective
challenges
offers new reps.

P. Hall, 2011 || “Bubbles, Lines, and String: How Information Visualization Shapes Society”

NOAA
The Nature Conservancy

Encode your information in an intuitive way

visualizing species distribution for stakeholders



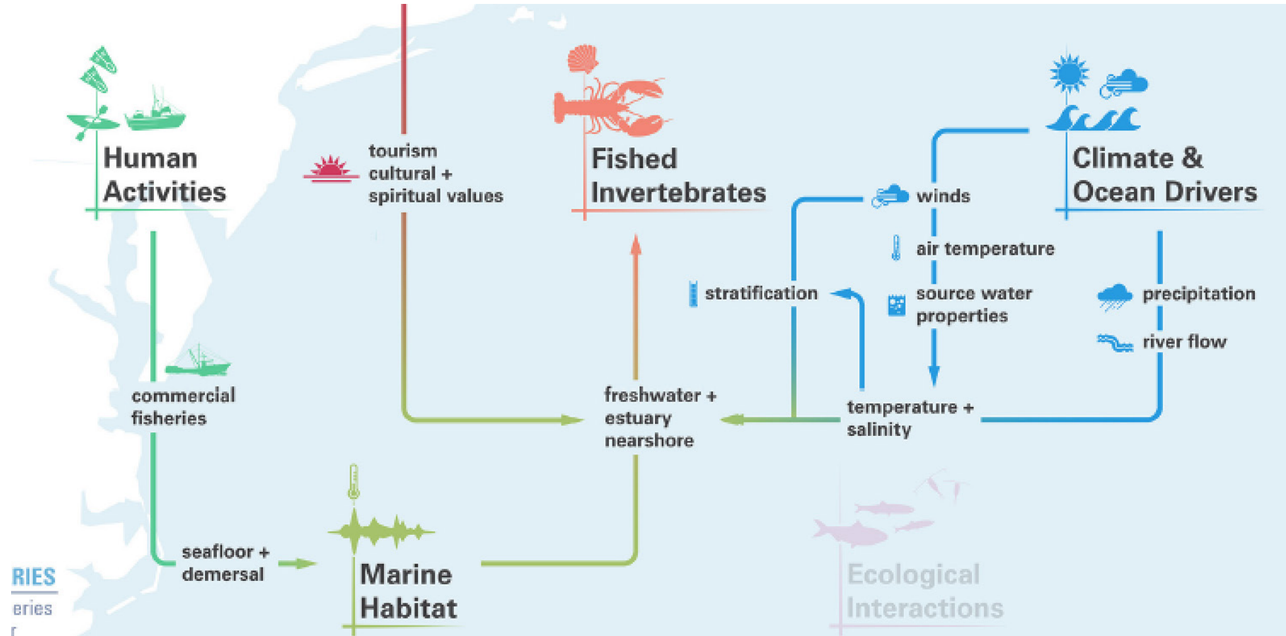
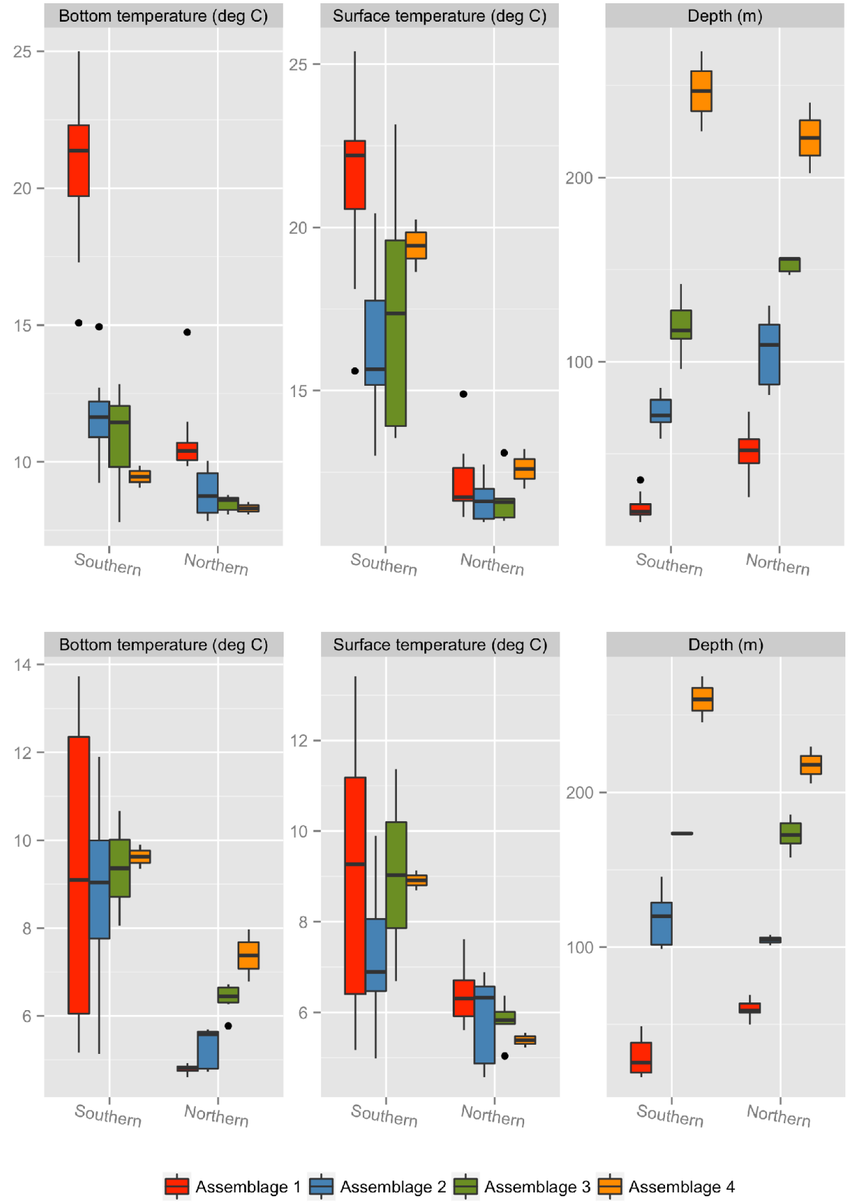


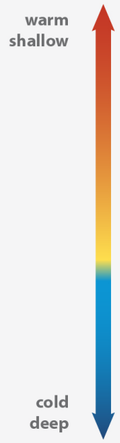
Table 1. Description of species assemblages defined for the Gulf of Maine and Mid-Atlantic Bight/Georges Bank regions from the fall bottom trawl survey.

North: Gulf of Maine	
Assemblage	**Description**
1: Alewife, American lobster, Atlantic mackerel, Blueback herring, Little skate, Longfin squid, Scup, Windowpane flounder, Winter flounder, Winter skate, Yellowtail flounder	Mid-trophic level species; mainly demersal; primarily in shallower, coastal inshore waters/protected bays and estuaries; some spawn in estuaries and rivers.
2: American plaice, American shad, Haddock, Red hake, Spiny dogfish, Wolffish	Mix of mid- and higher trophic level species; mix of open ocean and bottom-dwelling species; found more frequently in coastal inshore waters.
3: Barndoor skate, Monkfish, Silver hake, White hake, Witch flounder	Mainly higher trophic level species; generally demersal, mid to deep waters and occasionally/soft bottom.
4: Blackbelly rosefish, Smooth skate	Mid-trophic level species; found in very deep waters.
South: Mid-Atlantic Bight/Georges Bank	
1: Atlantic croaker, Banded drum, Black sea bass, Bluefish, Bluntnose stingray, Bullnose stingray, Clearnose skate, Cownose ray, Cravelle jack, Northern kingfish, Northern puffer, Northern sea robin, Pig fish, Pin fish, Roughtail stingray, Scup, Sharpnose shark, Smooth dogfish, Southern stingray, Spiny butterfly ray, Spot, Striped burrfish, Striped sea robin, Summer flounder, Tautog, Weakfish, Windowpane flounder	Mix of mid- and higher trophic levels; mainly demersal and reef-associated; strongly tied to coastal inshore waters, bays, estuaries, etc. and warm waters.
2: Alewife, American shad, Atlantic cod, Atlantic herring, Barndoor skate, Butterfish, Fourspot flounder, Longhorn sculpin, Red hake, Sea raven, Sea scallop, Silver hake, Spiny dogfish, Yellowtail flounder	Mix of mid- and higher trophic level species; mainly demersal/benthic; Generally in coastal waters, or have the ability to migrate between deeper and shallower depths.
3: American lobster, American plaice, Monkfish, Rosette skate, Shortfin squid, Thorney skate, White hake	Mid- to high trophic levels; Found mostly around shelf edge over soft bottoms.
4: Blackbelly rosefish, Witch flounder	Mid-trophic level species; found in very deep waters.



FALL

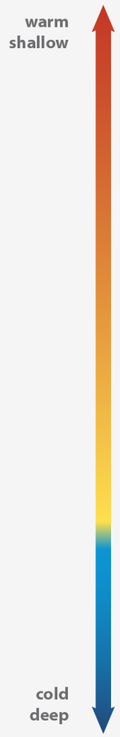
GULF OF MAINE



	ASSEMBLAGE		DESCRIPTION
1	Alewife American lobster Atlantic mackerel Blueback herring Little skate Longfin squid	Scup Windowpane flounder Winter flounder Winter skate Yellowtail flounder	Mid-trophic level Mainly demersal Primarily in shallower, coastal inshore waters/ protected bays & estuaries Some spawn in estuaries & rivers
2	American plaice American shad Haddock	Red Hake Spiny dogfish Wolffish	Mix of mid- and higher trophic level Mix of open ocean & bottom-dwelling Found more frequently in coastal inshore waters
3	Barndoor skate Monkfish Silver hake	White hake Witch flounder	Mainly higher trophic level Generally demersal Mid- to deep waters and occassionally/soft bottom
4	Blackbelly rosefish Smooth skate		Mid-trophic level Found in very deep waters

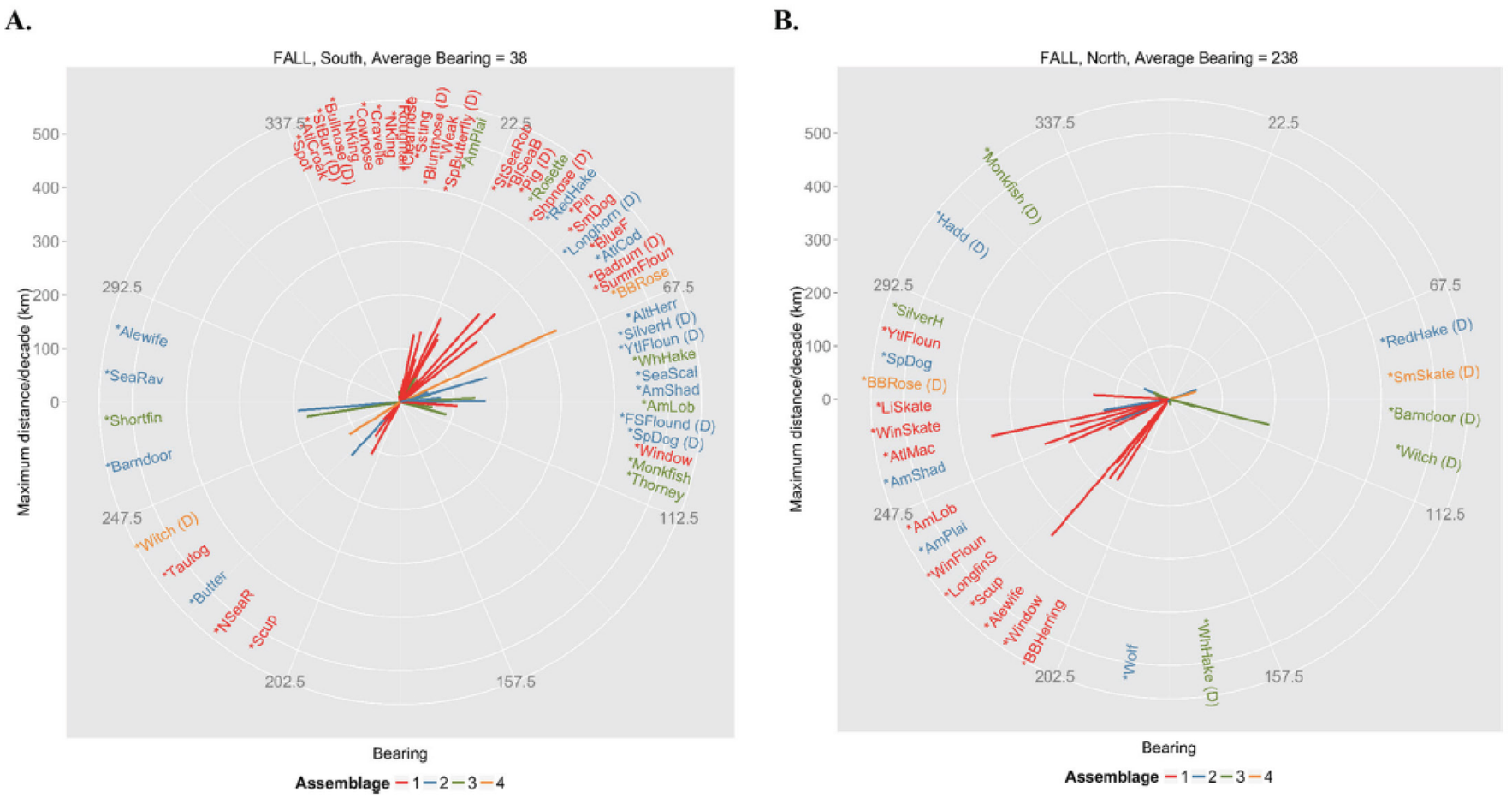
FALL

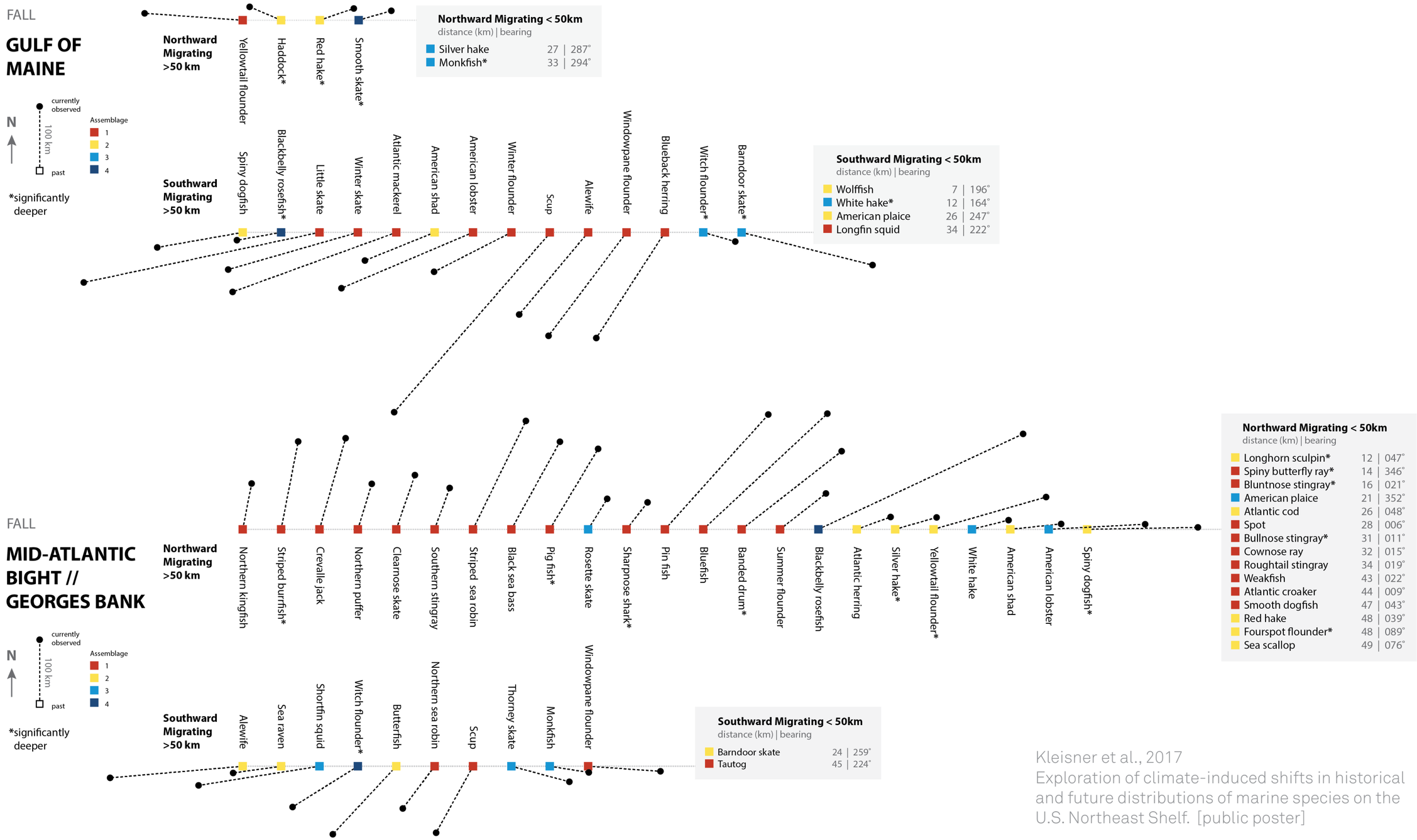
MID-ATLANTIC BIGHT / GEORGES BANK



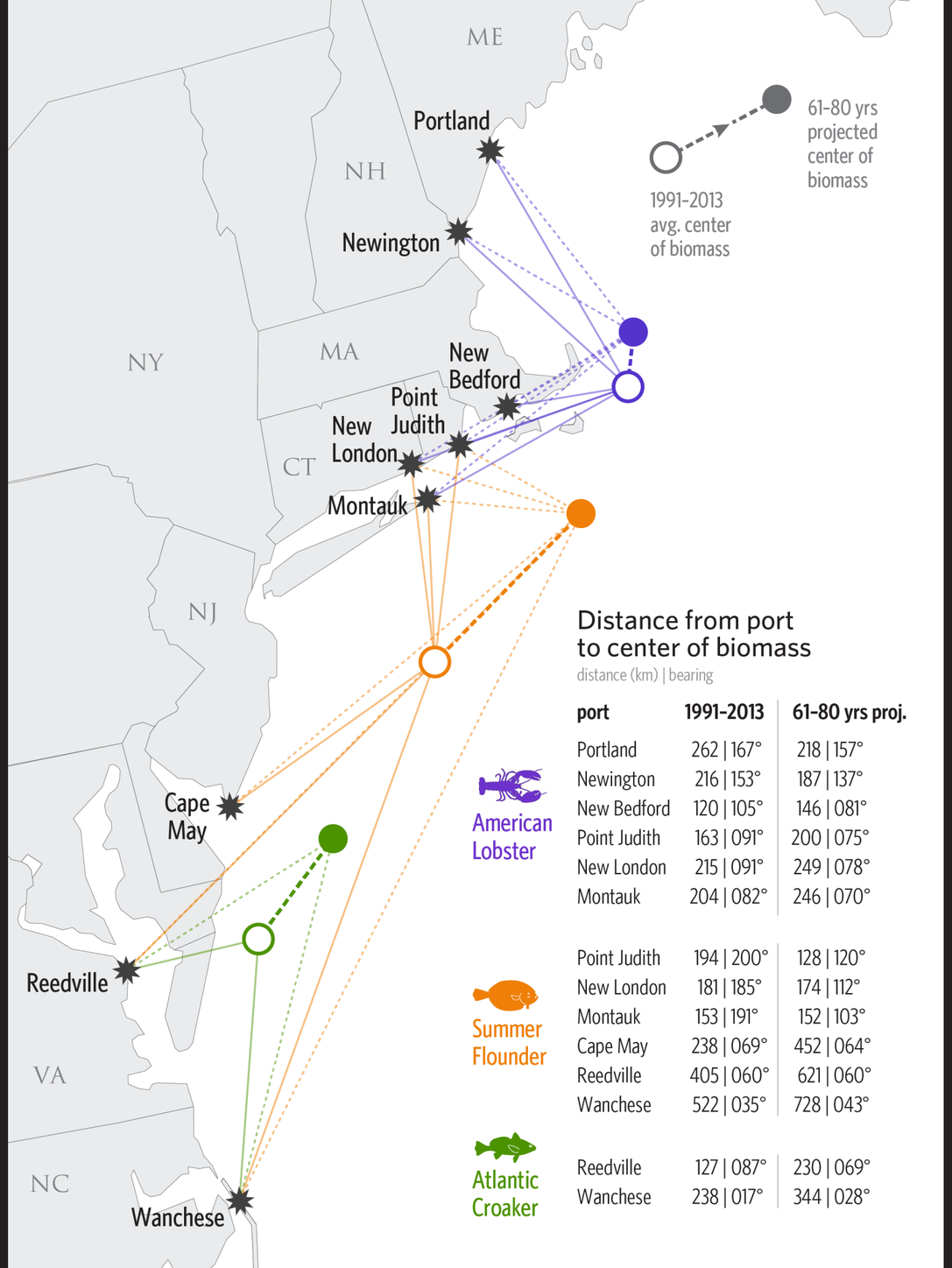
	ASSEMBLAGE		DESCRIPTION
1	Atlantic croaker Banded drum Black sea bass Bluefish Bluntnose stingray Bullnose stingray Clearnose skate Cownose ray Crevalle jack Northern kingfish Northern puffer Northern sea robin	Pig fish Pin fish Roughtail stingray Spiny butterfly ray Spot Striped burrfish Striped sea robin Summer flounder Tautog Weakfish Windowpane flounder	Mix of mid- and higher tropic levels Mainly demersal and reef-associated Strongly tied to coastal inshore waters, bays, estuaries, etc. and warm waters
2	Alewife American shad Atlantic cod Atlantic herring Barndoor skate Butterfish Fourspot flounder	Longhorn sculpin Red hake Sea raven Sea scallop Silver hake Spiny dogfish Yellowtail flounder	Mix of mid- and higher trophic levels Mainly demersal/benthic Generally in coastal waters or have the ability to migrate between deeper & shallower depths
3	American lobster American plaice Monkfish Rosette skate	Shortfin squid Thorney skate White hake	Mid- to higher trophic levels Found mostly around shelf edge over soft bottoms
4	Blackbelly rosefish Witch flounder		Mid-trophic level Found in very deep waters

Kleisner et al., 2017
Marine species distribution shifts on the U.S. Northeast Continental Shelf under continued ocean warming.


A.
FALL, South, Average Bearing = 38
Maximum distance/decade (km)
500
400
300
200
100
0
337.5
22.5
67.5
112.5
157.5
202.5
247.5
292.5
*Alewife
*SeaRav
*Shortfin
*Barndoor
*Witch (D)
*Tautog
*Butter
*NSeaR
*Scup
*Spot
*AtlCroak
*StBurr (D)
*Bullnose (D)
*NKing
*Cownose
*Cravelle
*NKing
*Roughtail
*Sstring
*BluntNose (D)
*Weak
*SpButterfly (D)
*AmPlai
*StSeaRob
*BlSeaB
*Pig (D)
*Roselle
*Shpnose (D)
*RedHake
*Pin
*SmDog
*Longhorn (D)
*BlueF
*AtlCod
*Badrum (D)
*SummFloun
*BBRose
*AltHerr
*SilverH (D)
*YtlFloun (D)
*WhHake
*SeaScal
*AmShad
*AmLob
*FSFlound (D)
*SpDog (D)
*Window
*Monkfish
*Thorney
Bearing
Assemblage 1 2 3 4
B.
FALL, North, Average Bearing = 238
Maximum distance/decade (km)
500
400
300
200
100
0
337.5
22.5
67.5
112.5
157.5
202.5
247.5
292.5
*Monkfish (D)
*Hadd (D)
*SilverH
*YtlFloun
*SpDog
*BBRose (D)
*LiSkate
*WinSkate
*AtlMac
*AmShad
*AmLob
*AmPlai
*WinFloun
*LongfinS
*Scup
*Alewife
*Window
*BBHerring
*Wolf
*WhHake (D)
*RedHake (D)
*SmSkate (D)
*Bamdoor (D)
*Witch (D)
Bearing
Assemblage 1 2 3 4



Kleisner et al., 2017
Exploration of climate-induced shifts in historical and future distributions of marine species on the U.S. Northeast Shelf. [public poster]

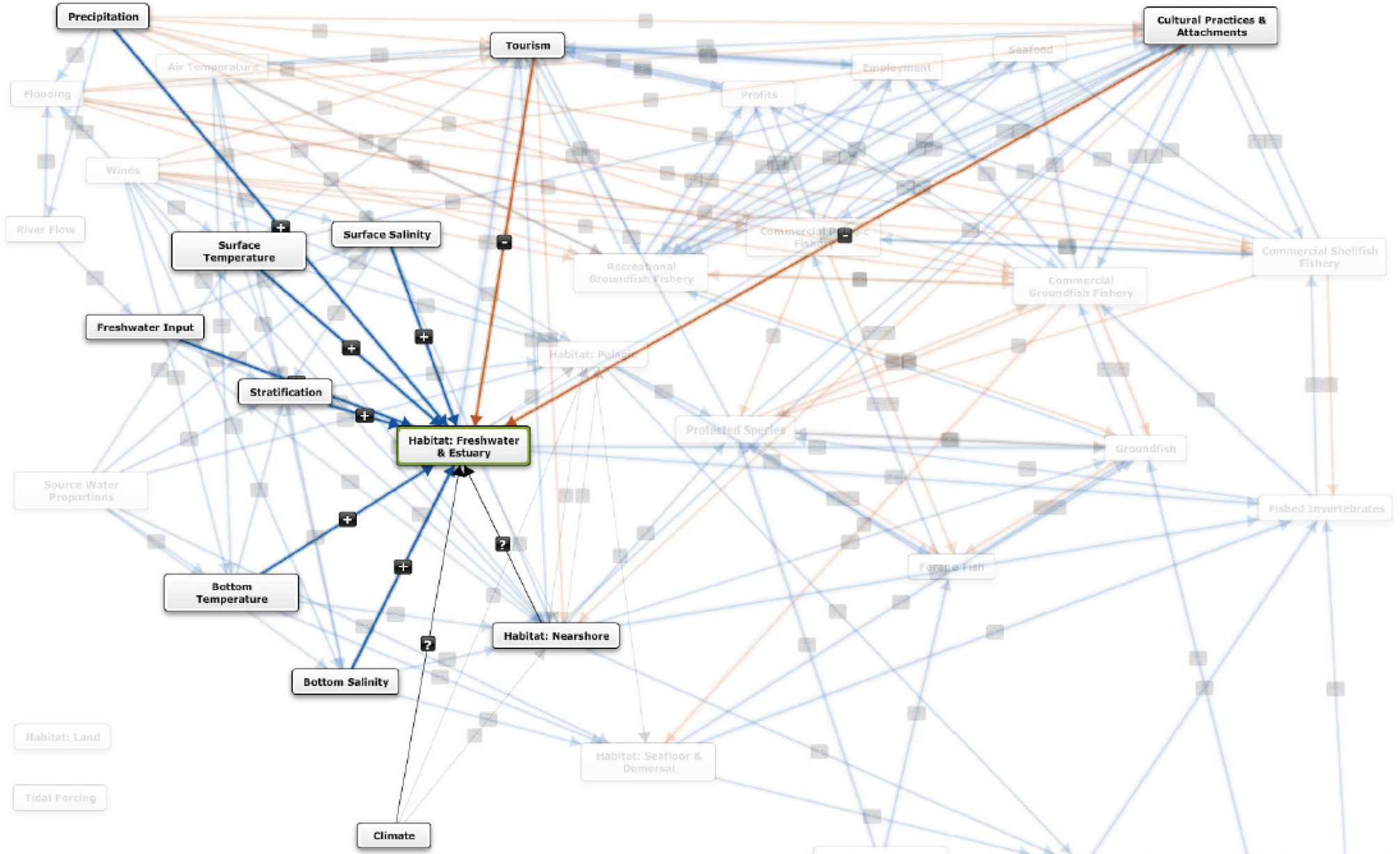


Distance from port to center of biomass

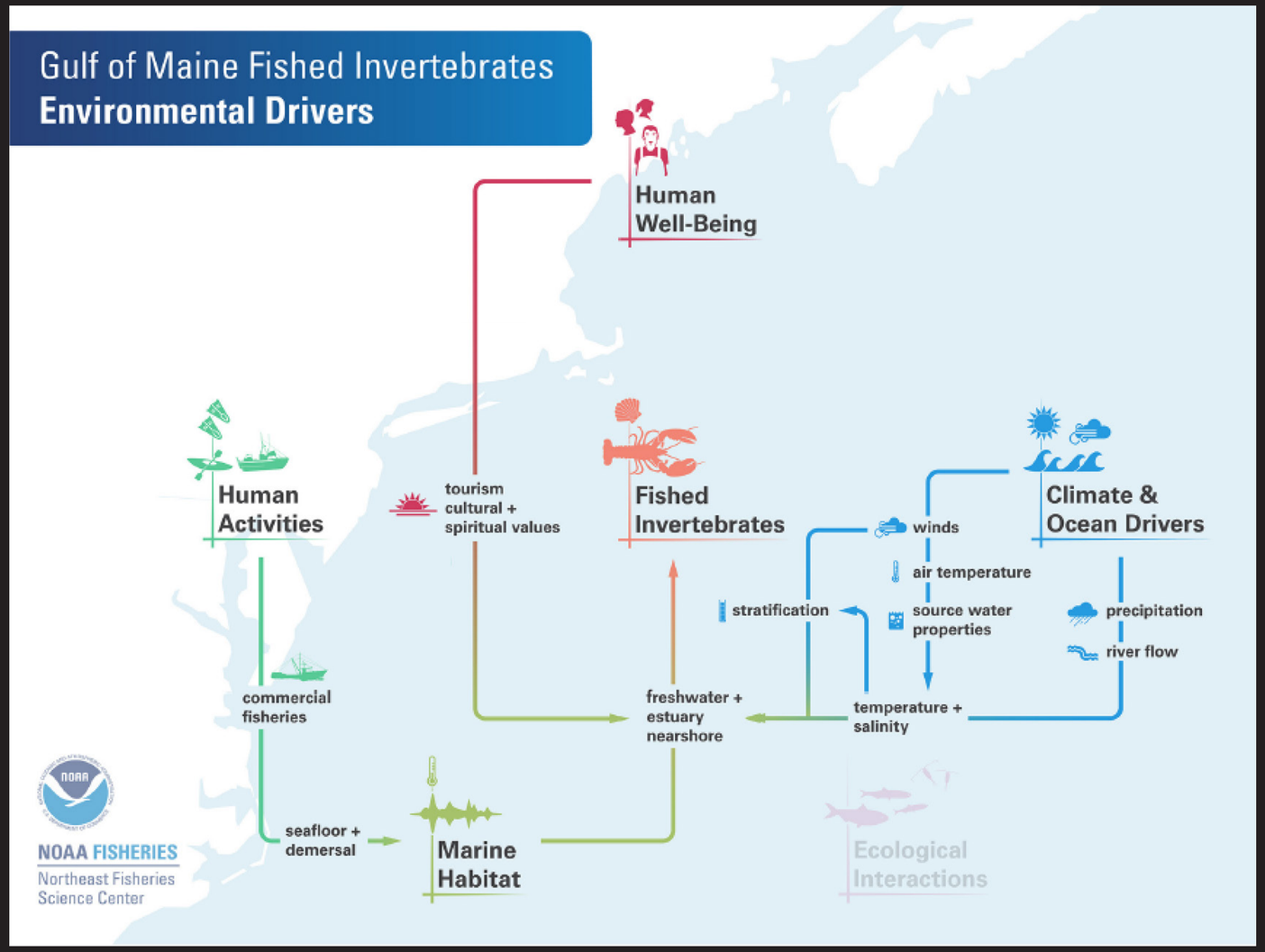
distance (km) | bearing

port	1991–2013	61–80 yrs proj.
Portland	262 | 167°	218 | 157°
Newington	216 | 153°	187 | 137°
New Bedford	120 | 105°	146 | 081°
Point Judith	163 | 091°	200 | 075°
New London	215 | 091°	249 | 078°
Montauk	204 | 082°	246 | 070°
Point Judith	194 | 200°	128 | 120°
New London	181 | 185°	174 | 112°
Montauk	153 | 191°	152 | 103°
Cape May	238 | 069°	452 | 064°
Reedville	405 | 060°	621 | 060°
Wanchese	522 | 035°	728 | 043°
Reedville	127 | 087°	230 | 069°
Wanchese	238 | 017°	344 | 028°

Kleisner et al., 2017
Marine species distribution shifts on the U.S. Northeast Continental Shelf under continued ocean warming.



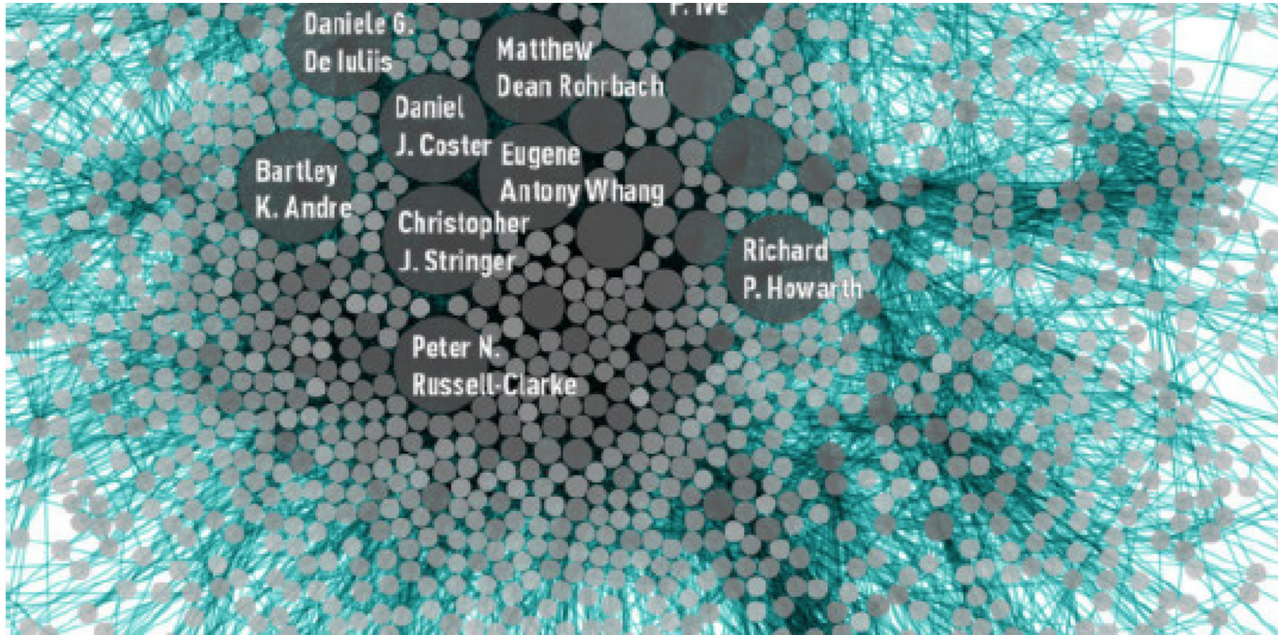
NOAA NEFSC, 2017 || preliminary figures


Gulf of Maine Fished Invertebrates
Environmental Drivers
Human Well-Being
Human Activities
tourism
cultural +
spiritual values
Fished Invertebrates
Climate & Ocean Drivers
winds
air temperature
stratification
source water properties
precipitation
river flow
commercial fisheries
freshwater + estuary nearshore
temperature + salinity
seafloor + demersal
Marine Habitat
Ecological Interactions
NOAA FISHERIES
Northeast Fisheries Science Center

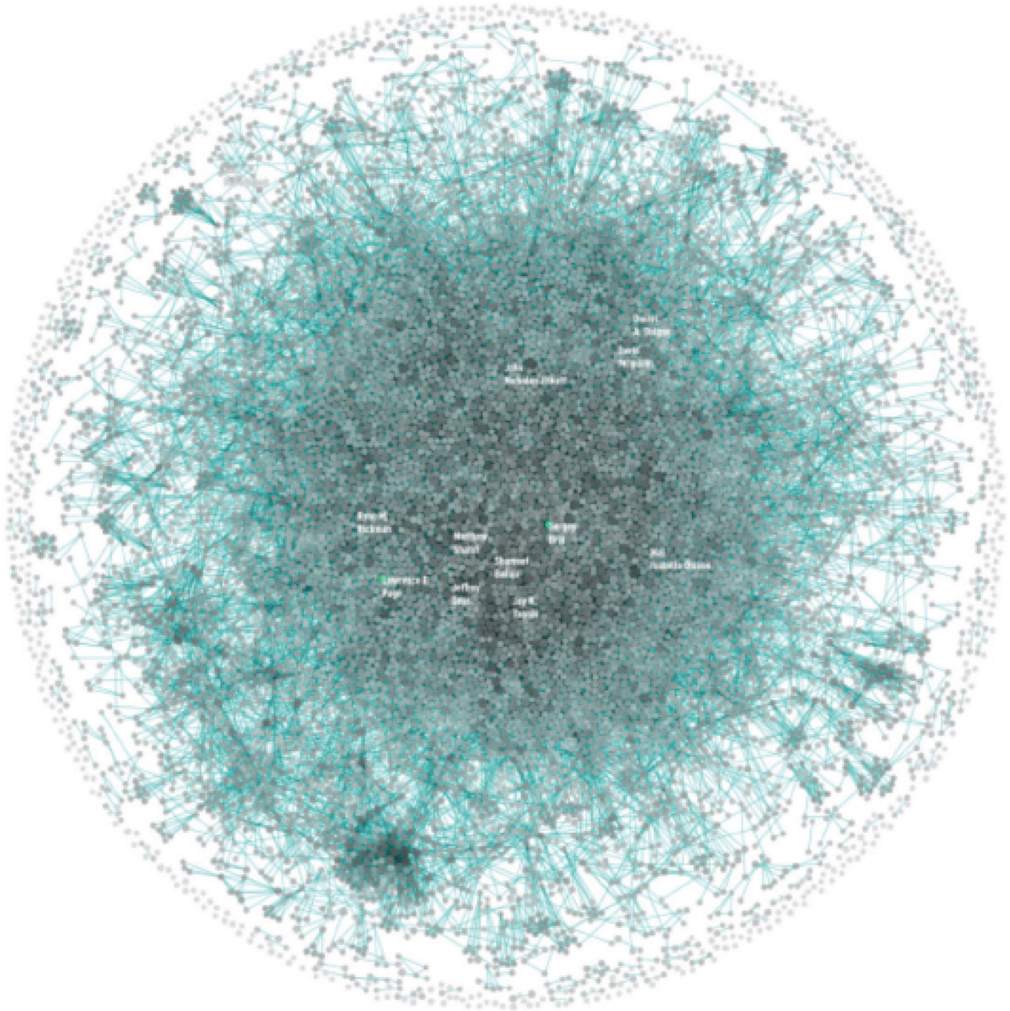
Periscopic
+ Personal work

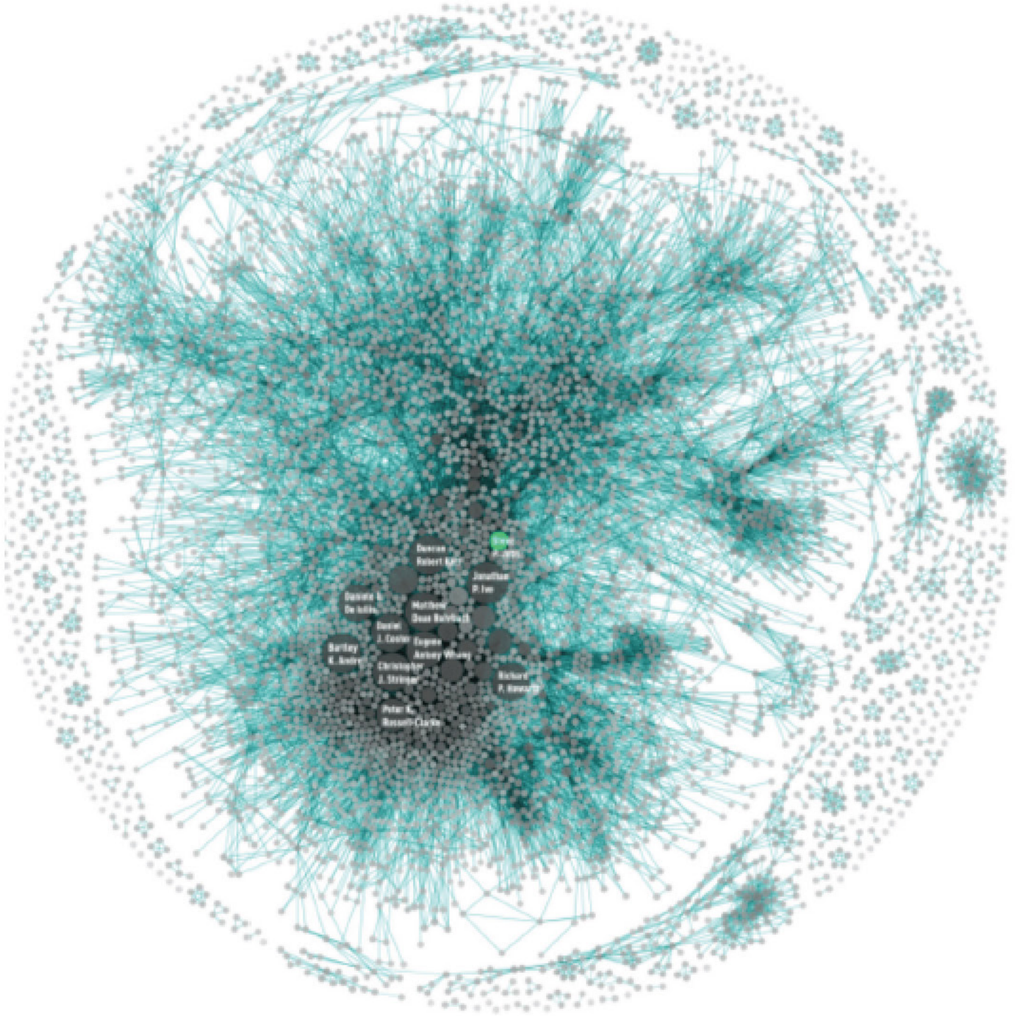
Experiment with form + engagement

working with designers to widen opportunities



Skye Moret, 2016 || ongoing data-driven installation



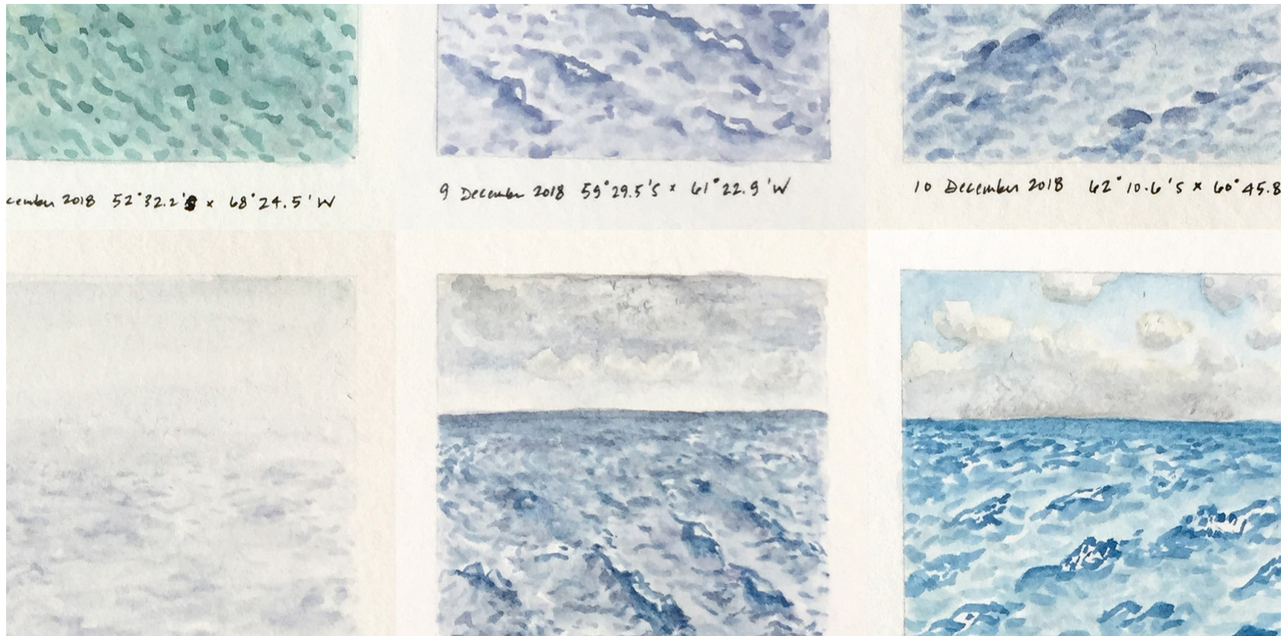


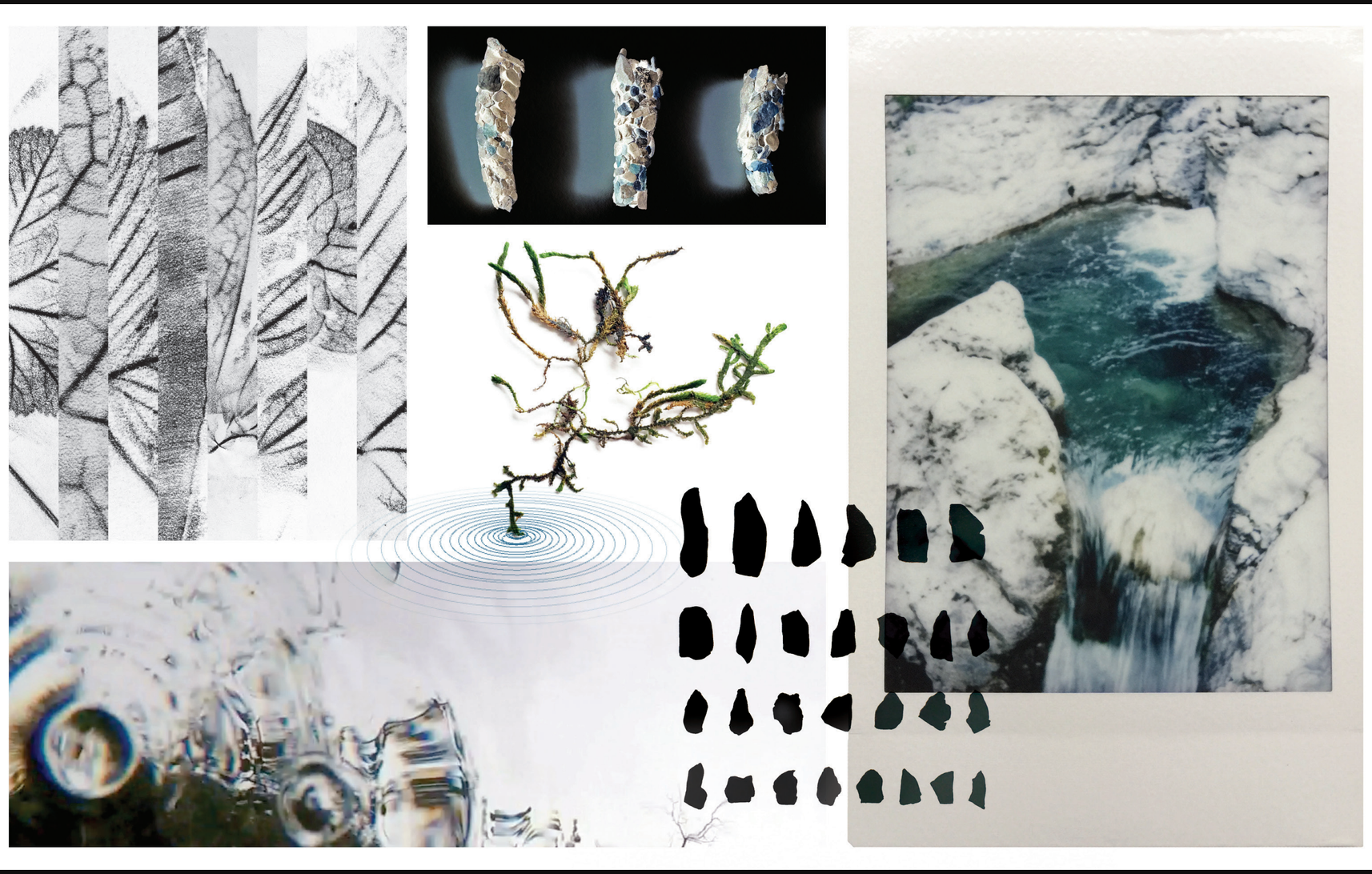
Periscopic 24.2.17 || “The Real Difference Between Google and Apple”

Southern Ocean
Italian Alps

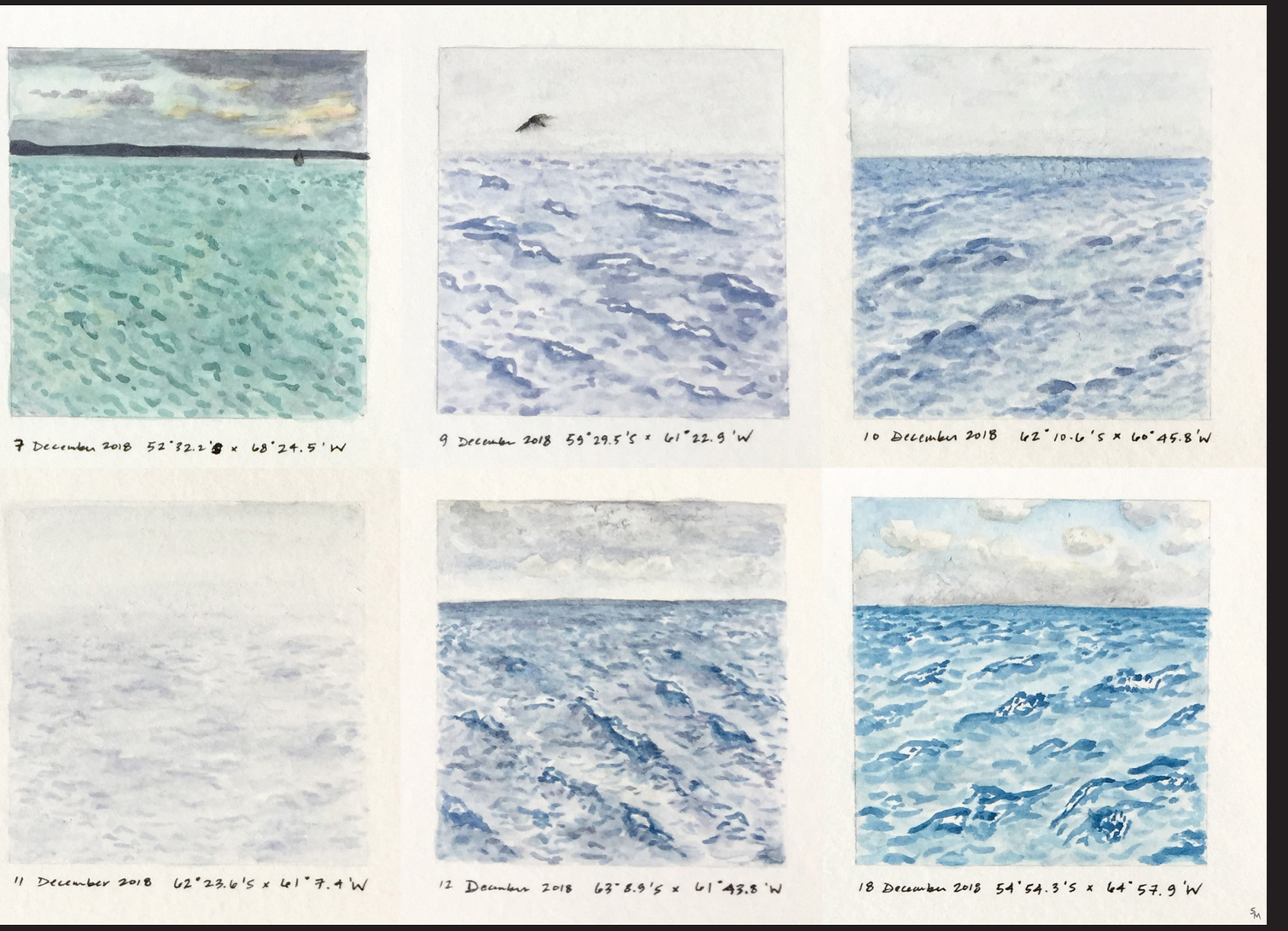
Connect society with science through narrative

asking what makes a place ‘a place’





Skye Moret, 2018 || Indizi per l’immersione (Cues for Immersion)



Skye Moret, 2018 || Surface series: Southern Ocean

information

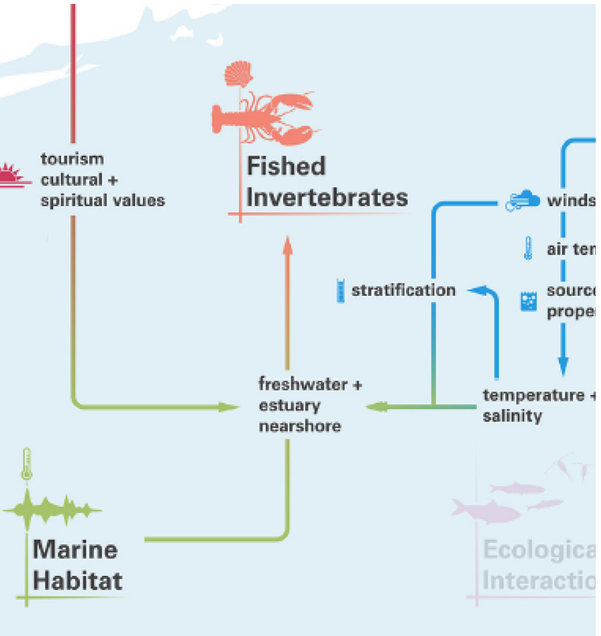
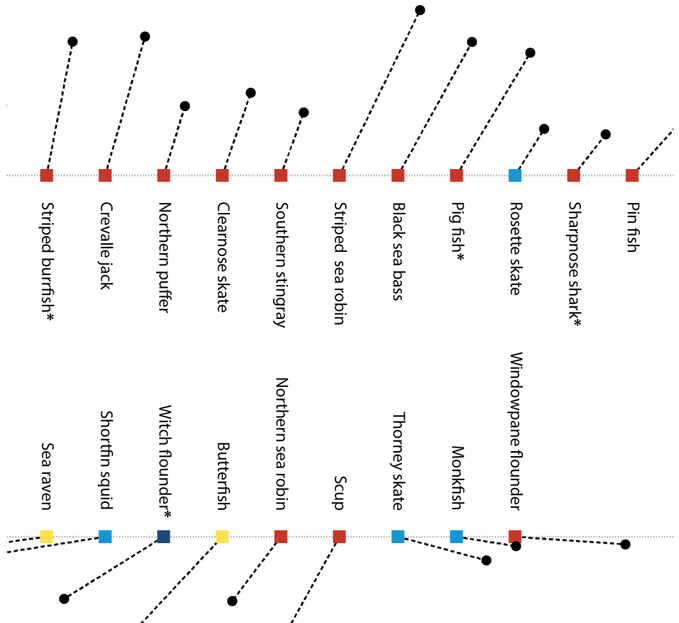
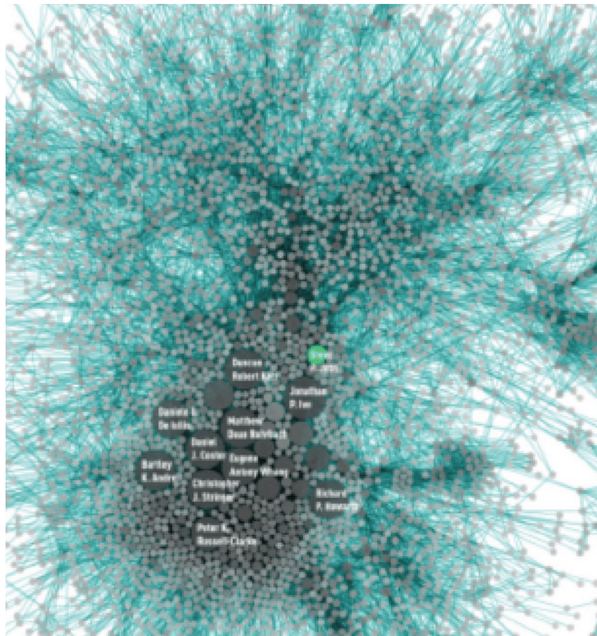
who is your audience?
why do they need this information?

information

what form is best?
how will audience engage?

Thank you

science + data viz = impact

Skye Morét
skyemoret.com
skyemoret@gmail.com
@SeaMeetsSkye

Pacific Northwest College of Art
TBA21–Academy