Herring Amendment 8
Review draft analyses and select preferred alternatives

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Herring AP and Committee
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New England
Fishery Management Council

Outline of Presentation

1. Review A8 alternatives (10 slides)
2. Review Draft Affected Environment (20 slides)
3. General PDT Analysis (15 slides)
4. Draft Impacts (25 slides)
5. *AP Only – input on 8 questions about effort shifts (5 slides)*
6. *Herring RSA research priorities (5 slides)*

Potential actions

1. Input on text of MWT gear prohibition alternatives.
2. *AP only – Input of potential effort shifts from alternatives.*
3. Preferred alternative?
4. Approve document for public hearing?
5. Herring RSA research priority recommendations

Amendment 8 goals

1. To account for the role of Atlantic herring within the ecosystem, including its role as forage;
2. To stabilize the fishery at a level designed to achieve optimum yield;
3. To address localized depletion in inshore waters (this goal added after initial scoping).

Document #2, page 31

Definition and Problem Statement

"Localized depletion is a reduction of population size, independent of the overall status of the stock, over a relatively small spatial area as a result of intensive fishing.

Scoping comments for Amendment 8 identified concerns with concentrated, intense commercial fishing of Atlantic herring in specific areas and at certain times that may cause detrimental socioeconomic impacts on other user groups (commercial, recreational, ecotourism) who depend upon adequate local availability of Atlantic herring to support business and recreational interests both at sea and on shore. The Council intends to further explore these concerns through examination of the best available science on localized depletion, the spatial nature of the fisheries, reported conflicts amongst users of the resources and the concerns of the herring fishery and other stakeholders."

Amendment 8 Timeline

2015	Council initiates action, revises goals & objectives, two public scoping periods.
2016	Review scoping comments, MSE workshops, develop alternatives.
2017	MSE peer review, approve range of alternatives, impacts analysis, approve document for public comment period.
2018	Public hearings, review comments, Council selects final action, A8 implementation ideally before fishing year 2019.

Part 1: Acceptable Biological Catch (ABC) Control Rules

- **Ten alternatives.**
- **Council reviewed draft analysis in September 2017.**
- **Declined to identify preferred alternative; approved that portion of document for public hearings.**

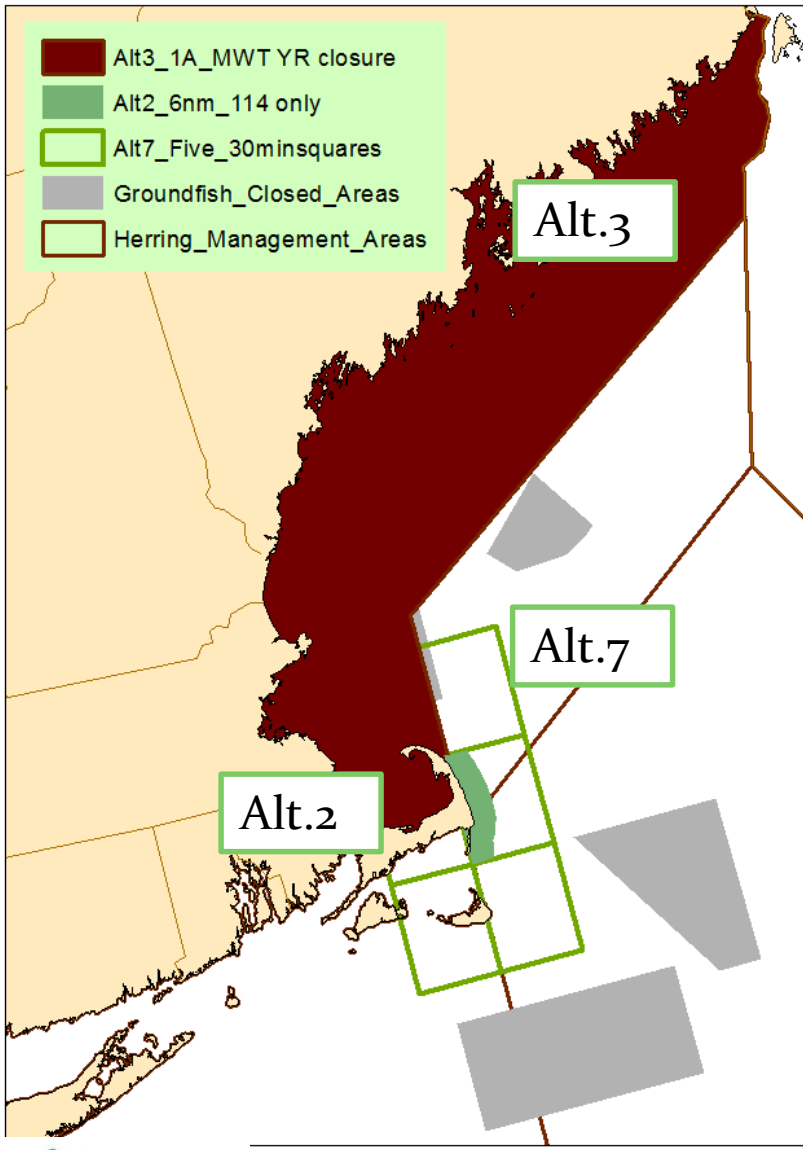
Document #2, page 33

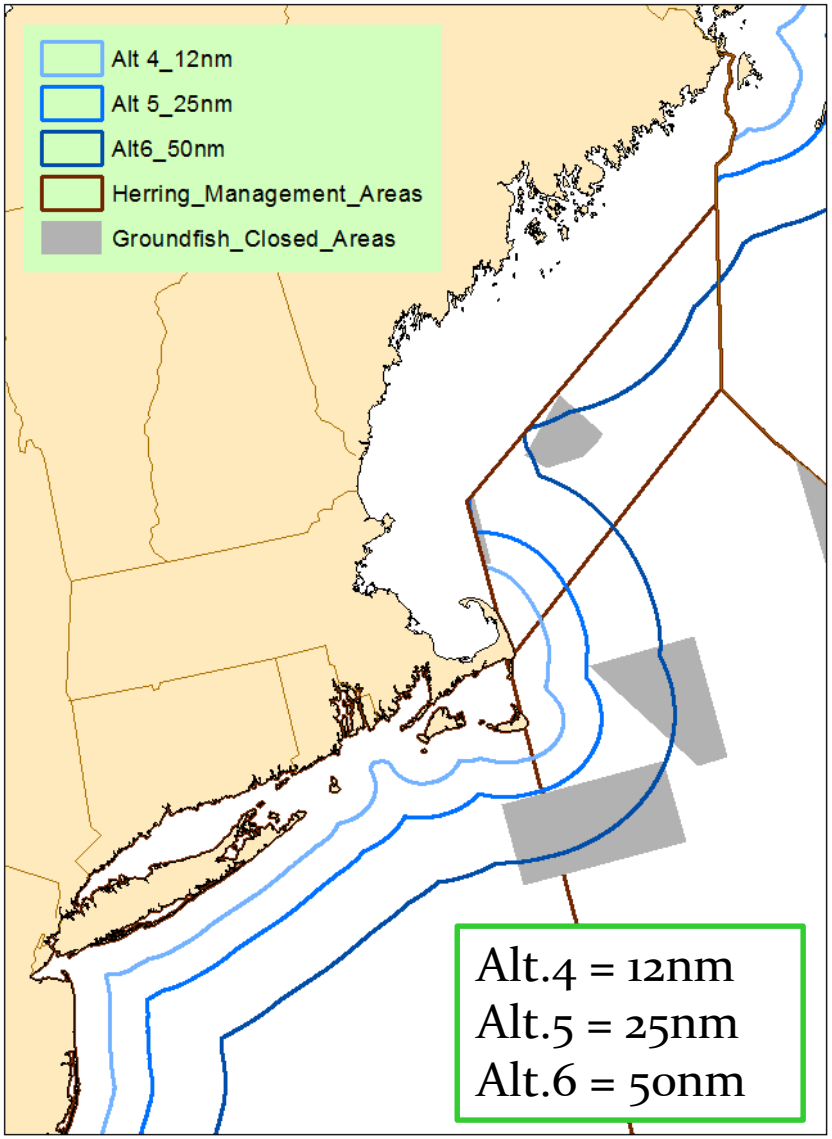
Part 2: Measures to address potential localized depletion and user conflicts

1. No Action – Prohibit MWT gear in Area 1A - June 1 – Sept 30
2. Close 6nm in Area 114 to all herring gears for part of the year with a 2 year sunset clause
3. Prohibit MWT gear in Area 1A year round
4. Prohibit MWT gear within 12 miles in Areas 1B, 2, + 3
5. Prohibit MWT gear within 25 miles in Areas 1B, 2, + 3
6. Prohibit MWT gear within 50 miles in Areas 1B, 2, + 3
7. Prohibit MWT gear in areas 99, 100, 114, 115, and 123
8. Revert boundaries between Areas 1A and 3
9. Eliminate seasonal closure of Area 1B (Jan – Apr)

Document #2, page 43

Section 2.2 LD Alternatives (p.43)

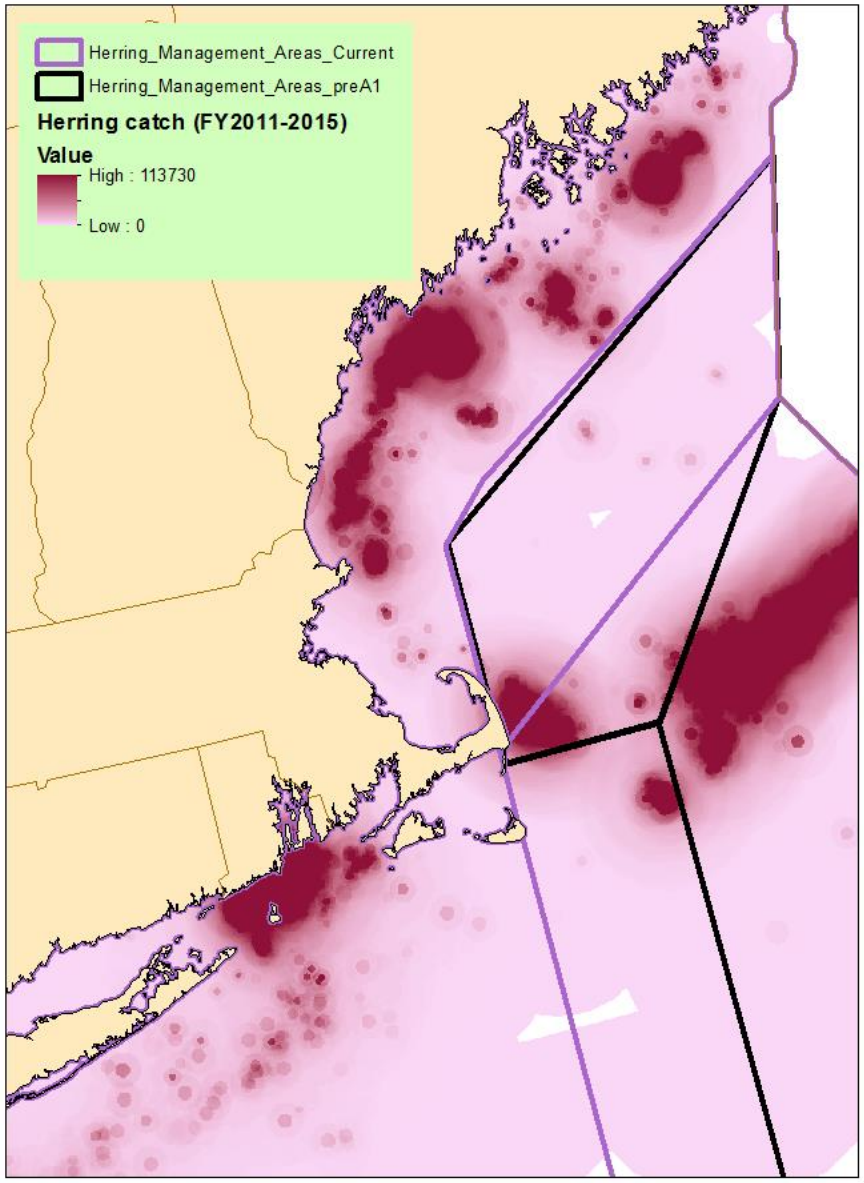




LD Alternatives (cont.)

Spatial and Seasonal Sub-options

- Alternative 2 – 6nm alternative
  - Jun–Aug (3 months) or Jun–Oct (5 months)
- Alternatives 4-7
  - year round or Jun – Sept (4 months)
- Alternatives 4-7
  - Areas 1B, 2 and 3 or Areas 1B and 3 only



Alternative 8

Current Boundary – purple

Pre-Amendment 1 – black

Alternative 9

Area 1B currently closed Jan-April.

If open all year, effort may spread out and reduce user conflicts in late spring-fall.

Alternative	Description	Section #	Page #
1	**No Action**	**2.2.1**	**43**
2	**Closure within 6nm from shore in Area 114 to ALL vessels fishing for herring**	**2.2.2**	**45**
	Seasonal Sub-option A (Jun1-Aug31)	2.2.2.1.1	47
	Seasonal Sub-option B (Jun1-Oct31)	2.2.2.1.2	47
3	**Prohibit MWT in Area 1A (year round)**	**2.2.3**	**48**
4	**Prohibit MWT inside of 12nm south of Area 1A**	**2.2.4**	**50**
	Area Sub-option A (Areas 1B, 2 and 3)	2.2.4.1.1	51
	Area Sub-option B (Areas 1B and 3)	2.2.4.1.2	51
	Seasonal Sub-option A (year round)	2.2.4.2.1	52
	Seasonal Sub-option B (Jun1-Sept30)	2.2.4.2.2	52
5	**Prohibit MWT inside of 25nm south of Area 1A**	**2.2.5**	**52**
	Area Sub-option A (Areas 1B, 2 and 3)	2.2.5.1.1	53
	Area Sub-option B (Areas 1B and 3)	2.2.5.1.2	54
	Seasonal Sub-option A (year round)	2.2.5.2.1	54
	Seasonal Sub-option B (Jun1-Sept30)	2.2.5.2.2	54
6	**Prohibit MWT inside of 50nm south of Area 1A**	**2.2.6**	**55**
	Area Sub-option A (Areas 1B, 2 and 3)	2.2.6.1.1	56
	Area Sub-option B (Areas 1B and 3)	2.2.6.1.2	56
	Seasonal Sub-option A (year round)	2.2.6.2.1	56
	Seasonal Sub-option B (Jun1-Sept30)	2.2.6.2.2	56
7	**Prohibit MWT within 30minute squares off Cape Cod (99, 100, 114, 115, and 123)**	**2.2.7**	**58**
	Area Sub-option A (All squares in Areas 1B, 2, and 3)	2.2.6.1.1	60
	Area Sub-option B (All squares in Areas 1B and 3)	2.2.6.1.2	60
	Seasonal Sub-option A (year round)	2.2.6.2.1	60
	Seasonal Sub-option B (Jun1-Sept30)	2.2.6.2.2	60
8	**Revert boundary between Areas 1B and 3 to original boundary**	**2.2.8**	**61**
9	**Remove seasonal closure of Area 1B**	**2.2.9**	**62**

Doc. #4
Table 91
Page 166

When is a vessel "fishing for herring"

- Alternatives currently read, "restrict vessels fishing for herring with MWT gear"
- PDT recommendation to clarify:

  Vessels with any Atlantic herring permit (limited or open access) may not use, deploy, or fish with midwater trawl gear in __???_ from _???_ to __???_ of each fishing year.

- Impact – Currently, if possess one pound of herring need to declare a herring trip. These would apply to any MWT vessel with a herring permit, on a declared herring trip or not.
- Potential mackerel fishery impacts on radar from start; staff updated MAFMC Squid, Mackerel, Butterfish Committee (Nov. 6, 2017). *See correspondence.*

Recent Correspondence – Doc. #8

- The Council received over 30 letters since Sept Council meeting.
- Over 100 individuals signed one letter.
- Almost all from towns and conservation groups on Cape Cod concerned about depletion of herring inshore and negative impacts on river herring bycatch from MWT fishing.
- MAFMC MSB Committee memo with concerns about potential impacts on mackerel fishery. Preference for measures that exclude Area 2.
- One from UMass Amherst about forage range of Atlantic seabirds (common and roseate terns).

Next Steps for Amendment 8

Meeting - Location	Date	Primary Agenda Topic(s)
NEFMC – *Gloucester, MA*	Sept 26-28	Review DEIS and select pref. alts for ABC CR alternatives
Herring AP/Cmte -	November 20/21	Review DEIS and select pref. alts for LD measures
NEFMC – *Newport, RI*	December 5-7*	Review DEIS, select pref. alts for LD measures, approve DEIS for public hearings
Public Hearings	March 2018 (tent.)	Input on A8 DEIS
NEFMC	June 2018 (tent.)	Final Action

** If Council not ready in December, this meeting pushes back until late January.*

Part II
Draft Affected Environment

Draft Affected Environment

- **Document #4 – Section 1.0**
- Quick summary of each VEC

  1.1 Target species

  1.2 Non-target (bycatch)

  1.3 Predator species (non-protected – fish, tuna)

  1.4 Protected species (mammals and seabirds)

  1.5 Physical Environment (EFH)

  1.6 Human Communities

  Herring Fishery, mackerel fishery, lobster fishery, predator fisheries (tuna, gf), ecotourism (whale and bird watching)

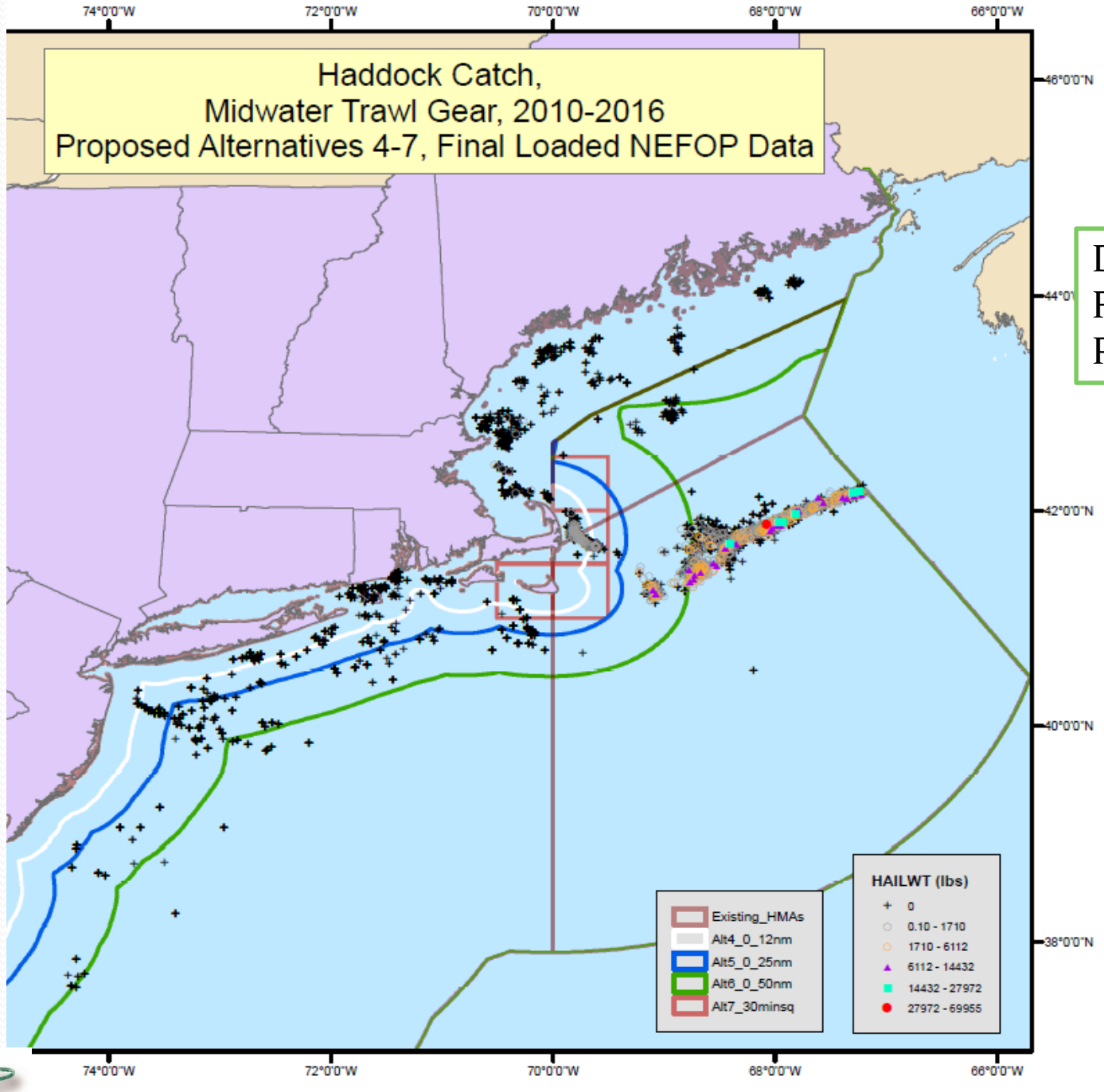
- Few missing tables and sections still being completed.

1.1 Target Species (Doc. #4 p. 7-22)

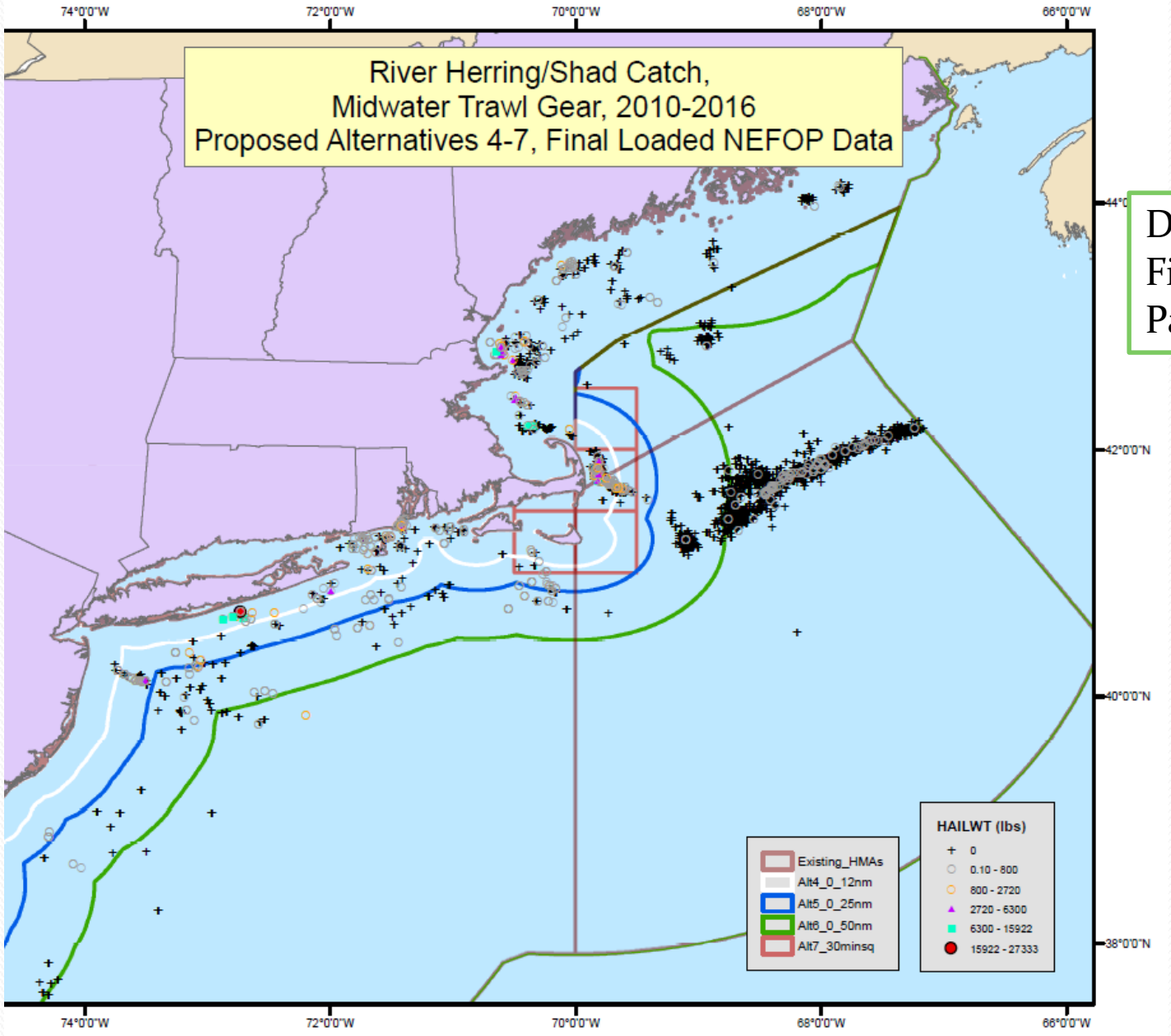
- Widely distributed from northern GOM to Chesapeake Bay – mostly 20-200 meters, and in waters 5-9°C.
- Spawning in summer and fall, earlier in eastern ME and later on GB (Map 1, p.13).
- Generally migrate from summer feeding grounds in GOM and GB to SNE and MA during winter.
- Assessed and managed as a single stock complex.
- 2015 update: herring rebuilt (not overfished) and F above Fmsy (no overfishing) (Table 1, p. 15).
- Forage – dogfish, cod and sliver hake highest stomach contents for herring (about 20%), 10-20% of marine mammal diet (important but not dominant), several seabird species, tuna (over 50% of diet), but many other prey species in this region (Figures 6 and 7, p.22).

1.2 Non-target (Bycatch) (Doc. #4 p. 23-28)

- Primary bycatch species are haddock and river herring/shad.
- Sub-ACLs and AMs in place for both species (Fig. 8 and 9, p.24).
- Haddock rebuilt and overfishing not occurring; in 2017, herring MWT fishery allocated 801 mt. GB cap exceeded once (2015).
- Coastwide meta-complex of RH stocks in depleted condition, overfished/overfishing status could not be determined. Some river systems have increasing trends, dam removals helping.
- In 2017, herring fishery allocated: 32.4mt for Cape Cod, 76.7 mt for GOM, 122.3 mt for SNE BT cap, and 129.6 mt for SNE MWT cap.
- Since 2014 the only RH/S cap exceeded was SNE BT (2015); MWT Cape Cod catch over 80% of cap this fishing year (2017).



Doc. #4
Fig. 40
Page 185



Doc. #4
Fig. 38
Page 183

1.3 Predator species (e.g. tuna) (Doc. #4 p. 29-36)

- BFT – found in Atlantic from Gulf of Mexico to Newfoundland, and west to Mediterranean Sea.
- Opportunistic feeders, but when enter GOM in May/June feed on herring, sandlance, and mackerel (stay 6 months).
- Recruitment has varied, stocks rebounded after rebuilding plan (post 1998). Fishing mortality has decreased since 2003.
- Status depends on recruitment scenario – never overfished, may be subject to overfishing.
- Uncertainty about mixing, spawning, and recruitment.

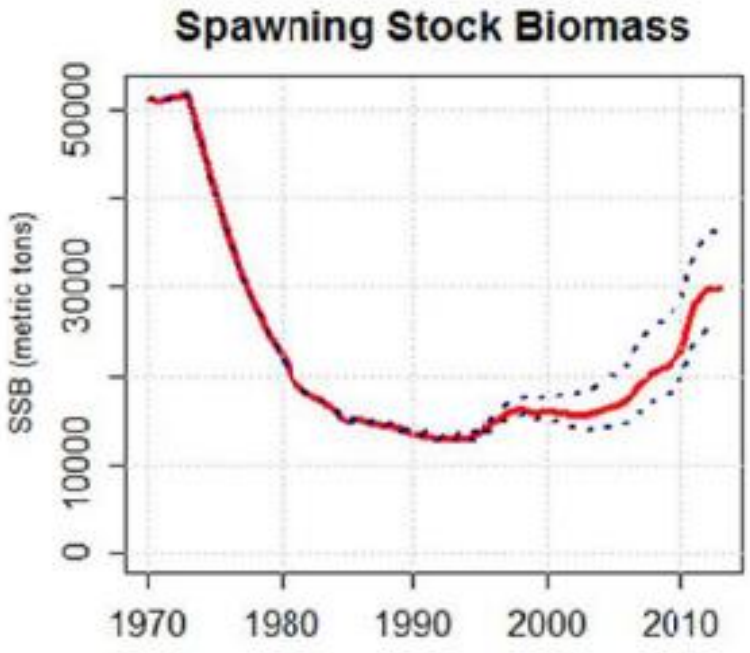


Figure 10, p. 30

1.3 Predator species (e.g. tuna) (cont.)

- Managed under 2006 Consolidated HMS FMP.
- 20-year recovery plan in 1998 – US gets 45% of western quota.
- US further sub-divides 20% recreational and 80% commercial, with seasonal quotas as well.
- US – gear rest., min. fish sizes, closed areas, trip limits, etc.
- Reliance on herring – come to GOM to feed on high lipid prey, recent trend of lean condition despite abundant herring (Golet, 2015).
- Herring weight and size-at-age has declined drastically, -55%.
- Poor BFT condition can lead to decreased egg production and even historical distribution if fish migrate out of the area.
- Herring important prey for 7 groundfish stocks (Table 5, p.36) and other recreational species.

1.4 Protected species (Doc. #4 p. 37-57)

- Table 6 (p.37) identifies the species protected under ESA and/or MMPA – some not LIKELY affected by herring FMP, and some POTENTIALLY affected (Table 7 and 8).
- Gear interaction risks by gear type/area – Sec. 1.4.3 (p.46)

  Sea turtles

  Sturgeon

  Atlantic Salmon

  Large whales

  Small cetaceans and pinnipeds
- Risks vary by gear and area – need to consider during impacts of alternatives.

1.4 Protected species (Seabirds)

- Section 1.4.4 (p.51)
- About 20 species found in Northeast Shelf Ecosystem.
- Eight are important predators of herring – and some of those are on priority list for conservation (Table 11, p.53).
- Seabirds consume relatively small amount of herring in total (3-5mt), but likely underestimated.
- Fairly opportunistic, diets and proportion variable.
- Common tern – proxy for impacts – identified at MSE workshop.

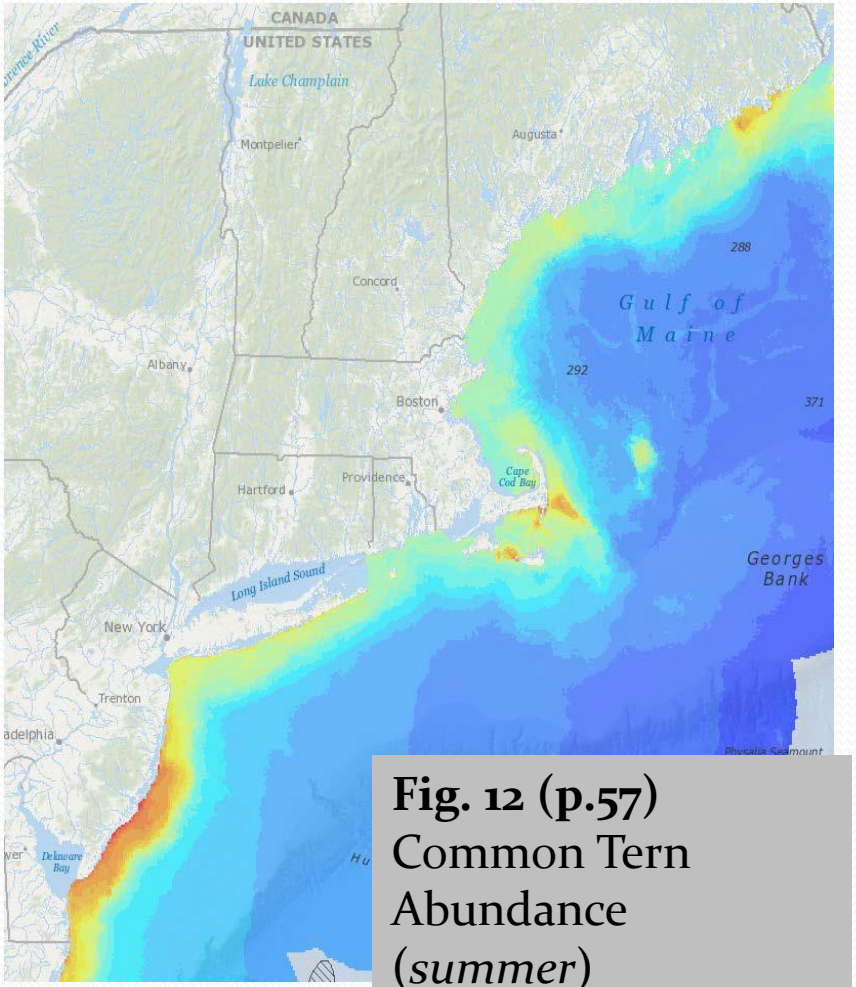
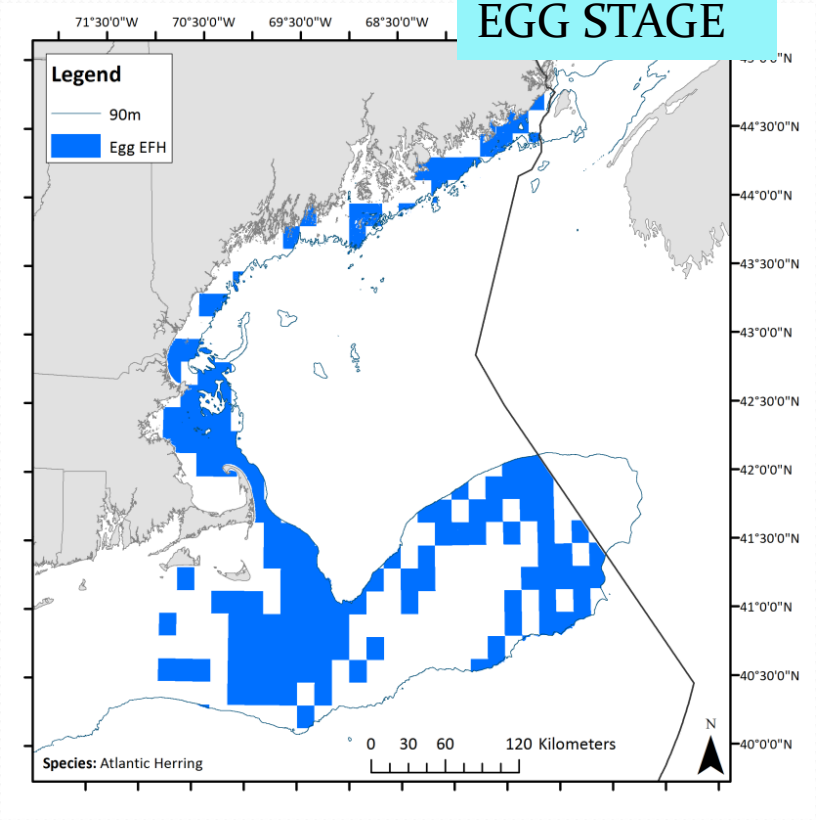


Fig. 12 (p.57) Common Tern Abundance (*summer*) *Source: NCCOS*

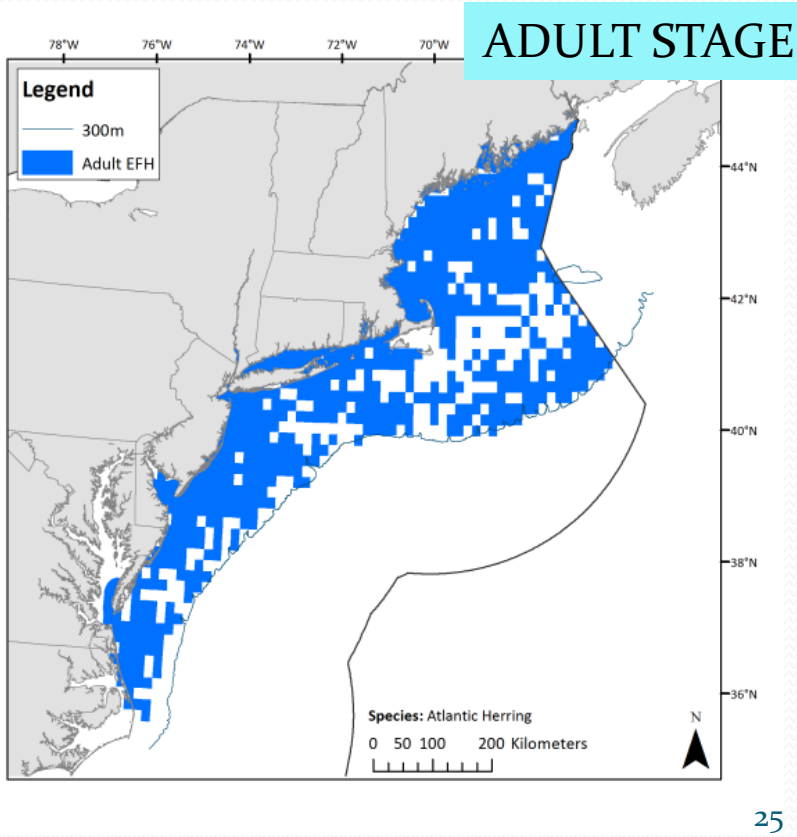
1.5 EFH (Doc. #4 p. 59-64)

- EFH designations updated in EFH Omnibus Amendment 2
- If approved, adult EFH now most of GOM and addition of southern half of GB, and additional areas for egg EFH, to include very small larvae (Text on page 59 and Maps 3-6).

EGG STAGE



ADULT STAGE



1.6.1 Herring Fishery (Doc. #4 p. 65-107)

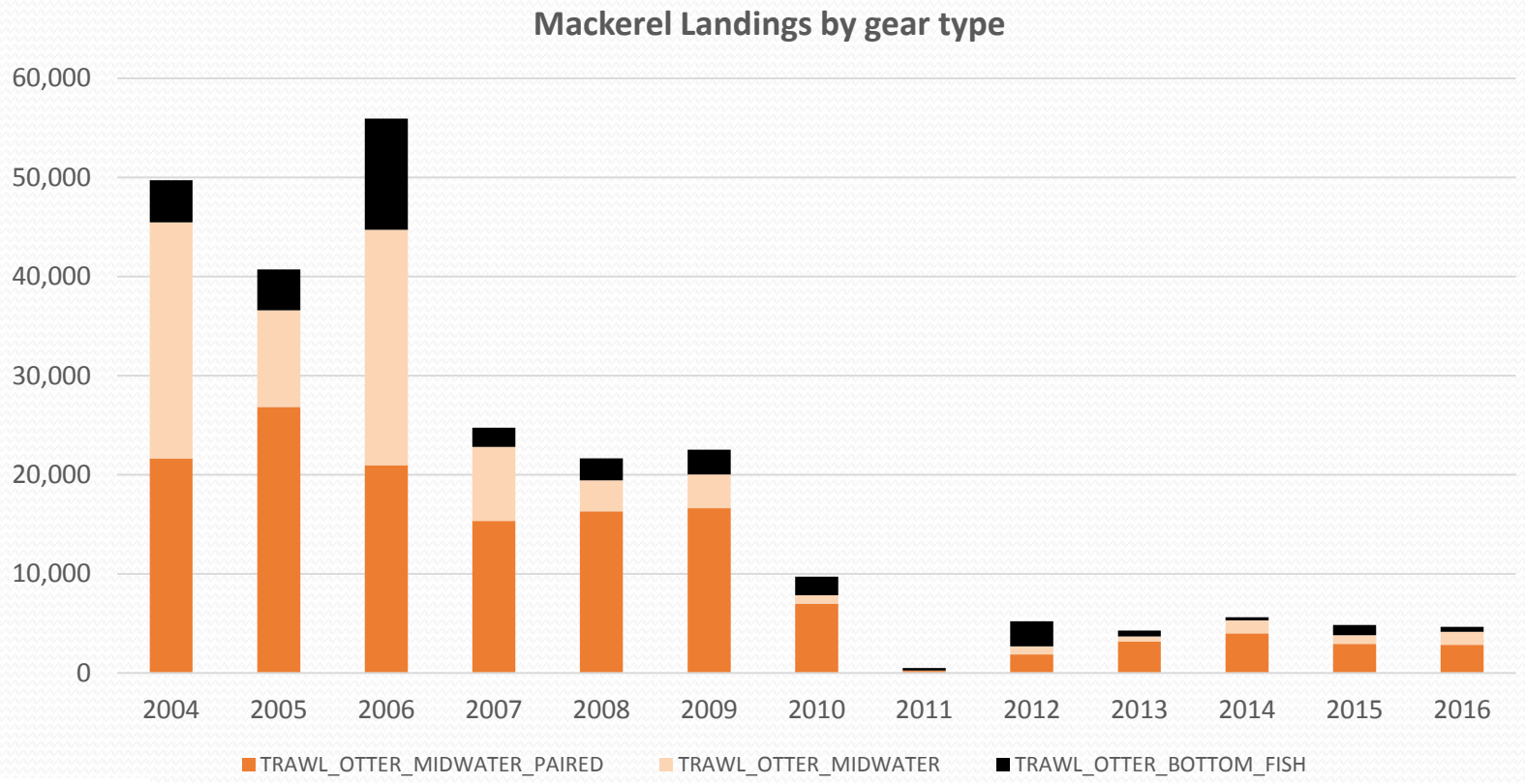
- ACL divided into 4 sub-ACLs (Area1A, 1B, 2 and 3).
- In general, effort in Area 2 during the winter (Jan-April), and oftentimes as part of the directed mackerel fishery.
- The summer fishery (May-August) is generally prosecuted throughout the GOM in Areas 1A, 1B and in Area 3 (GB) as fish are available. Restrictions in Area 1A have pushed the fishery in the inshore GOM to later months.
- Fall and winter fishing (September-December) tends to be more variable and dependent on fish availability; the Area 1A sub-ACL is always fully used, and the inshore GOM fishery usually closes around November.
- Table 17 (p.69) and Figures 14-17 summarize catch trends by area and season.

1.6.1 Herring Fishery (cont.)

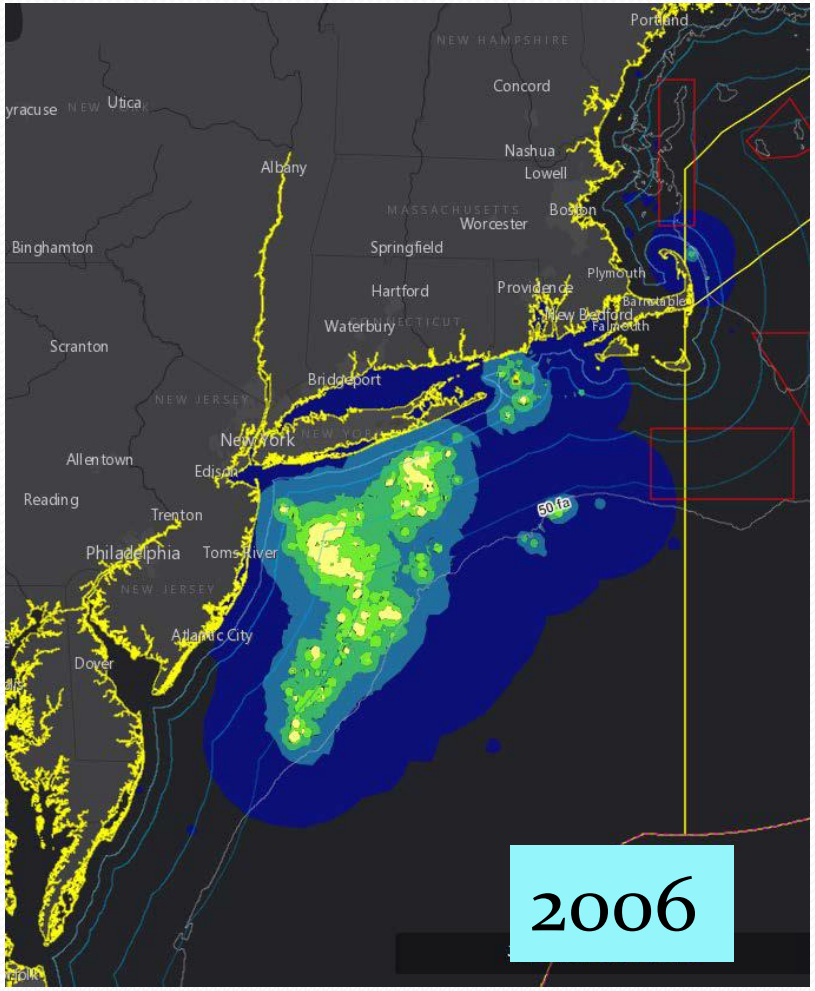
- About 40 limited access vessels active, and less than 5% of the 1,800 open access permits (Table 22, p.75).
- Proportion of total catch by gear type relatively stable, BT (under 10%), MWT (65-70%), and PS (25%) (Table 30/31).
- Trends in CPUE and costs (Tables 32 and 33).
- Trends in bait usage, state catch and Canadian catch.
- Employment, carrier activity, dealers/processors, shoreside support.
- Trends in prices and revenues.

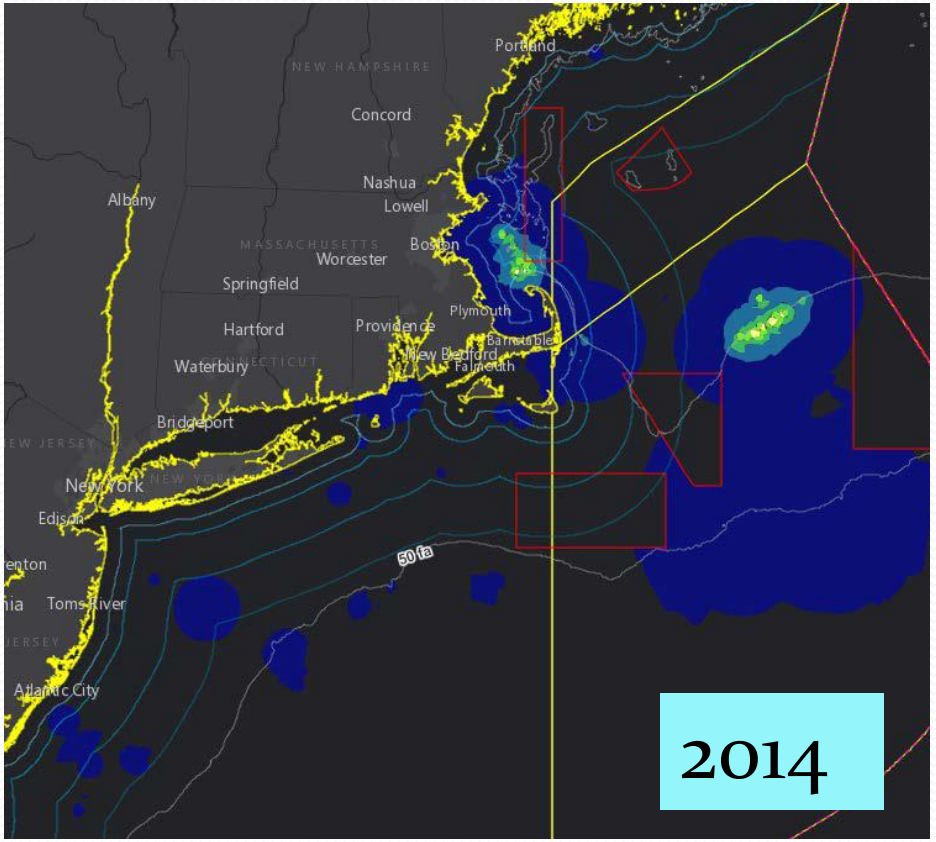
1.6.2 Mackerel Fishery (Doc. #4 p. 108)

- About 50 vessels have LA for both herring and mackerel, but only a dozen or so active each year.



FY2006 and FY2014 Mackerel landings

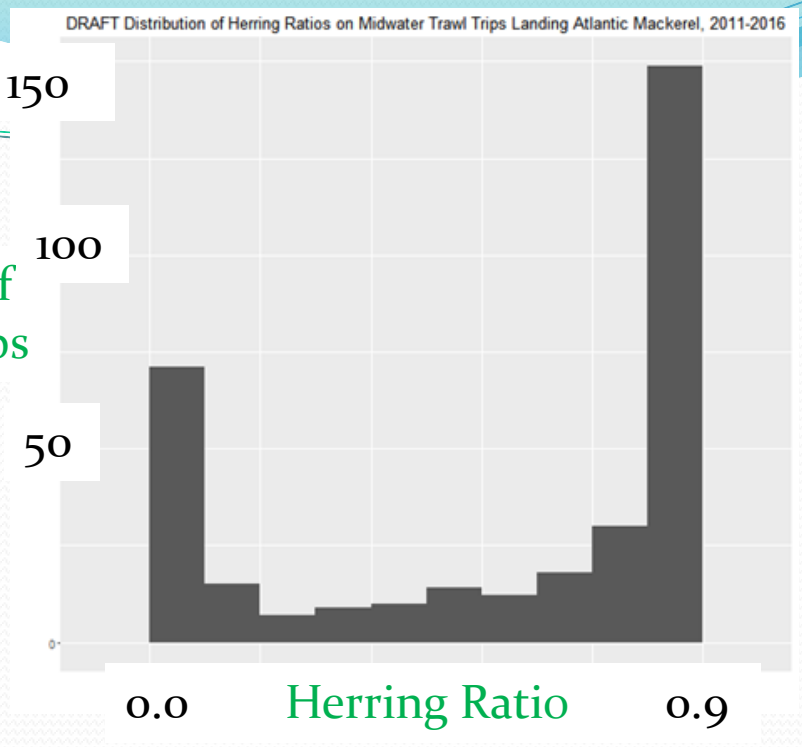




GARFO Interactive maps for A8:
http://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=5d3a684fe2844eedb6beacf1169ca854

More maps: page 110

Herring MWT trips landing Mackerel (2011-2016)



Year	Permits	Trips	Trips Landing Herring	Trips Landing >= 90% Herring	Herring Live Pounds	Mackerel Live Pounds	Avg. Herring Percent per Trip[2]
2011	12	24	23	16	6,496,623	673,915	87.7%
2012	12	41	36	15	9,145,718	5,877,851	52.2%
2013	16	58	57	33	13,853,901	8,118,382	74.0%
2014	11	55	52	15	19,068,466	11,691,912	54.8%
2015	11	67	59	29	15,855,332	8,445,115	57.4%
2016	11	90	85	41	20,637,136	9,550,445	65.8%

1.6.3 Lobster Fishery (Doc. #4 p. 111)

- 2015 assessment mixed – record high for GOM and GB and record low for SNE.
- Jointly managed by ASMFC (0-3 miles) and NMFS (federal); seven management areas (Map 9, p. 112) using variety of management tools (trap limits, protections for egg bearing females etc.).
- Fishery has expanded and is now #1 revenue fishery in US.
- In 2016, over 150 million pounds, over 80% landed in Maine.
- Over 8,000 commercial permits (state), and 3,000 federal (Table 59, p.114).
- Most landings July – November (Table 58, p. 114).
- Herring important bait for lobster fishery, over 80% of all bait usage in many areas in Maine (Table 49, p. 101); less so farther south.

1.6.4 Bluefin tuna Fishery (Doc. #4 p. 115)

- Over 800mt commercially landed per year, mostly from rod and reel and longline gear (worth over $8million).
- Fishery generally occurs off of NC from Dec – Jan, and becomes active off of Cape Cod and in the GOM in summer and fall.
- Fishing area and catch rates are highly variable due to bluefin abundance and distribution, which is influenced by oceanographic and ecological conditions, including forage availability.
- On average catches highest in GOM (HMS Areas 1-3) in the summer, and east of Cape Cod (Area 4) in Sept and Oct (Tables 63-66, p.118-119)

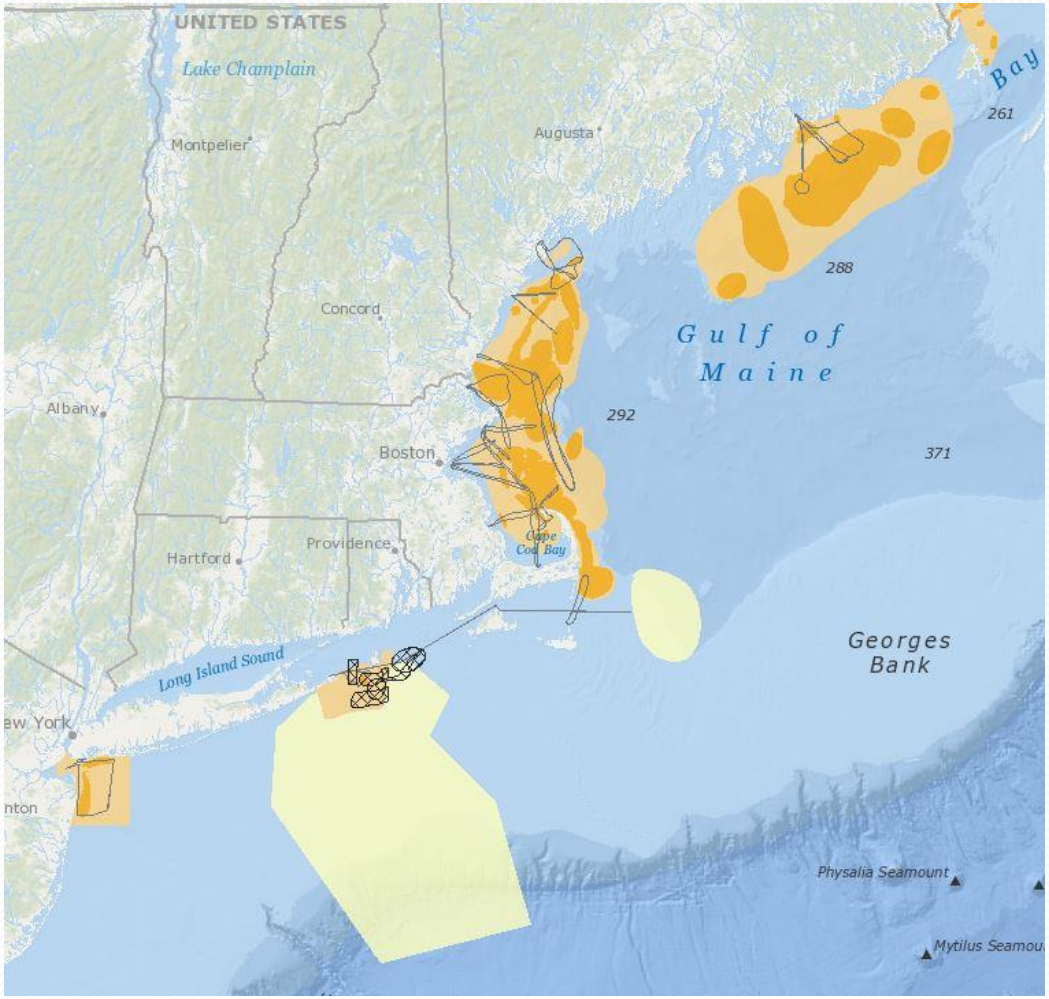
1.6.5 Groundfish and Striped bass fisheries (Doc. #4 p. 120)

- Groundfish – general decline in number of vessels, landings, and revenues (2013 – over 19,000 mt and $59 million revenue).
- Striped bass – recreational catch has increased since 1980s with a peak in 2006, and up and down around 12,000 mt since (Figure 23, p.121).
- Maryland, New York and Massachusetts highest catches per state (Table 67, p. 121).
- About half of commercial catch in Maryland (3,000 mt).
- MRIP does not have spatial data for catch locations at sea.
- MADMF has state water data – typically in MA in May-Oct, but commercial fishery under 2 months in length (Fig. 24/25).
- Stomach data estimated <10% herring, but at specific times and regions (GOM in summer/fall) up to 30% herring.

1.6.7 Ecotourism (Doc. #4 p. 125)

- Whale watching – Season runs from April – October, and into Nov in some places.
- Key species: fin, humpback, and minke.
- In 2008, an estimate of about 30 whale watching businesses in New England ($35 million direct revenue)(Table 68, p.126).
- Total number of companies has declined (estimate from 2017 for entire Northeast is 22, highest number in MA) (Table 69).
- Whales tend to congregate near schooling prey.
- Not required to report location of trips or what species observed – but many companies have naturalists onboard that do collect some information.

Commercial whale watching (Fig. 27, p.128)



- **Map from input at workshops to map areas where whale watching takes place in Northeast.**
- **General use areas** [light orange] reflect the full footprint of whale watch activity in (2010 – 2014) regardless of frequency or intensity
- **Dominant use areas** [dark orange] include all areas routinely used by most users most of the time, according to seasonal patterns.

http://www.northeastoceandata.org/data-explorer/

Seabird watching (p.129)

- New England popular destination, particularly Petit Manan and Machias Seal Islands.
- Seabird tourism season in Maine generally runs May-July when most seabirds come to land to nest.
- 2001 – 120 companies in Maine, 2/3 in Penobscot Bay or east. About 10-15% primary focus is seabirds, rest more incidental.
- Total revenue estimated at 5-10 million annually (2001).
- Some information for other states, but working with USFWS to include more detailed info for DEIS.

1.6.3 Fishing Communities (Doc. #4 p. 130)

- About 140 communities identified as potentially impacted by A 8.
- Within a given communities, many of the fisheries/industries co-occur.
- Eleven communities with "high" reliance on herring (p.145-155)
- Community of interest criteria – must meet at least 1/6 (Table 72).
- Key port communities also identified for other fisheries/ecotourism.

Key ports	
Herring	18
Mackerel	8
Lobster	20
Bluefin tuna	7
Commercial groundfish	32
Recreational	191
Ecotourism	30

Table 78, p. 141

Part III
Draft PDT Analysis of potential localized depletion and user conflicts

Draft PDT Analysis (Doc. #4 - 2.0-5.0)

- **2.0 Background** – input from scoping, Amendment 1 background, literature review and other examples.
- **3.0 PDT Analysis (Appendices 6a, 6b, 6c)**

  6a – PDT Memo from Committee Tasking (online maps)

  6b – PDT fishery overlap analysis (user conflicts)

  6c – LD references an other examples

High level input: 1) depletion occurs regardless of gear type, all concentrated removals; 2) depletion different than user conflicts; 3) catch rates not a good measure of depletion for schooling, pelagic fish; 4) more direct research needed; 5) effort shifts difficult to predict so impacts somewhat uncertain.

- **4.0 Summary of LD and user conflict alternatives**
- **5.0 Draft Impacts**

6a. PDT tasking memo appendix

- Memo 1 topics: herring consumption by predators; monthly fishery maps (herring and gf predators); trends in Area 1A fishing to assess No Action; trends off backside of Cape Cod (episodic and fast); striped bass, tuna and whale watching data.
- Correlation between catches of herring and predator fisheries – VTR data for herring, cod, pollock, dogfish. No evidence of LD found, but several caveats with analysis.
- Memo 2 topics: online mapping tool; explore CPUE analysis for herring and tuna; explore study fleet data; explore MRIP data;

6b. PDT fishery overlap analysis

- Objective - identify the seasons and areas important to MWT fleet and other users - greatest conflicts expected to occur.
- Data – VTR kept for herring, GF (cod, pollock, dogfish), tuna. For tuna all BFT reported to HMS in large zones, if have VTR requirements for a different permit used in analysis (about 10,000 trips, 10-20% of total landings). For whale watching used commercial survey (NROC).
- Methods – VTR landings summarized into ten-minute squares by month, and "dominant" areas from whale survey by season.
- Overlap index calculated for each fishery for three time periods: Pre-A1, post-A1, and "recent" (2013-2015).

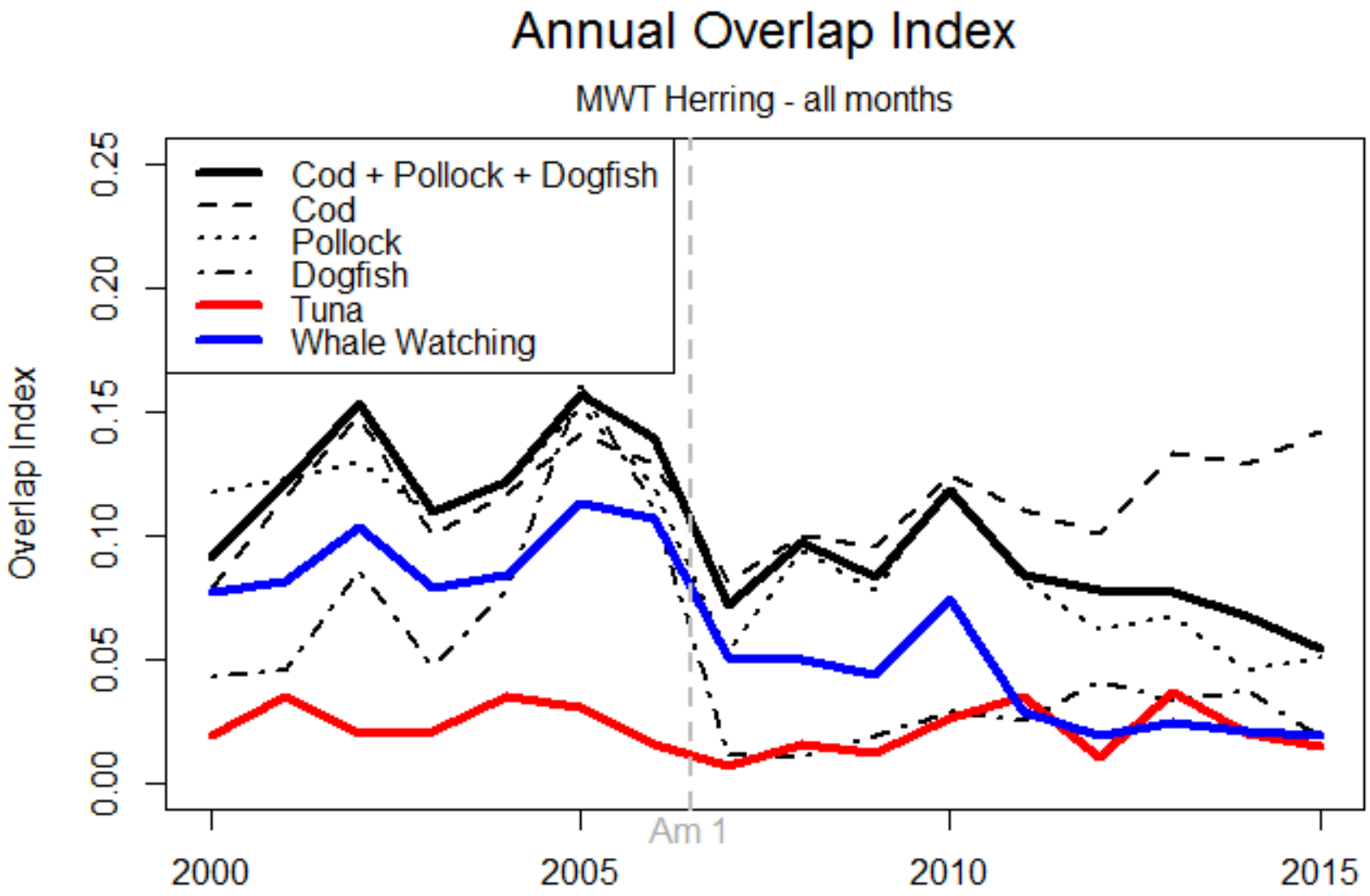
Overlap Index (example)

Total Landings	Herring	Other
	0 0 0 1 2 0 0 3 1	1 2 1 2 5 1 1 1 0
	Σ = 7	Σ = 14

% of Total	pHerring	pOther	Overlap
	0 0 0 0.1 0.3 0 0 0.4 0.1	0.1 0.1 0.1 0.1 0.4 0.1 0.1 0.1 0	0 0 0 0.1 0.3 0 0 0.1 0
	Σ = 1	Σ = 1	Σ = 0.5

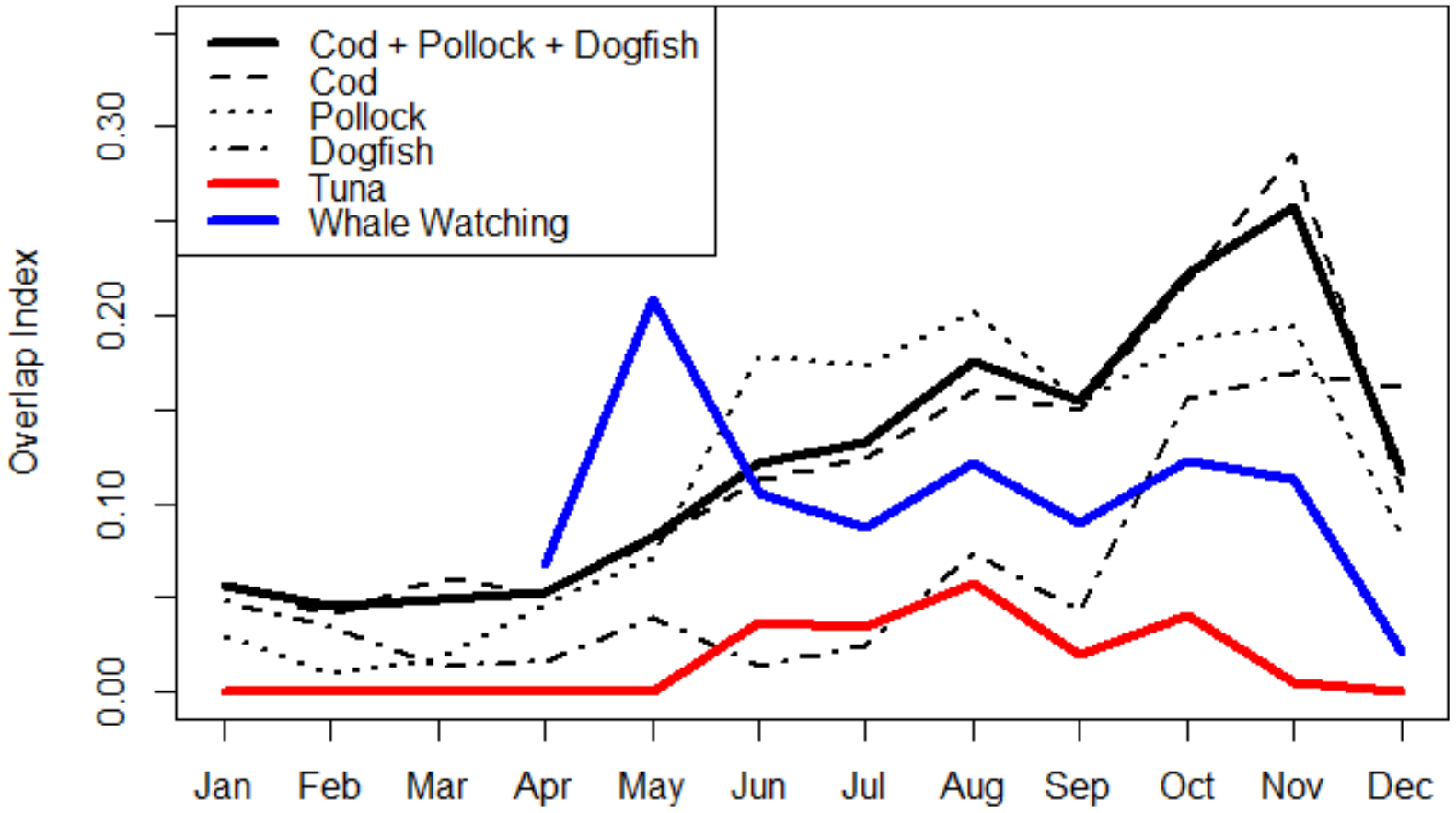
min(pH, pO)

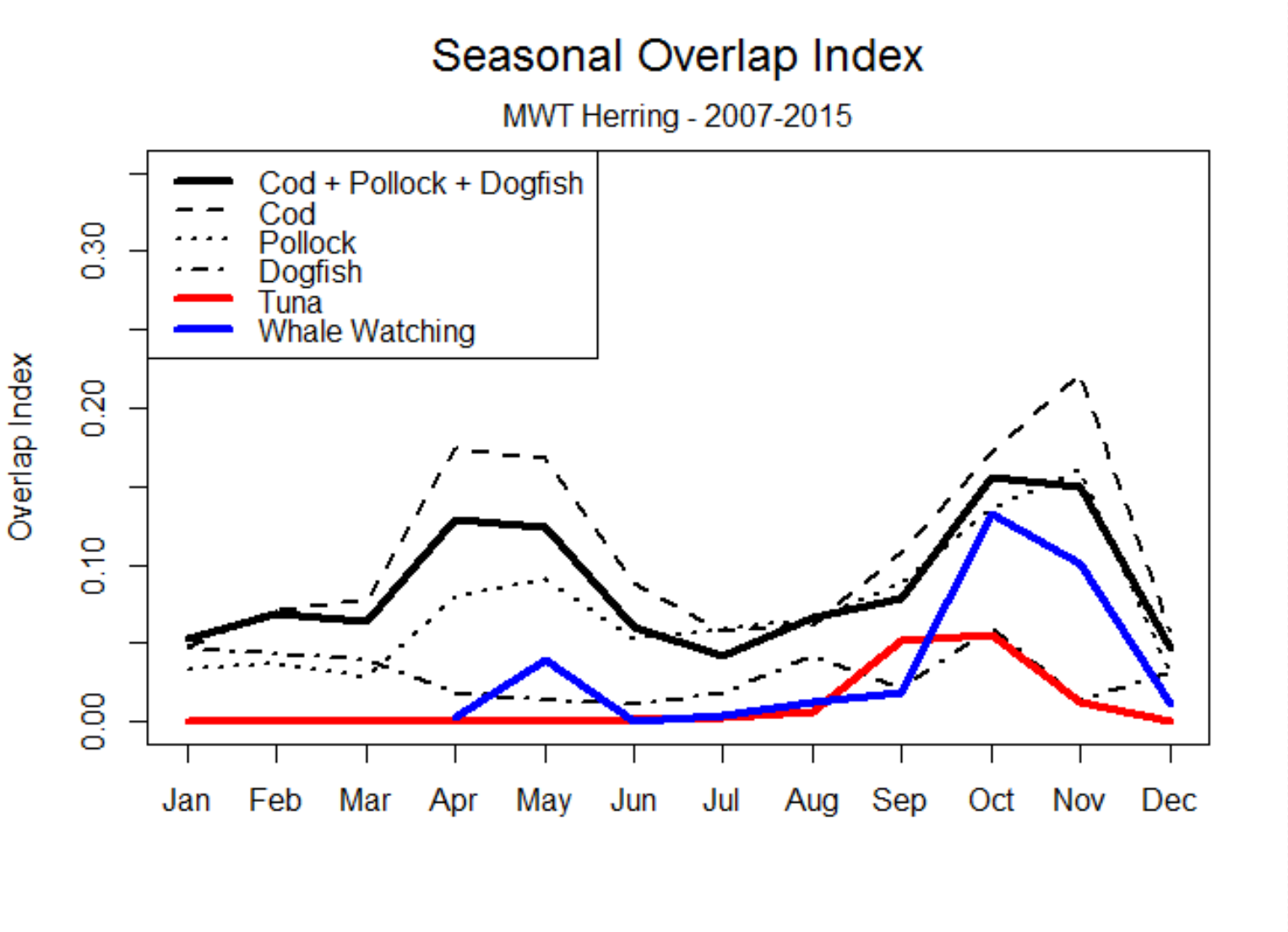
Czekanowski index of overlap: 0 = no overlap and 1.0 = perfect overlap

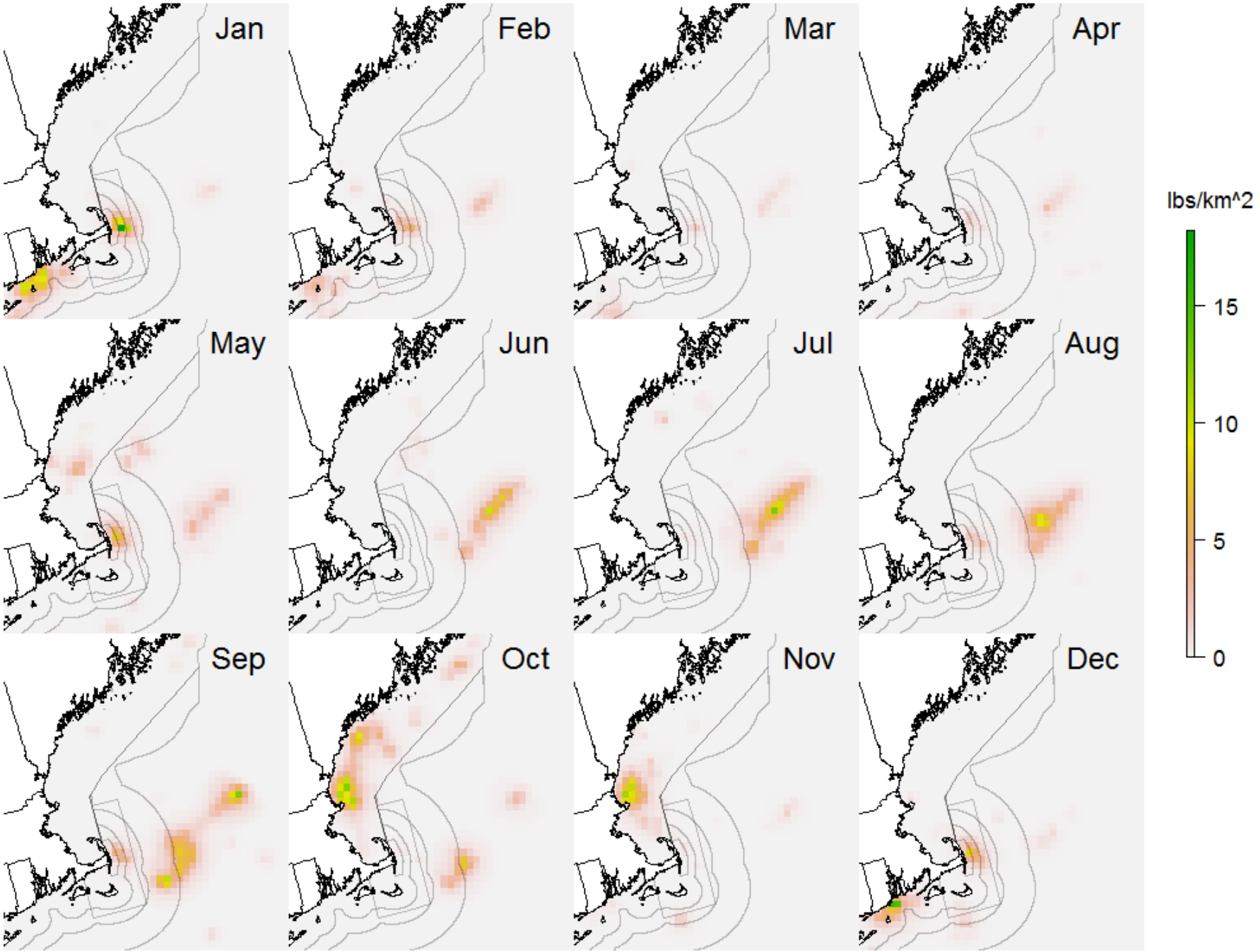

Annual Overlap Index
MWT Herring - all months
Cod + Pollock + Dogfish
Cod
Pollock
Dogfish
Tuna
Whale Watching
Overlap Index
0.00
0.05
0.10
0.15
0.20
0.25
Am 1
2000
2005
2010
2015

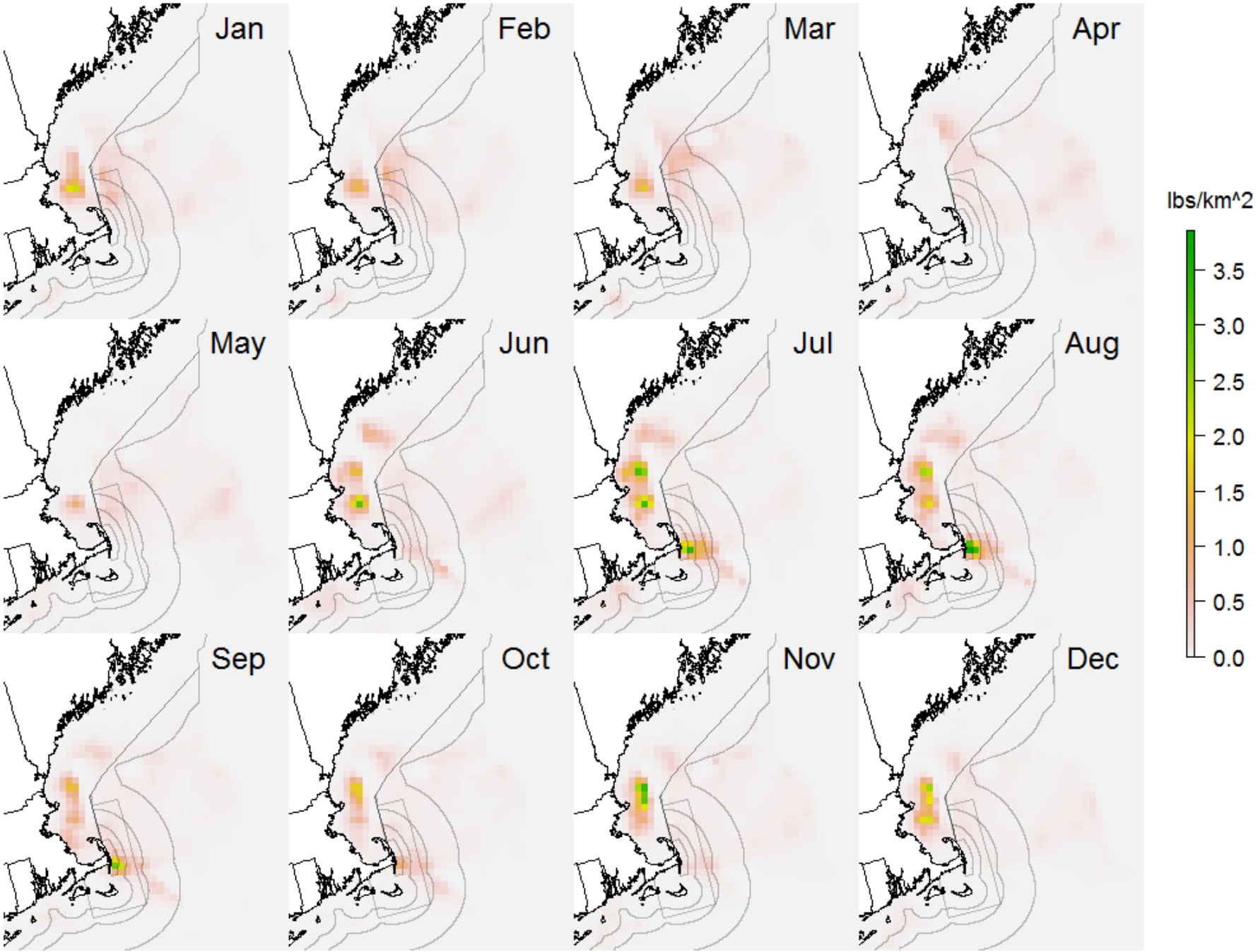
Seasonal Overlap Index

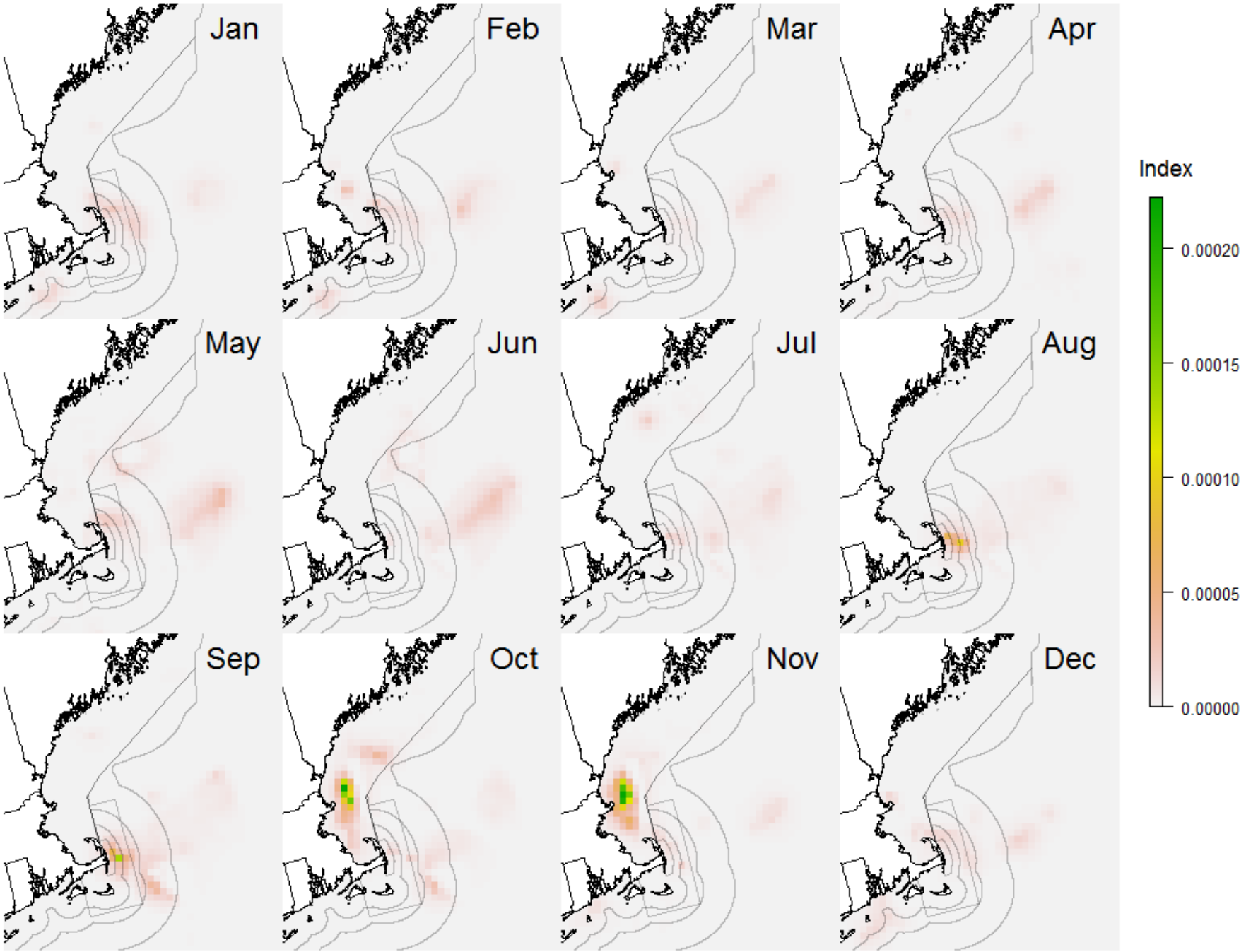
MWT Herring - 2000-2006



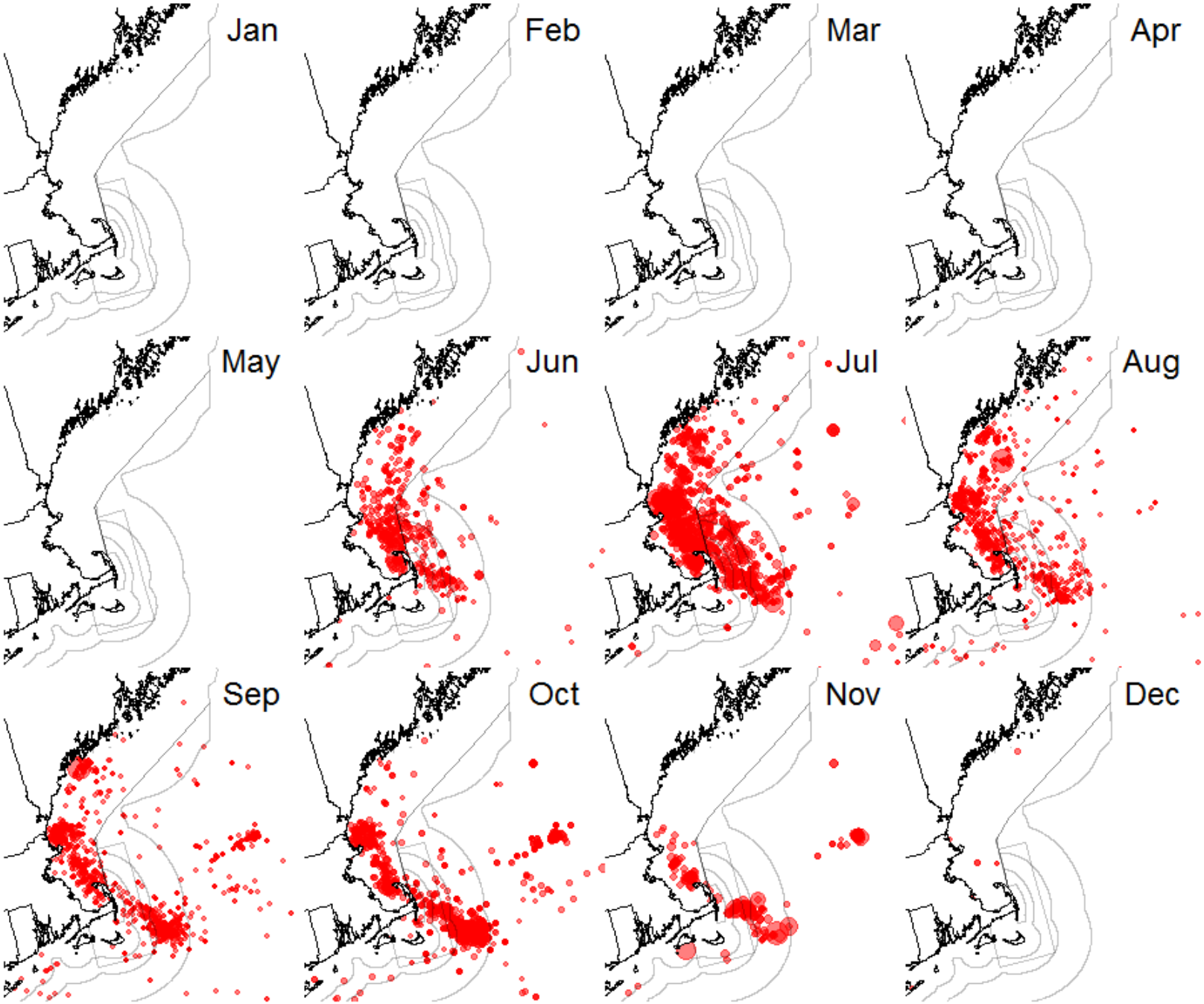

Seasonal Overlap Index
MWT Herring - 2007-2015
Cod + Pollock + Dogfish
Cod
Pollock
Dogfish
Tuna
Whale Watching
Overlap Index
0.00
0.10
0.20
0.30
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

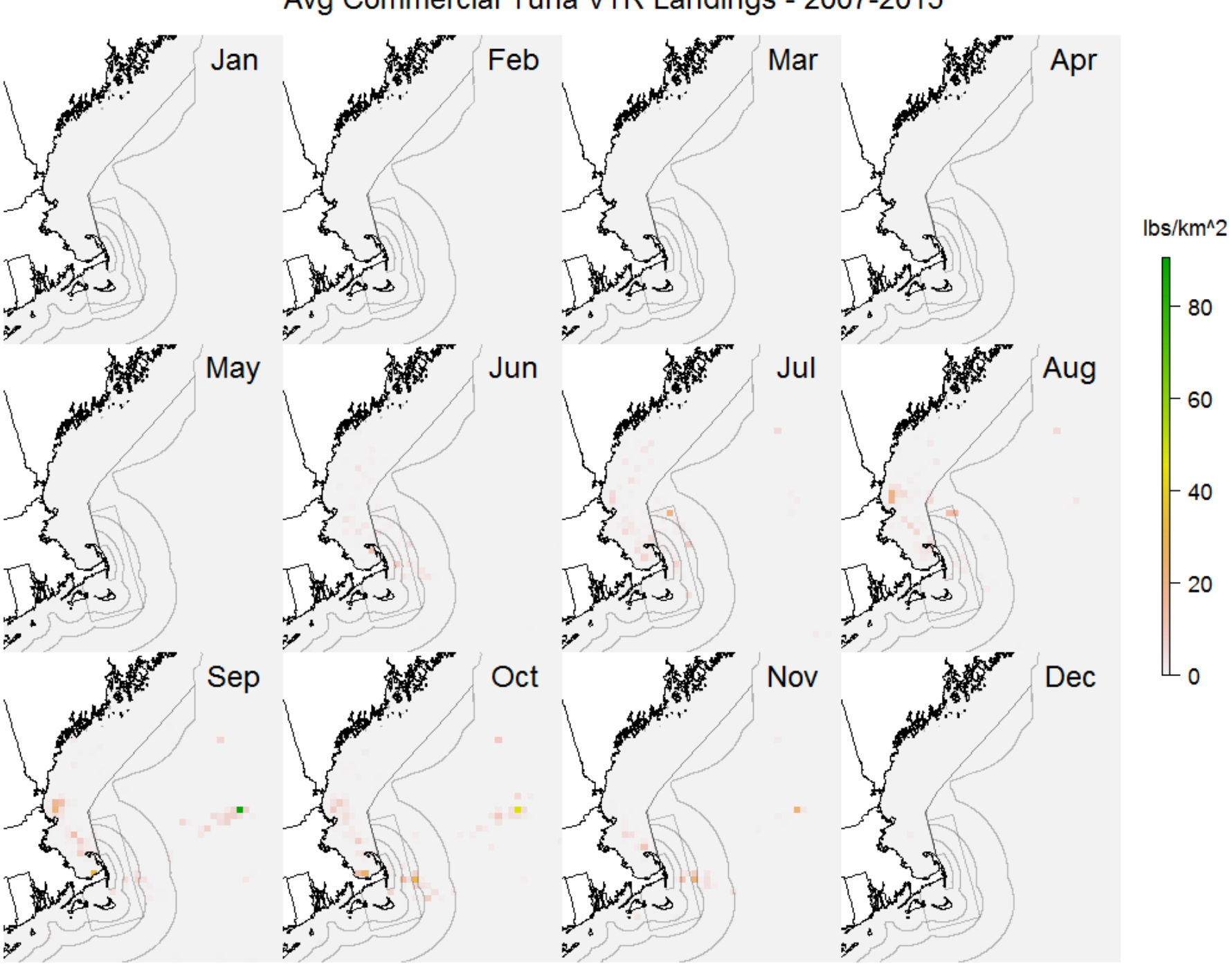

Avg MWT Herring Landings - 2007-2015
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
lbs/km^2
15
10
5
0

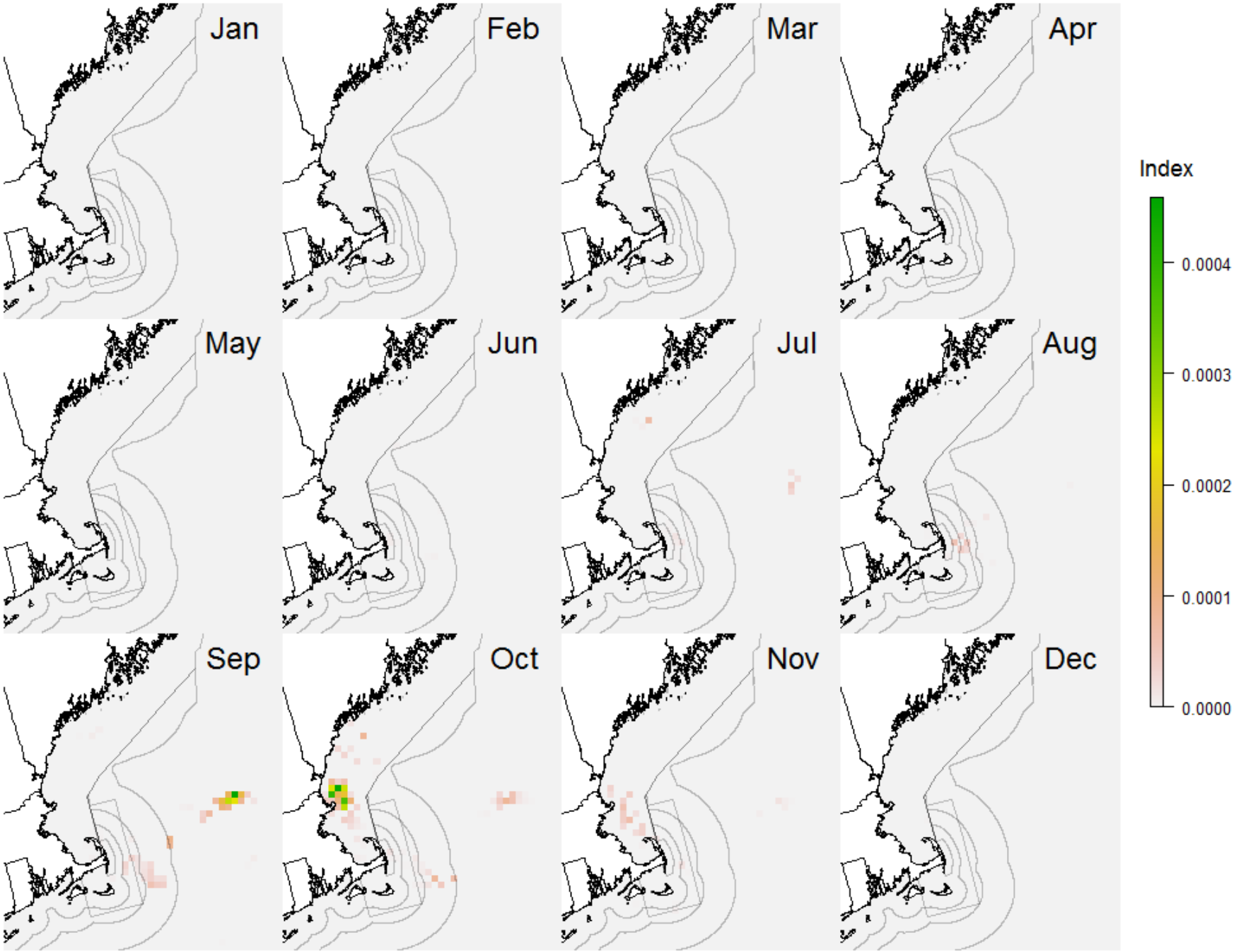

Avg Cod, Pollock, & Dogfish Landings - 2007-2015
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
lbs/km^2
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0


Overlap: MWT Herring - GF Predators - 2007-2015
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Index
0.00020
0.00015
0.00010
0.00005
0.00000

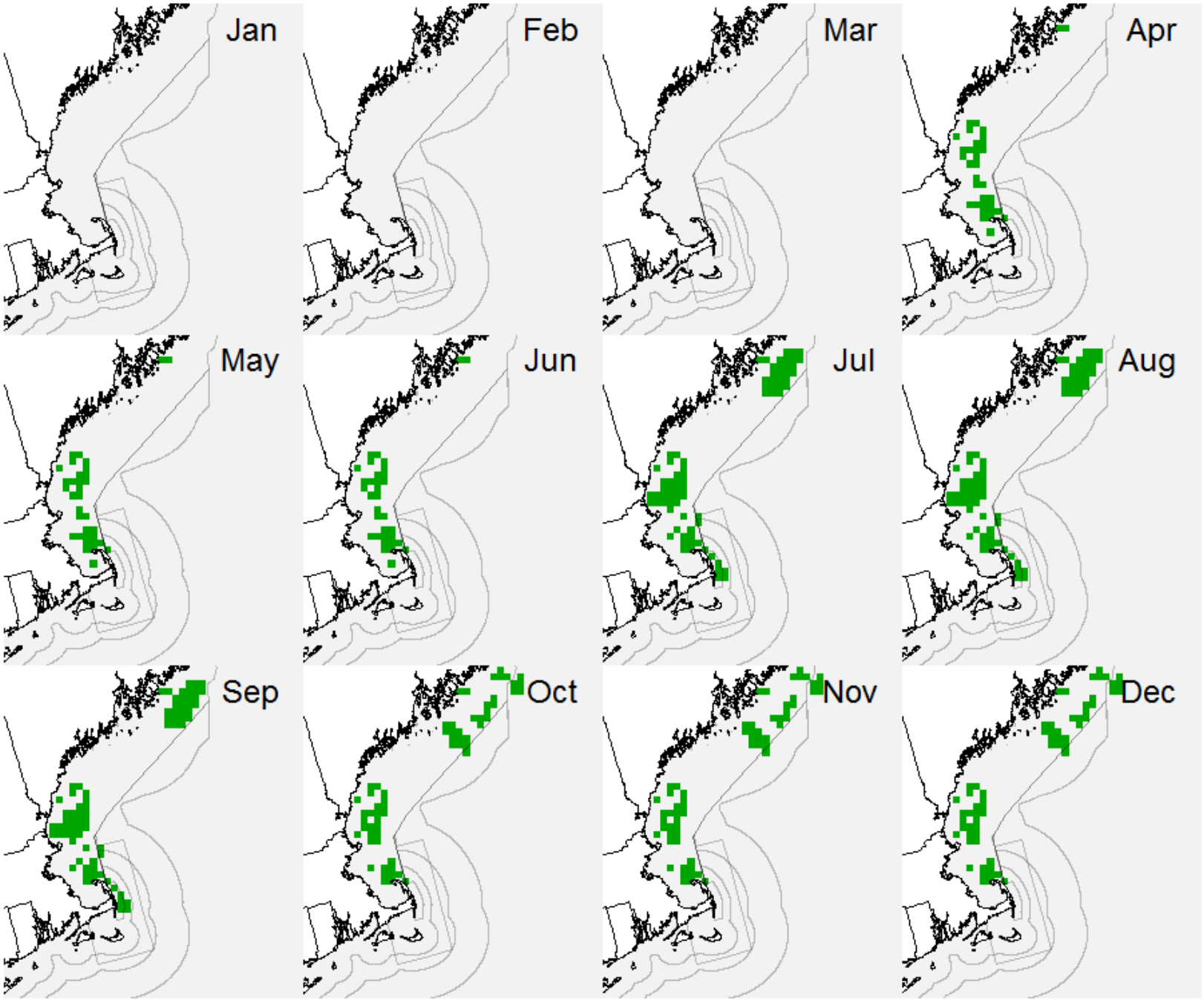
Avg Commercial Tuna VTR Landings - 2000-2016



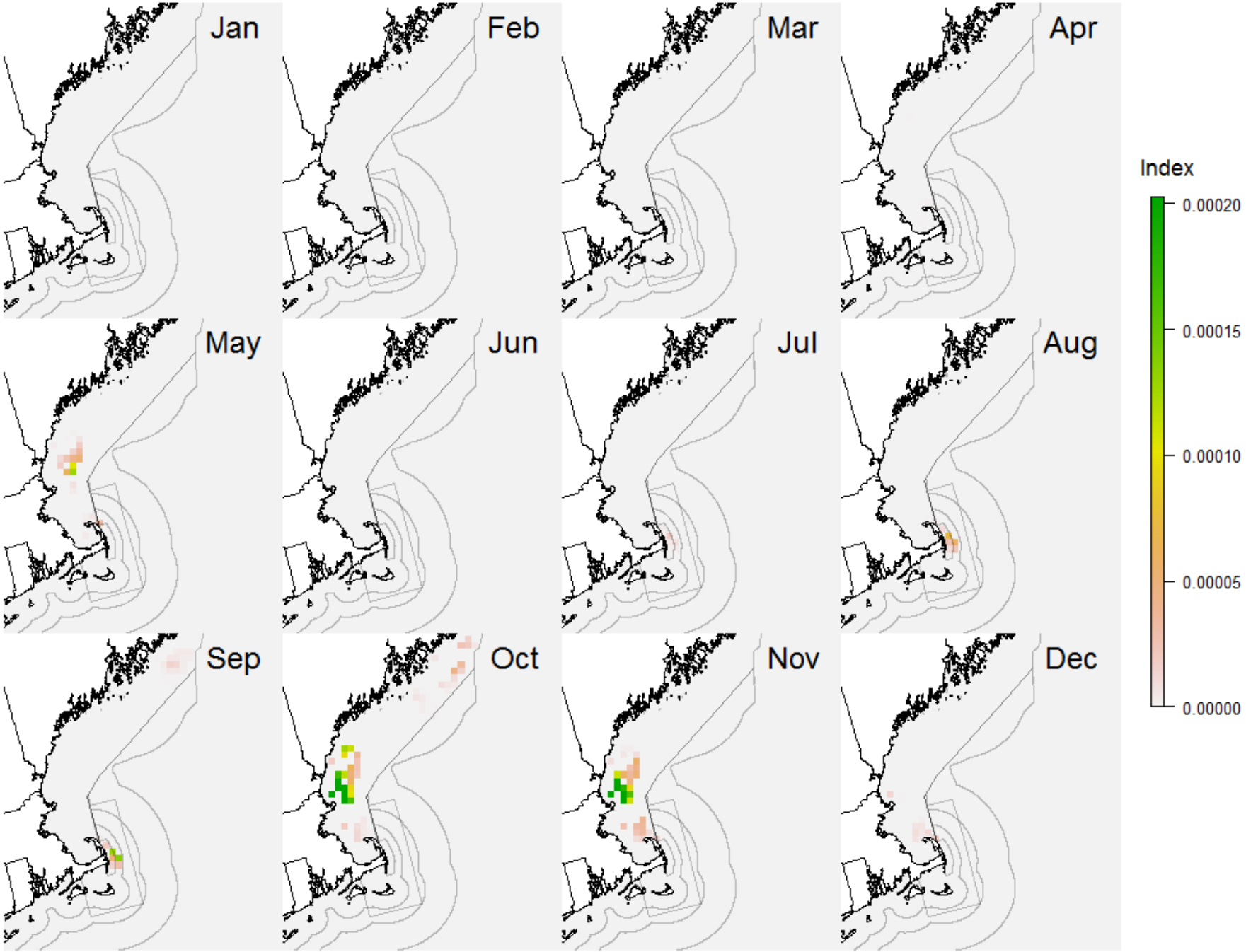

Avg Commercial Tuna VTR Landings - 2007-2015
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
lbs/km^2
80
60
40
20
0


Overlap: MWT Herring - Comm Tuna VTR - 2007-2015
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Index
0.0004
0.0003
0.0002
0.0001
0.0000

Dominant Use Whale Watch Areas



Overlap: MWT Herring - Whale Watching - 2007-2015



6c. PDT LD literature review

- Objective: 1) summarize analogous management cases that address LD and user conflict issues; and 2) review large body of scientific literature about herring and predators as well as other examples.
- Management cases constraining prey fisheries: squid off Nantucket; Atlantic menhaden; N. Pacific Stellar sea lion; Antarctic krill; North Sea sandlance.
- Management cases preventing development of prey fisheries: N. Pacific forage fish, Pacific krill, Mid-Atlantic forage fish.
- Management cases resolving user conflicts: Dolphin and wahoo, snapper/grouper, Alaska halibut.
- List of references by topic.

Part IV
Draft Impacts of potential localized depletion and user conflicts

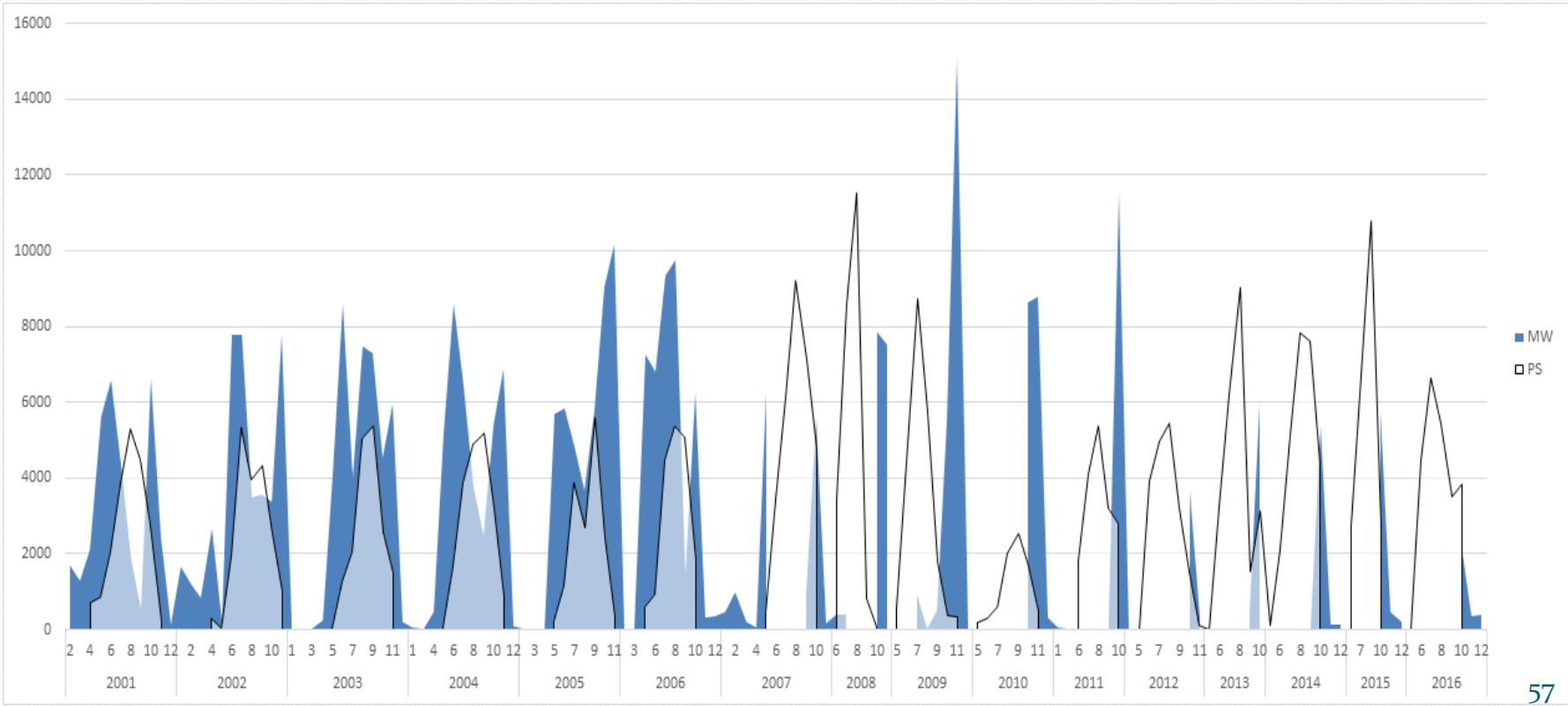
5.1 Herring Resource Impacts (Doc. #4 p. 167)

No Action – MWT prohibition in Area 1A June-Sept - NEUTRAL

- Not possible to determine direct impacts in isolation of other measures adopted in Area 1A.
- Sub-ACL controls total removals –TAC in Area 1A has been reduced by 50% since Amendment 1.
- Resource still assessed on stockwide basis, so impacts of localized closure on the overall resource is not possible.
- Similar levels of herring being removed by PS fishery (Tables 32/33). No research available on differential impacts of gear type – driver is capacity of vessel.
- No direct positive or negative impacts on spawning – no research available on direct impacts of fishing on spawning or whether there are any differential impacts by gear type.

5.1.1 No Action (cont.)

- Area 1A catch more truncated post-A1 (Figure 32, p.169).
- Larger catches for both gear types (Figures 33 and 34).
- Combination of measures lead to this, as well as changes in storage and ability to freeze.



5.1 Herring Resource Impacts (Doc. #4 p. 167)

Alt. 2 – 6nm closure to all gear in Area 114 - NEUTRAL

- Small area – does not overlap primary fishing areas.
- Not likely to prevent sub-ACL from being harvested.
- Migratory corridor
- Seasonal sub-options both expected to have similar, neutral impacts.

5.1 Herring Resource Impacts (Doc. #4 p. 167)

Alt. 3 – MWT prohibition in Area 1A year-round – NEUTRAL

- Sub-ACL will likely still be harvested.
- Same amount of herring removed, just from a different gear type, similar impacts on resource.
- Other measures in place that limit weekly removals per vessel (ASMFC days out measures and spawning closures).

5.1 Herring Resource Impacts (Doc. #4 p. 167)

Alt. 4 – MWT prohibition within 12 nm in Areas 1B, 2 and 3 – NEUTRAL TO LOW POSITIVE

- Neutral if fishery able to harvest sub-ACLs, and low + if prevents harvest of sub-ACLs. Range of herring landings within area is about 20% (all areas/all year) to 4% (excluding Area 2 and June-Sept only).
- Low + impacts are somewhat uncertain because small increases in biomass may not have measurable increased impacts on overall resource since biomass levels already high.
- Neutral impacts if vessels convert gear to harvest sub-ACLs.
- Excluding Area 2 more neutral impacts, especially if combined with seasonal sub-option (June – Sept only).

5.1 Herring Resource Impacts (Doc. #4 p. 167)

Alt. 5 – MWT prohibition within 25 nm in Areas 1B, 2 and 3 – NEUTRAL TO LOW POSITIVE

- Similar to Alt. 4 (neutral if fishery able to harvest sub-ACLs, and low + if prevents harvest of sub-ACLs) range of herring landings within alternatives is 28% (all year/all areas) and 5% (excluding Area 2 and June-Sept only).

Alt. 6 – MWT prohibition within 50 nm in Areas 1B, 2 and 3 – NEUTRAL TO LOW POSITIVE

- Similar to Alt. 4 and 5 (neutral if fishery able to harvest sub-ACLs, and low + if prevents harvest of sub-ACLs) but likelihood of sub-ACL not being harvested is higher. Range of herring landings within alternatives is 40% (all year/all areas) and 20% (excluding Area 2 and June-Sept only).

5.1 Herring Resource Impacts (Doc. #4 p. 167)

Alt. 7 – prohibit MWT gear in 30 minute squares around Cape Cod – NEUTRAL

- Area 1B sub-ACL may not be harvested, but small catch compared to total ACL and stockwide resource. Biomass already large so may not have added benefits.
- Area sub-options expected to have similar neutral impacts
- Seasonal sub-option of June – Sept may not have impact because harvest usually in May or winter months if not all harvested in May.

5.1 Herring Resource Impacts (Doc. #4 p. 167)

Alt. 8 – Change boundaries between HMAs 1B and 3 – NEUTRAL

- If Area 1B sub-ACL stays the same, some low positive impacts possible, but if Area 1B sub-ACL increases than neutral impacts.
- Changing boundaries could increase risk of fishing one spawning component harder.

Alt. 9 – Remove seasonal closure of Area 1B (Jan-Apr) – NEUTRAL

- Sub-ACL for the area controls mortality, so impacts on the resource neutral. Shifting the season effort takes place not expected to have different impacts on the resource; this area not important spawning area.

Section 5.2 Impacts on bycatch (p.181)

- Primary bycatch species: haddock and river herring/shad
- PDT approach: map bycatch from observer data with alternatives and calculate bycatch rates inside vs. outside (not completed).
- Overall – uncertain impacts because too many unknowns about effort shifts. Negative if effort shifts to Area 2 in winter; negative if effort shifts to GB in fall; negative if fishing pushed to areas and times with higher bycatch rates; negative if switch gear to bottom trawl; uncertain if effort shifts to places not fished now.
- In the end, fishery already under sub-ACLs for bycatch; that directly limits overall impacts on bycatch.

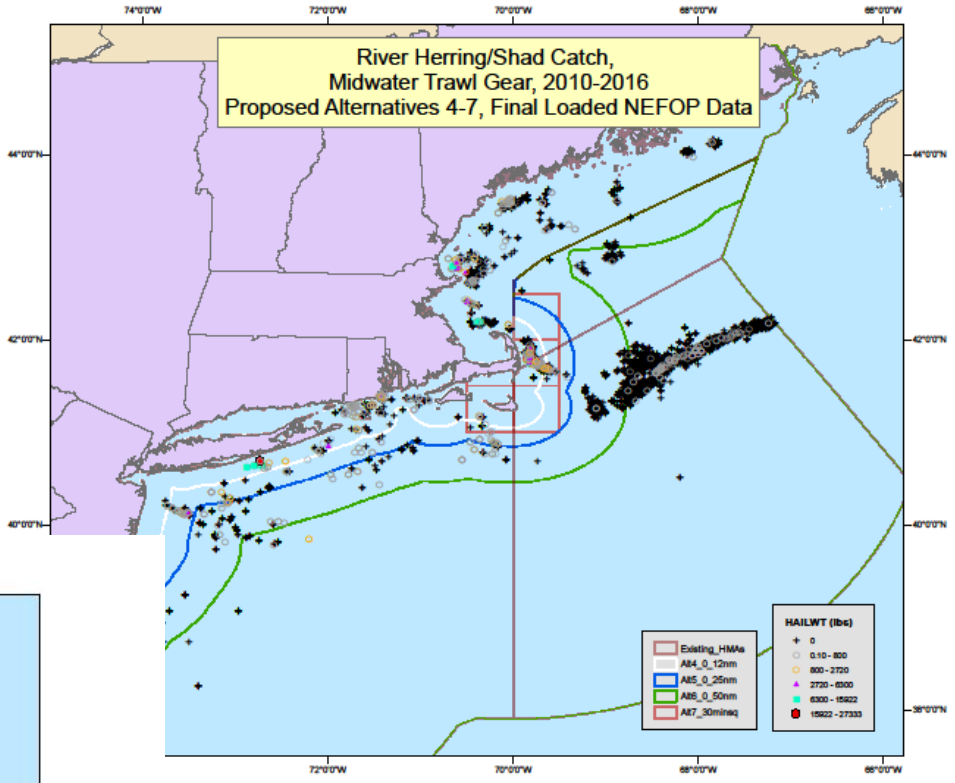
NEFOP Observed tows

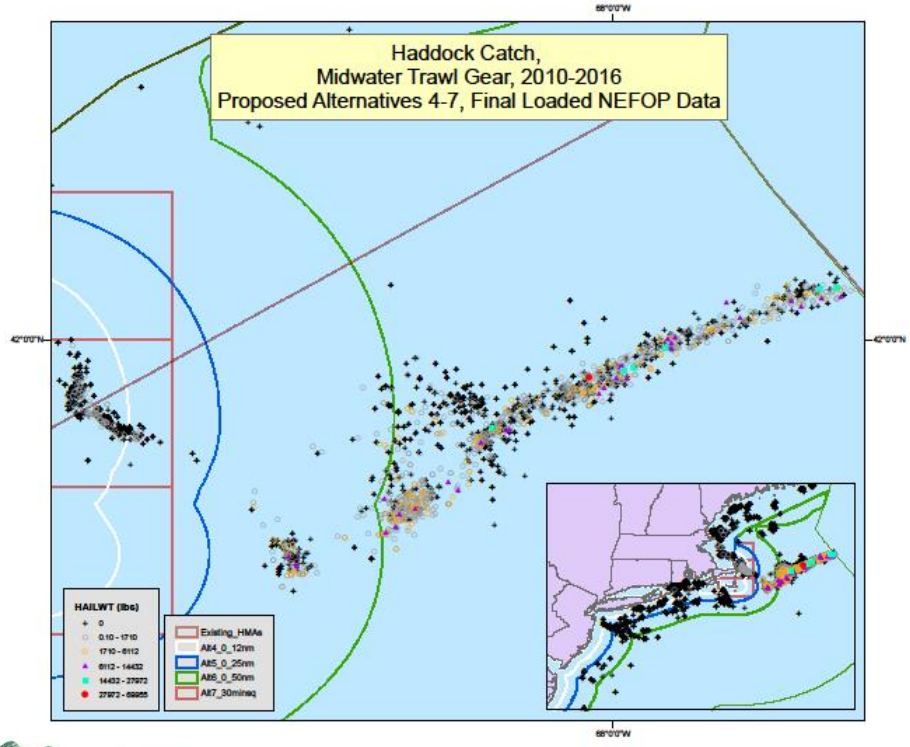
RH/S bycatch (right)

Haddock (below).

FY2010-2016

Figures 38-43 (p.183-188)





Similar maps for: shark/tuna/ray, and seabirds for seasonal sub-options as well.

5.2 Bycatch Impacts (Doc. #4 p. 167)

- No Action – total effort has declined so +, impacts depend on where effort has shifted, bycatch caps limit impacts (Neutral).
- Alt. 2 – RH/S interactions, but west of 6nm as well, could increase effort in diff seasons with low (-) impacts, but low level of effort overall (Neutral).
- Alt. 3 – lower bycatch in Area 1A, but higher in other areas (GB haddock impacts could increase, but cap in place (Neutral).
- Alt. 4 – MWT effort highest within 12nm in Nov and Dec. If Area 2 excluded effort could increase there, if effort shifts offshore could increase impacts there (Neutral to low negative). But if Area 2 included and year-round – low positive impacts on RH/S. Similar impacts for Alternatives 5 and 6.

5.2 Bycatch Impacts (Doc. #4 p. 167)

- Alt. 7 – Council be some positive impacts on RH/S unless effort shifts to other nearshore areas also with RH/S bycatch. Some positive impacts on haddock within Area 114, but if effort shifts offshore some areas have higher GB haddock bycatch rates. Both species have caps, so limits on bycatch impacts (Neutral).

- Alt. 8 – Changing boundary could impact effort levels, but bycatch caps limit any potential increased impacts (Neutral)

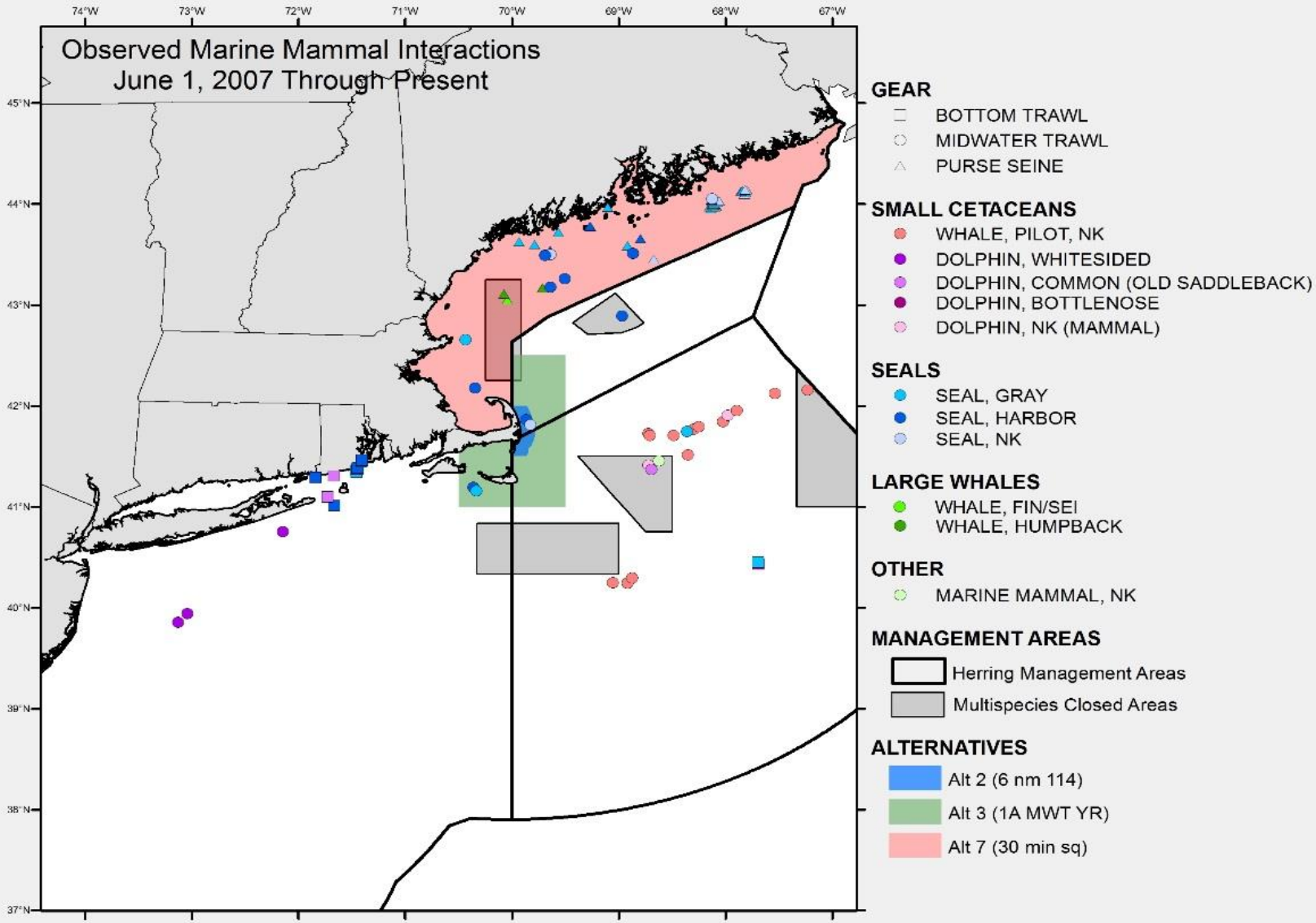
- Alt. 9 – Low negative (if effort shifts to winter) to neutral (because bycatch caps would limit impacts)

5.3 Predator species (tuna, groundfish, etc.)

- Section not complete.
- Herring an important forage for many species in this region.
- But many species in this region are generalists, and utilize multiple prey items – complex system.
- No research in this region on direct impacts of herring fishery on predators.
- Impacts will focus on predator fisheries, which is in line with problem statement.

5.4 Protected species (marine mammals and seabirds) p. 194-206

- Two types of impacts: incidental take and forage impacts (more work needed on second part).
- Main consideration for analysis is where will effort (and associated gear type) shift to and how will fishery behavior change relative to current conditions.
- PDT needs more input to complete this work – 8 AP questions.
- Developed incidental take maps – Figure 44 and 45, p. 195-196.
- Overall – takes with PS gear in GOM, and MWT on GB.


Observed Marine Mammal Interactions
June 1, 2007 Through Present
74°W
73°W
72°W
71°W
70°W
69°W
68°W
67°W
45°N
44°N
43°N
42°N
41°N
40°N
39°N
38°N
37°N
GEAR
BOTTOM TRAWL
MIDWATER TRAWL
PURSE SEINE
SMALL CETACEANS
WHALE, PILOT, NK
DOLPHIN, WHITESIDED
DOLPHIN, COMMON (OLD SADDLEBACK)
DOLPHIN, BOTTLENOSE
DOLPHIN, NK (MAMMAL)
SEALS
SEAL, GRAY
SEAL, HARBOR
SEAL, NK
LARGE WHALES
WHALE, FIN/SEI
WHALE, HUMPBACK
OTHER
MARINE MAMMAL, NK
MANAGEMENT AREAS
Herring Management Areas
Multispecies Closed Areas
ALTERNATIVES
Alt 2 (6 nm 114)
Alt 3 (1A MWT YR)
Alt 7 (30 min sq)

5.4 PR Impacts (Doc. #4 p. 198)

- No Action – low negative
- Alt. 2 – Neutral compared to No Action, so low negative. Seasonal sub-options neutral.
- Alt. 3 – vary based on possible effort shifts (Negative to Low -)
  1. If MWT moves to Areas 1B, 2 and 3 (lower impacts for GOM, but higher for GB, lower co-occurance in Areas 1B and 2 – could be low positive if effort shifts there)
  2. MWT coverts to PS (GOM interactions higher, low negative)
  3. Existing PS effort increases (GOM interactions higher, low negative)

5.4 PR Impacts (Doc. #4 p. 198)(cont.)

- Alt. 4, 5, 6 – vary based on effort shifts (Negative to Low -)
  1. If MWT effort just outside of boundary (low -)
  2. If MWT effort shifts offshore in Area 3 (negative)
  3. Existing BT effort increases (negative)
  4. MWT vessels convert to BT (negative)

If measure prevents fishery from harvesting sub-ACL there may be less fishing effort overall, so low positive impacts on PR possible if effort decreases and does not shift somewhere else.

5.4 PR Impacts (Doc. #4 p. 198) (cont.)

- Alt. 7 – Negative to low negative if effort shifts to GB.
- Alt. 8 – Neutral – similar fishing levels overall in same general area, relatively low incidents in that area compared to GB and GOM.
- Alt. 9 – Low positive if effort shifts earlier before marine mammals and seabirds present in the area. Some arrive in March, but if effort shifts to Dec – Feb as it was in the past, interactions could be lower.

Seabirds (Section 5.4.11 p. 205)

More work needed. Fledging success determined by abundance and availability of prey near breeding colonies. Monomoy Island largest breeding ground for common tern. Forage offshore Aug-Sept, typically about 15nm from shore, up to 25nm. Low positive impacts if more herring available nearshore.

5.6. Human Community Impacts (p. 210)

- **Fishery catch inside vs. outside**

  VTR matched with Observer data – model used to expand VTR point location to better represent area fished. Estimates of herring, mackerel, and herring/mackerel combined. Economic impacts based on trip costs summarized into distance from shore categories (Tables 93/94, p. 211)

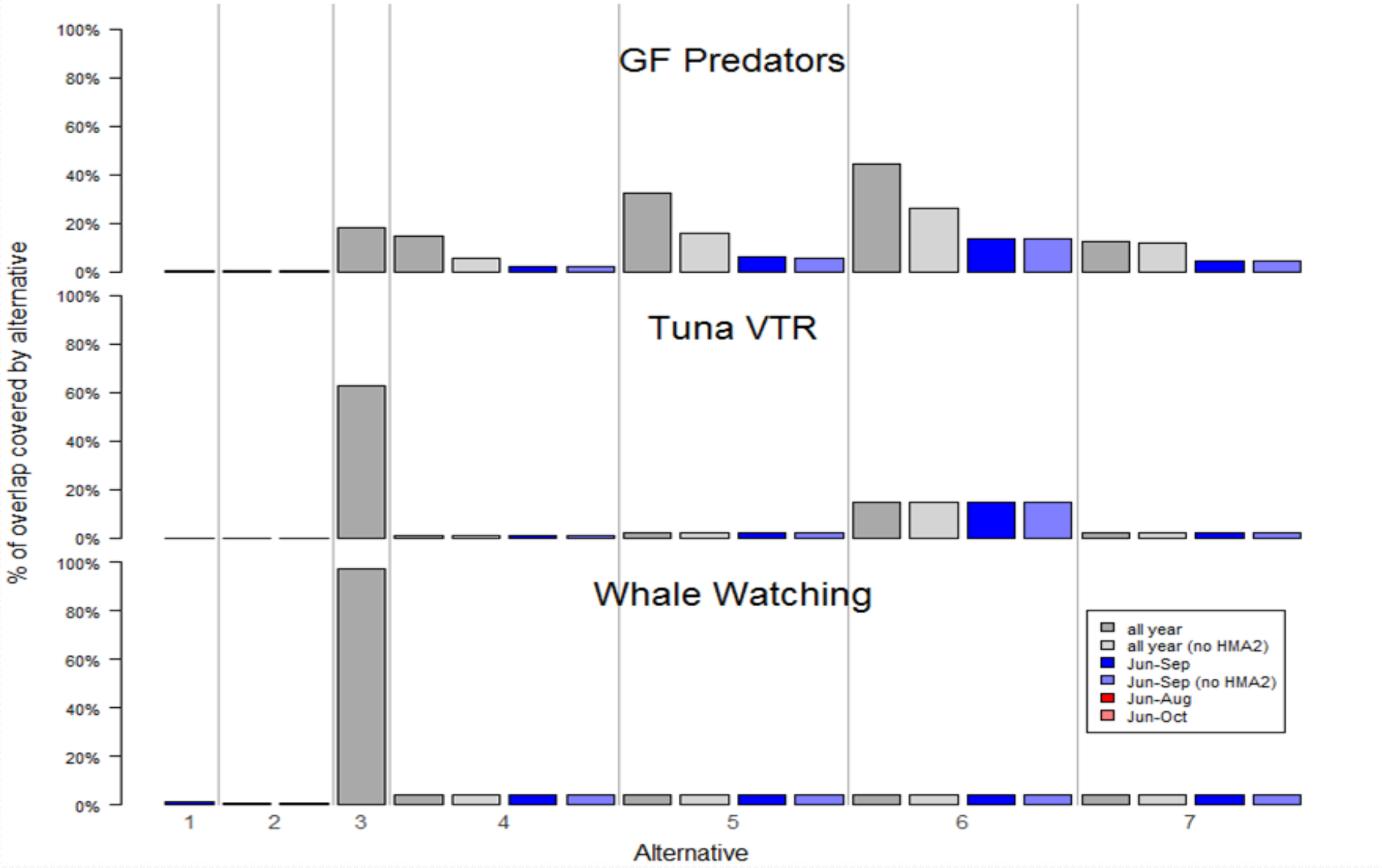
- **Fishery Overlap Analysis (**Appendix 6b and pages 212-215)

  Overlap dropped dramatically after A1. For GF: overlap highest near Cape Ann in Oct and Nov and northern edge of GB in May.
  For Tuna: Oct near Cape Ann, now northern edge in November.

- **Additional BFT info (p. 216)**

- **Human Community VECs** – herring fishery, mackerel fishery, lobster fishery, predator fisheries and ecotourism, and port communities.

2013-2015 MWT-predator industry overlap



Herring fishery impacts

No Action – Neutral. No additional impacts. Negative for MWT, but effort shifted. PS capacity/effort increased. Sub-ACL caught.

Alt. 2A (Jun-Aug) – Low negative. <0.5% of $$$ since 2000, mostly MWT.

Alt. 2B (Jun-Oct) – Low negative. <0.6% of $$$ since 2000, mostly MWT.

Alt 3 – Neutral. Reach sub-ACL if herring remain accessible to PS. Negative for MWT. Has been ~18% of MWT $$$. Additional vessels may retrofit. Carriers may increase.

Alt. 4A/A (12nm; 1B, 2, 3; year-round) – Low negative. 1B unharvested? Area 3 catch is outside 12nm. Greater impact in Area 2. Trip costs double outside 12nm. Has been 13-18% of MWT $$$.

Alt. 4A/B (12nm; 1B, 2, 3; Jun-Sept) – Low negative. 1B harvested. Area 3 catch is outside 12nm. Greater impact in Area 2. Trip costs double outside 12nm. Has been <6% of MWT $$$.

Alt. 4B/A (12nm; 1B, 3; year-round) – Low negative. 1B unharvested? Area 3 catch is outside 12nm. Trip costs double outside 12nm. Has been 6% of MWT $$$.

Alt. 4B/B (12nm; 1B, 3; Jun-Sept) – Low negative. 1B harvested. Area 3 catch is outside 12nm. Trip costs double outside 12nm. Has been <3% of MWT $$$.

Alt. 4-6 Herring/mackerel MWT $$$

Sub-options		Description	Years	Herring/mackerel MWT avg. $$$			
				South of Area 1A			Total all areas
Area	Season			Alt. 4 12 nm	Alt. 5 25 nm	Alt. 6 50 nm	
A	A	1B, 2 & 3; year round	00-07	13%	24%	45%	100%
			07-15	18%	26%	43%	100%
A	B	1B, 2 & 3; June-Sept	00-07	0.4%	0.7%	5.8%	100%
			07-15	3.8%	5.7%	19%	100%
B	A	1B & 3; year round	00-07	4.8%	6.4%	8.9%	100%
			07-15	6.3%	8.6%	16%	100%
B	B	1B & 3; June-Sept	00-07	0.3%	0.6%	5.1%	100%
			07-15	2.5%	5.1%	16%	100%

Herring fishery impacts

7A/A (1B, 2, 3; year-round) – Low negative. 1B unharvested? Area 3 catch is outside squares. Greater impact in Area 2. Trip costs double outside 12nm. Has been 7-9% of MWT $$$.

7A/B (1B, 2, 3; Jun-Sept) – Low negative. 1B harvested. Area 3 catch is outside squares. Greater impact in Area 2. Trip costs double outside 12nm. Has been <5% of MWT $$$.

7B/A (1B, 3; year-round) – Low negative. 1B unharvested? Area 3 catch is outside 12nm. Trip costs double outside 12nm. Has been 7-9% of MWT $$$.

7B/B (1B, 3; Jun-Sept) – Low negative. 1B harvested. Area 3 catch is outside 12nm. Trip costs double outside 12nm. Has been <5% of MWT $$$.

Alt. 8 (boundary move) – Low negative. Negative impacts on spawning components. Area 3 unharvested? Area 3 only accessible to offshore vessels.

Alt. 9 (No 1B closure) - Low negative. Benefits to flexibility by fishing earlier in year when price is lower.

Mackerel (MWT) fishery impacts

No Action – Low negative. Effort shifted. Mostly a winter fishery.

Alt. 2A (Jun-Aug) – Low negative. ~1% of landings.

Alt. 2B (Jun-Oct) – Low negative. ~0.9% of landings.

Alt. 3 – Negative. MWT precluded. ~6% of landings.

Alt. 4A/A (12nm; 1B, 2, 3; year-round) – Low negative. ~9% of landings.

Alt. 4A/B (12nm; 1B, 2, 3; Jun-Sept) – Low negative. No landings.

Alt. 4B/A (12nm; 1B, 3; year-round) – Low negative. ~6% of landings.

Alt. 4B/B (12nm; 1B, 3; Jun-Sept) – Low negative. No landings.

Alts. 5-6 – See next slide….

7A/A (1B, 2, 3; year-round) – Low negative. ~0.4% of landings.

7A/B (1B, 2, 3; Jun-Sept) – Low negative. No landings.

7B/A (1B, 3; year-round) – Low negative. <0.2% of landings.

7B/B (1B, 3; Jun-Sept) – Low negative. No landings.

Alt. 8 (boundary move) – Low negative, follows herring fishery impacts.

Alt. 9 (no 1B closure) – Low positive. Enables winter fishery.

Alt. 4-6 Herring/mackerel MWT $$$

Sub-options		Description	Years	Herring/mackerel MWT avg. $$$			
				South of Area 1A			Total all areas
Area	Season			Alt. 4 12 nm	Alt. 5 25 nm	Alt. 6 50 nm	
A	A	1B, 2 & 3; year round	00-07	2,618 (8.7%)	7,499 (25%)	21,341 (71%)	30,082 (100%)
			07-15	842 (12%)	2,116 (30%)	4,790 (69%)	6,993 (100%)
A	B	1B, 2 & 3; June-Sept	00-07	0	0	0	<10
			07-15	<1	<1	<1	<10
B	A	1B & 3; year round	00-07	59 (0.2%)	73 (0.2%)	146 (0.5%)	30,082 (100%)
			07-15	145 (2.1%)	203 (2.9%)	249 (3.6%)	6,993 (100%)
B	B	1B & 3; June-Sept	00-07	0	0	0	<10
			07-15	<1	<1	<1	<10

Potential impacts on lobster fishery

No Action – Neutral. Sub-ACL has still been reached.

Alt. 2A & 2B – Neutral to low negative.

Alt. 3 – Neutral to low negative.

Alts. 4 – 7 Neutral to low negative, depending on if sub-ACLs can be harvested.

Alt. 8 (boundary move) – Low negative if herring fishery suffers.

Alt. 9 (no 1B closure) – Low positive. Access to bait (1B small) in winter when cheaper.

Potential impacts on predator industries

1	Low positive. Low overlap prior to A1.
2	Low positive, A>B. Minimal overlap since A1.
3	Positive. Moderate to high overlap.
4	Low positive. Minimal to moderate overlap.
5	Low positive. Minimal to moderate overlap.
6	Low positive. Minimal to moderate overlap.
7	Low positive. Low overlap.
8	Neutral. May move some MWT effort offshore, but herring stock may deteriorate.
9	Low positive. Shifting MWT effort to early winter would lower overlap.

Questions and Discussion

Preferred Alternative?

Part V
AP input on potential effort shifts from alternatives under consideration

AP input on potential effort shifts

1. If MWT vessels are prohibited in an area, how will their fishing behavior most likely change? Is it more likely that vessels will shift seasonally and fish in the same area, or is it more likely that vessels will shift effort to a new area? How will this change in fishing behavior vary for the different seasonal and spatial alternatives?
2. How many MWT vessels currently switch gear types during the year, less than five? Is it only MWT to purse seine and vice versa, any BT? How many more vessels could reasonably covert? What is the initial cost of rigging a MWT vessel with a purse seine (BT)? After the initial cost, what is the cost to switch gears back and forth?

AP input on potential effort shifts (cont.)

3. Is there a threshold that would change the current incentives to switch gear types? Is it more likely that MWT vessels would convert to purse seine or bottom trawl if faced with LD measures with large potential impacts? Rather than switch gear type, is there a threshold that a MWT vessel would likely stop fishing, or potentially consider re-location?
4. How likely is it for a MWT vessel to become a carrier vessel under the various alternatives under consideration? When a MWT vessel acts as a carrier for the PS fishery, how is the carrier vessel paid, by the PS vessel or the dealer, is it a flat fee per day/trip or a fraction of total revenues from the trip?

AP input on potential effort shifts (cont.)

5. How has the PS fishery changed since Amendment 1 was implemented? How has capacity changed for those vessels (have vessels been upgraded, has use of carriers changed)? Why is the PS fleet primarily located in Area 1A and active primarily in the summer and early fall only? Are there operational barriers to fishing purse seines in the winter or other areas (e.g. weather, sea conditions, water depth), or is it primarily driven by regulations and demand for bait?
6. If MWT vessels are prohibited from an area (seasonally or year round), how will other herring vessels that use PS or BT gear respond? Is it likely for other gears to enter from other areas, or will the same number of vessels remain in the area as in previous years? Would effort increase, decrease, or stay the same?

AP input on potential effort shifts (cont.)

7. Alternative 9 is considering a removal of the current January-April seasonal closure of Area 1B. How is effort likely to shift if that area is open during those months? Would opening the area earlier impact the market? If so, how?
8. What drives bait preference in the lobster fishery and why? For example, is it primarily a lobster's preference for certain species, whichever bait type is cheapest, fresh vs. frozen, salted vs unsalted, geography/port region, fishing location (inshore vs offshore, mud vs hard bottom)? Does the market prefer fresh herring year-round?

Part VI
Herring RSA Research Priorities

Document #7 - Background

- Established in 2007 under Amendment 1.
- 0-3% of ACL from each management area.
- Set-aside specified and monitored per area.
- RSA compensation fishing exempt from:
  1) seasonal closures: Area 1A (Jan-May) and Area 1B (Jan-Apr);
  2) if area closes due to harvest of ACL.
- The Council needs to specify the total RSA amount per area in upcoming specs (2019-2021).
- The Council will approve research priorities earlier so application process can begin and awards can be made before the start of the 2019 fishing year.

Previously funded projects

Year	Project Category	Title	Funding Level	State	Organization	Final Report Due Date	*Used in mngt?*
2016	Bycatch Reduction	Sustaining, improving, and evaluating portside sampling and river herring incidental catch reduction in the Atlantic herring mid-water trawl fishery	$408,004	MA	University of Massachusetts - Dartmouth	3/31/2019	
2016	Tagging-Other	Coastwide Stock Structure of Atlantic Herring using DNA Analyses to determine the degree of mixing between stocks and spawning aggregations	$257,554	NY	Cornell Cooperative Extension	7/29/2019	
2014	Conservation Engineering-Trawl	Characterizing and Reducing River Herring Incidental Catch in the Atlantic Herring Mid-Water Trawl	$1,046,160	MA	University of Massachusetts - Dartmouth	3/31/17 (1 year extension) IN REVIEW	*Paper recently published?*
2008	Resource Dynamics	Effects of fishing on herring aggregations	$666,600	ME	Gulf of Maine Research Institute	Final Report Available Online *	*No?*

2014 SMAST Project - Final report recently posted on RSA website.

2016-2018 specifications

- 3% of all areas set-aside.
- All set-aside allocated, but little has been harvested.
- Research priorities (not in priority order):
    1. Portside sampling
    2. River herring bycatch avoidance
    3. Electronic monitoring
    4. Research to support/enhance assessment
- PDT memo includes past research priorities from A1, 2012 assessment, and 5-year Council priorities.

PDT input – pages 6-7 of Doc. #7

- **PDT recommends**:

  - removing portside sampling from priority list.

  - keeping RH/S bycatch, but be expanded.

  - removing EM for now.

  - added two from assessment list with management relevance: stock structure and spawning dynamics.

  - adding evaluation of localized depletion.

PDT Recommendations

1. **Bycatch avoidance** (e.g. river herring/shad, and haddock).
2. **Stock structure / spatial management**

In particular, continued work on distinguishing among stocks (e.g. morphometrics) and identifying stock of origin from mixed catches, identifying the relative size of stock components, movements and mixing rates, and degree of homing. This information could help development of a spatially explicit stock assessment model and inform appropriate apportionment of sub-ACLs and management uncertainty.

3. **Research spawning dynamics**

Including life history, gear interactions, spatial patterns, etc. Information about whether gear interactions disrupt spawning and negatively affect recruitment (i.e. egg disposition and survival) success would be particularly beneficial.

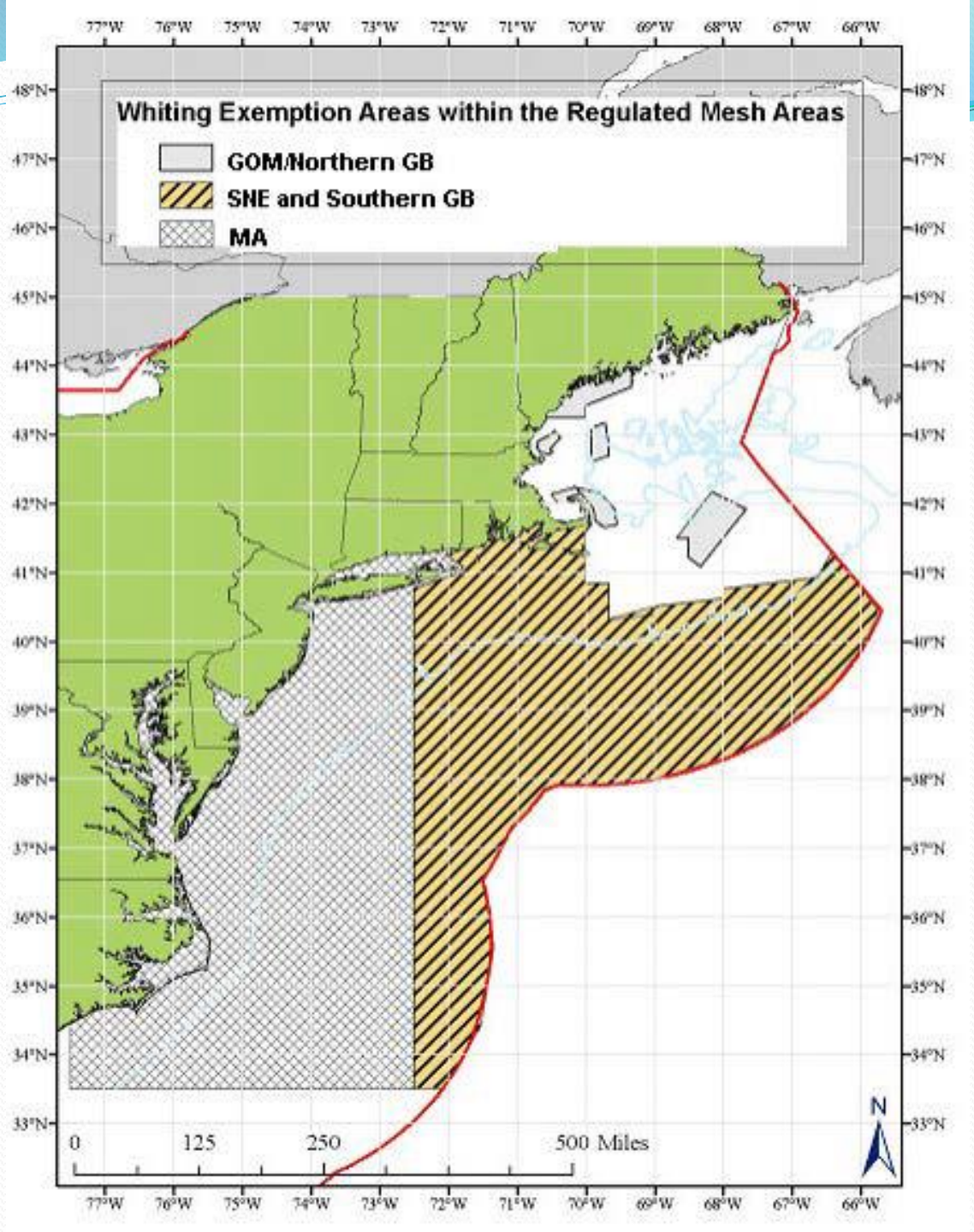
4. **Localized depletion**

Studies to evaluate the influence of localized depletion of herring on their predators. For example, projects that directly measure the potential influences of depleting herring on predator distributions, such as a before-after control impact study (BACI experiment), or other related research.

AP/Cmte agenda item

- Any input on research priorities?
- Any input about priority order?
- Initial input on RSA set-aside allocation?
- Any challenges or issues with the current program?

Backpocket slides


Whiting Exemption Areas within the Regulated Mesh Areas
GOM/Northern GB
SNE and Southern GB
MA
77°W
76°W
75°W
74°W
73°W
72°W
71°W
70°W
69°W
68°W
67°W
66°W
48°N
47°N
46°N
45°N
44°N
43°N
42°N
41°N
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125
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