



*Trawls, BRDs, Gear Testing,
and Workgroup Recommendations*

DEPARTMENT OF ENVIRONMENTAL QUALITY

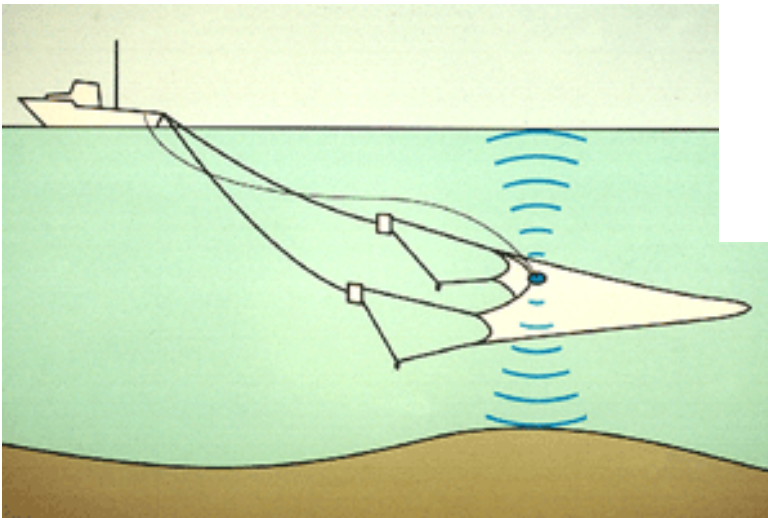
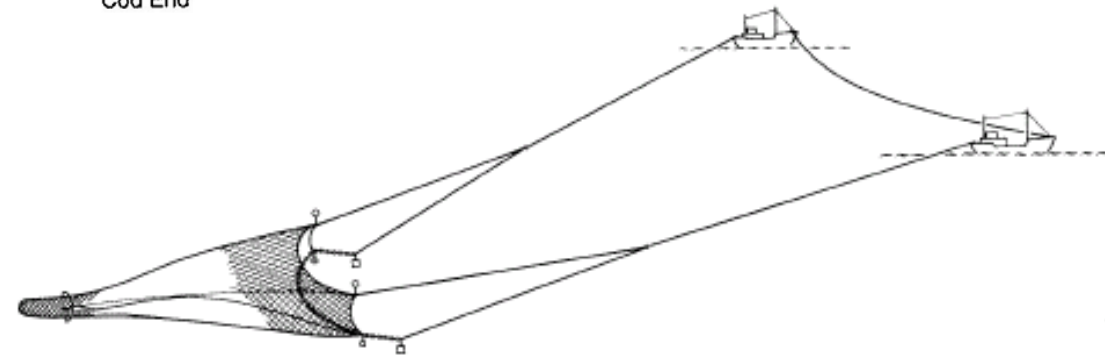
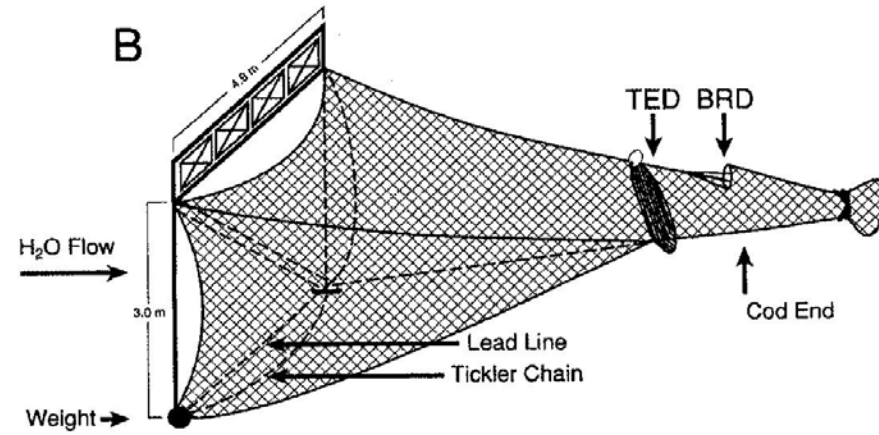
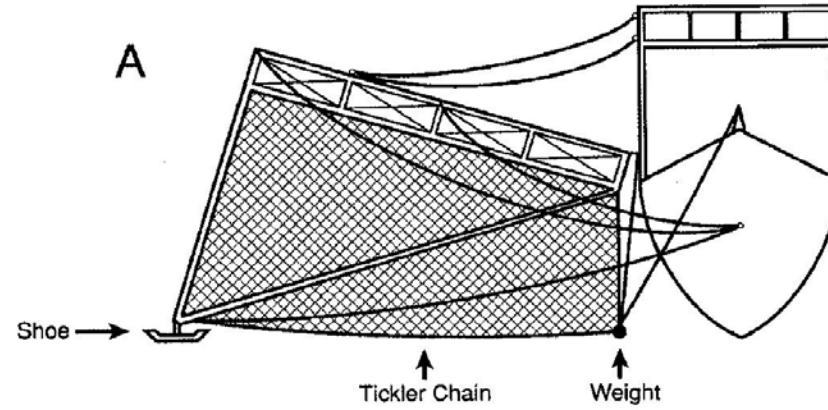
Marine Fisheries

Marine Fisheries Commission | Kevin Brown | May 17, 2018

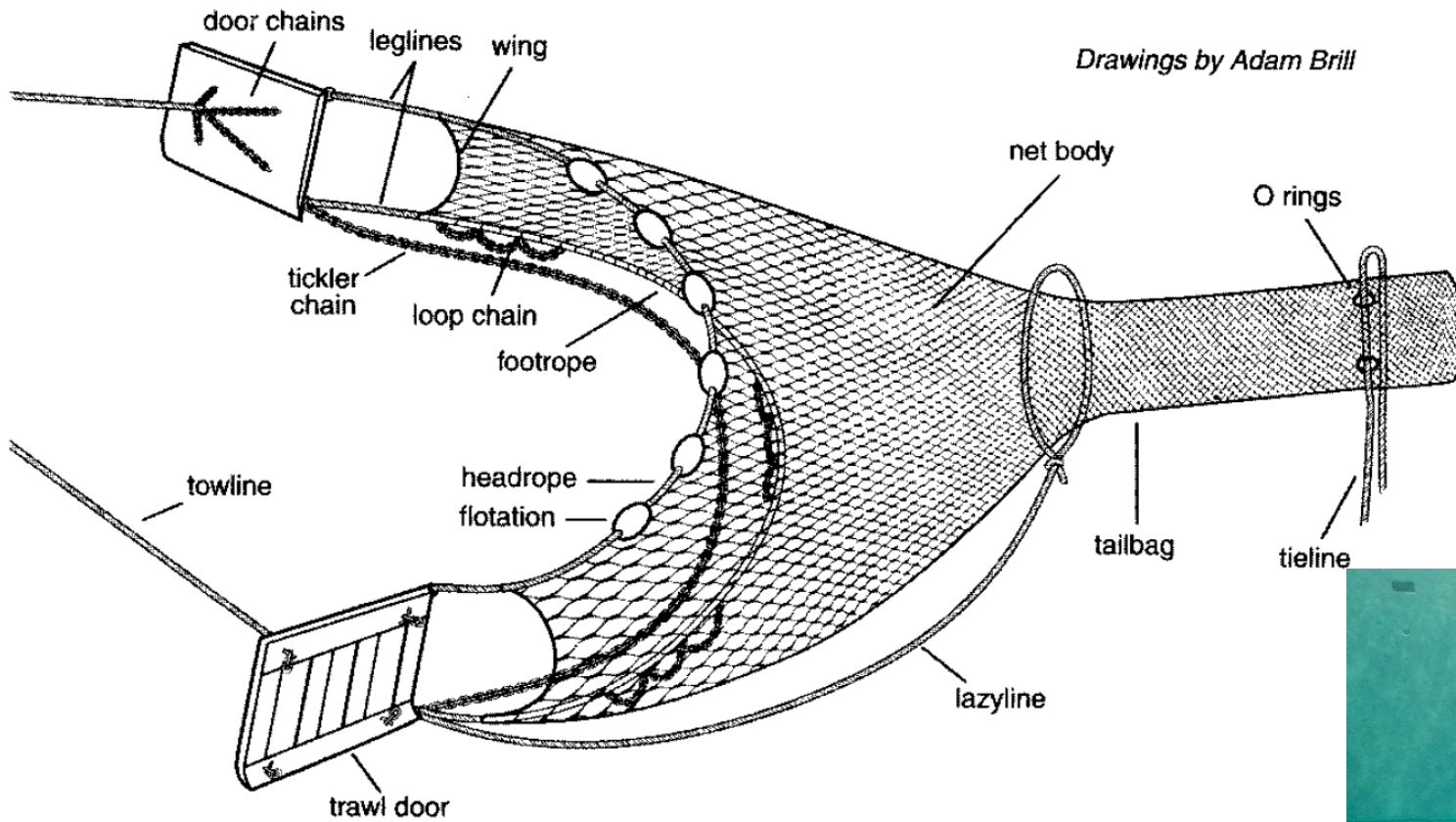


Trawl Nets

- Bottom trawls
- Midwater trawls
- Skimmer trawls
- Beam trawls
- Otter trawls
- Paired trawls



Shrimp Trawl

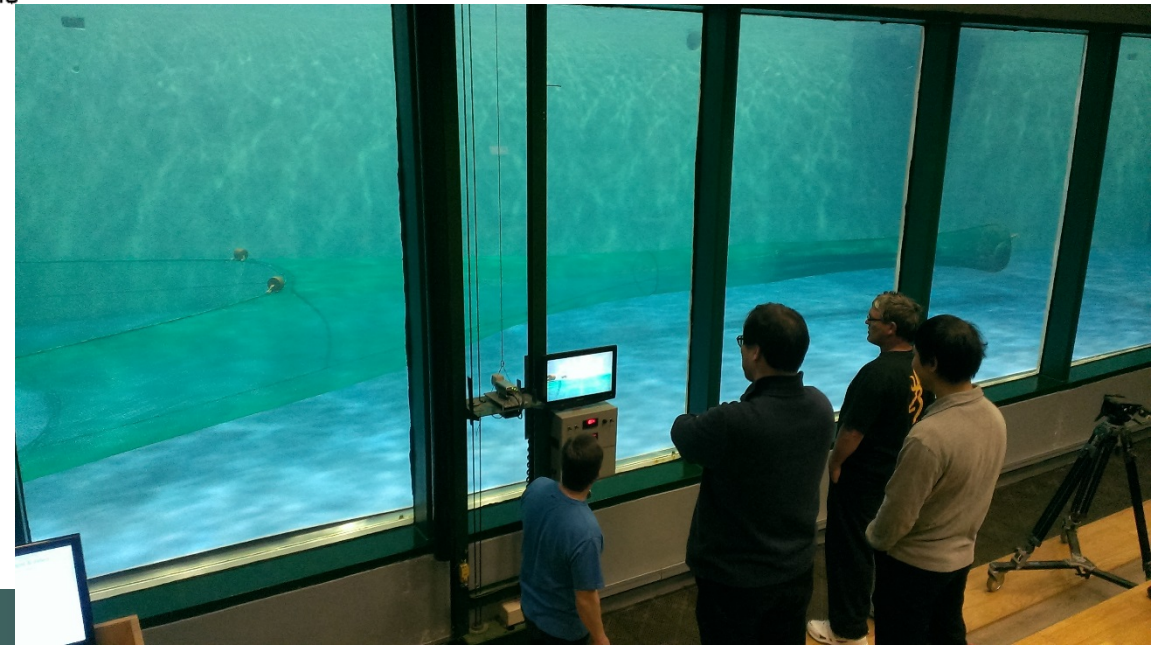


Drawings by Adam Brill

Figure 1: Shrimp Trawl

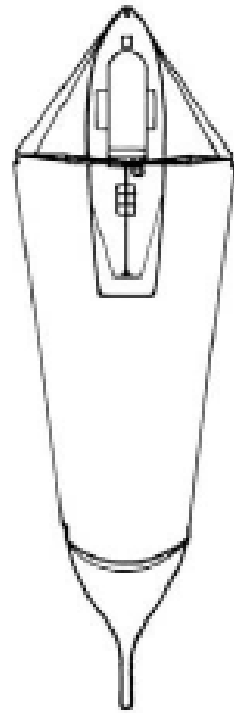
Performance Factors

- Headrope height
- Footrope height
- Net spread
- Spread ratio
- Twine area
- Towing tension

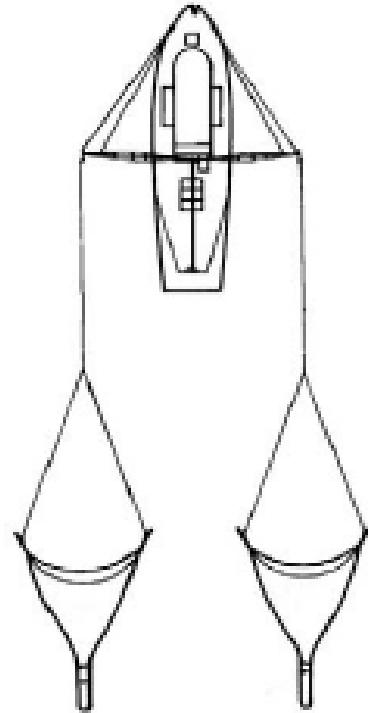


Multi-trawl Systems

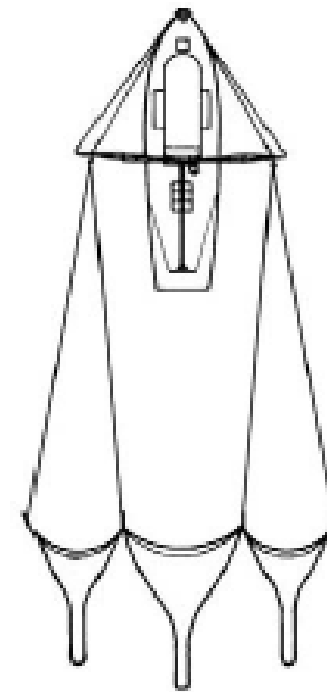
FIGURE 2 – Multi-net shrimp trawl systems; a) single rig, b) twin or double rig, c) triple rig, and d) quad rig



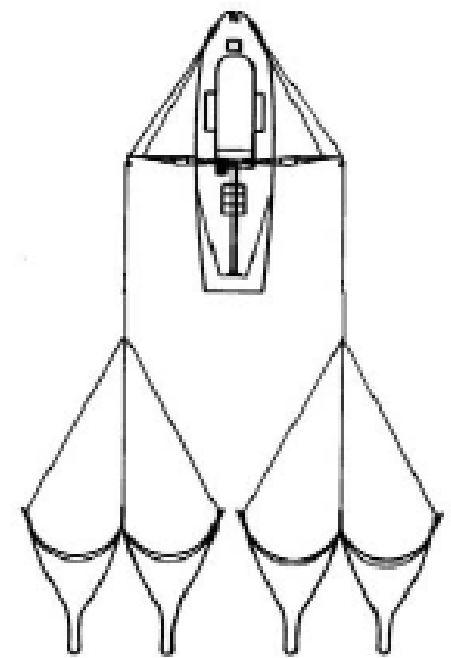
a) Single rig



b) twin or double



c) triple rig



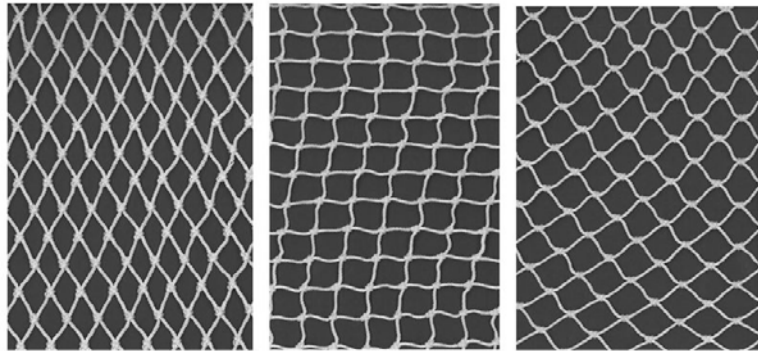
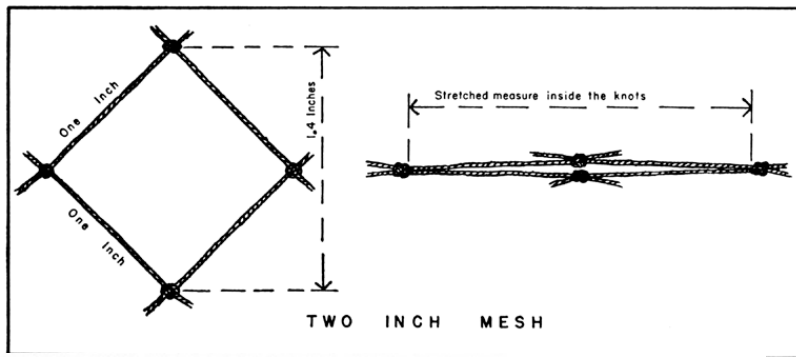
d) quad

Source: Sterling, 2005.

Bycatch Reduction Devices

- Improve selectivity
- Reduce bycatch
- Can be highly effective
- Introduction can be relatively straightforward
- Do not limit the ability of fishers to go fishing
- Categorized by method to reduce capture
 - Differences in size
 - Differences in behavior





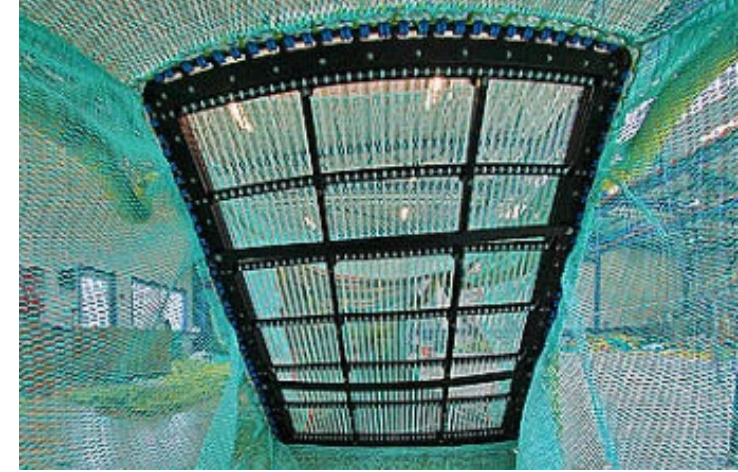
T0 24mm

T45 24mm

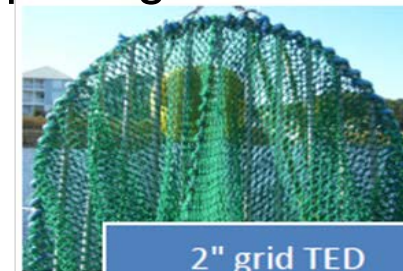
T90 24mm

Bycatch Reduction Devices to Separate Shrimp and Bycatch by Size

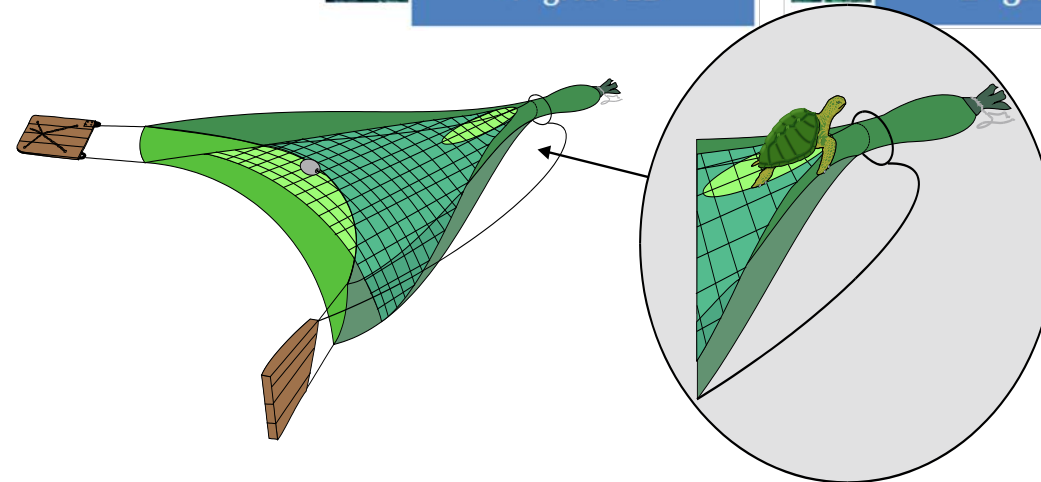
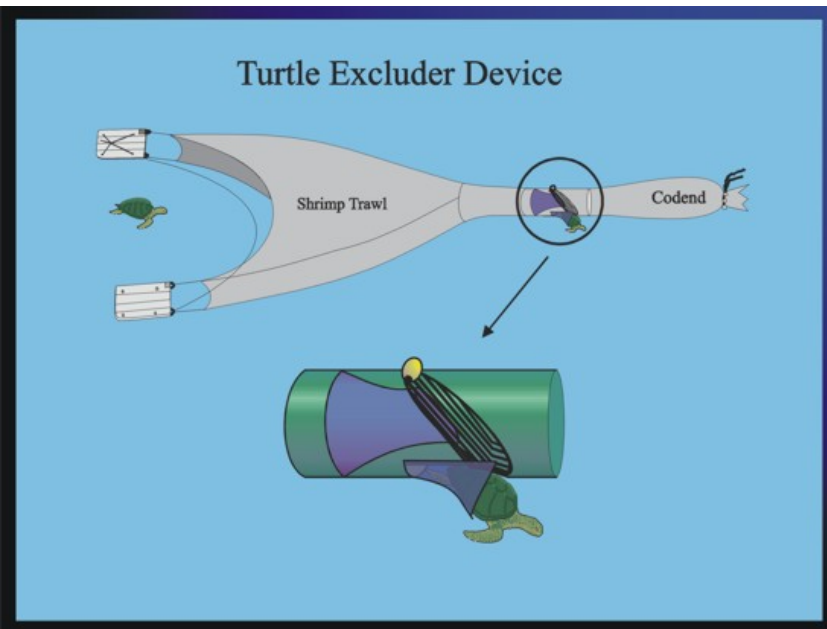
- Mesh Size and Geometry
- Inclined grids or panels of netting
 - Physically block passage of large organisms
 - Guide towards an escape opening



4" grid TED



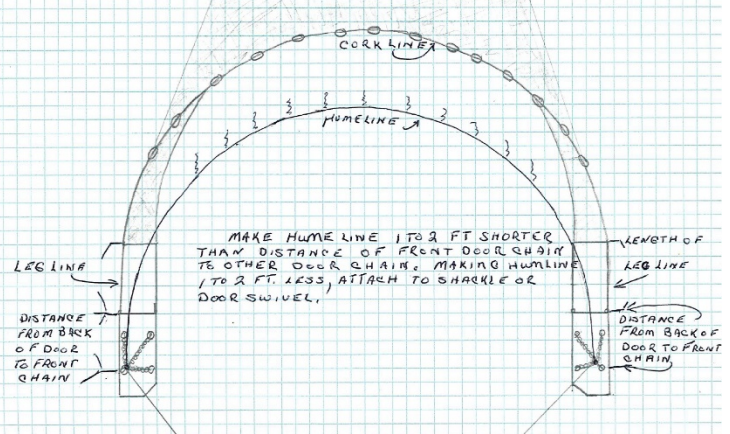
2" grid TED



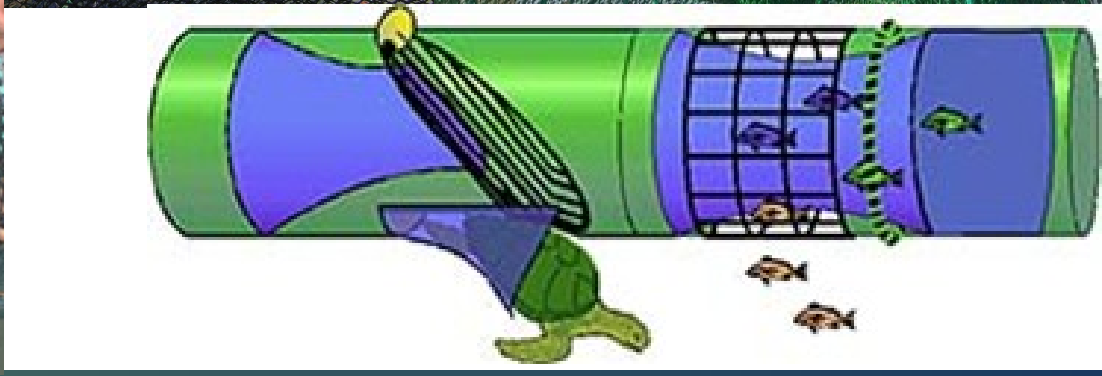
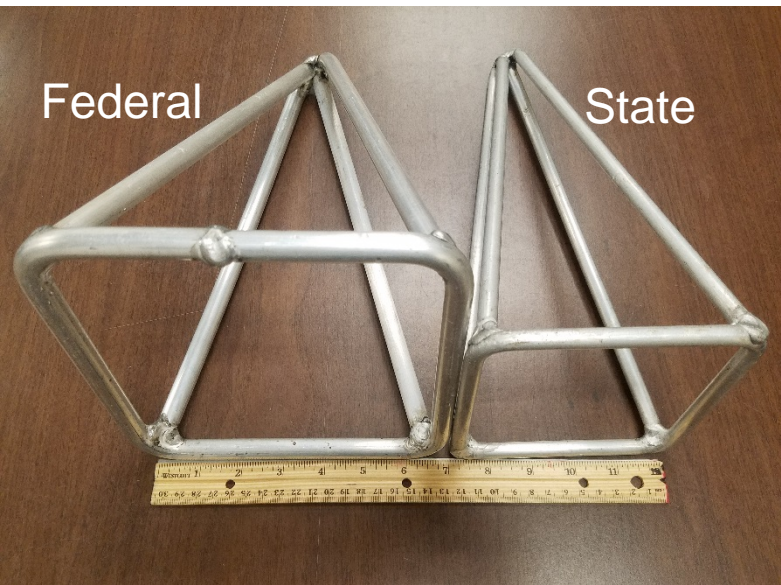
Bycatch Reduction Devices to Separate Shrimp and Bycatch by Behavior



...LINE, AND DISTANCE FROM FRONT CHAIN TO WHERE LEG LINE SHACKLES TO DOOR, MAKE HUMELINE ONE TO TWO FOOT LESS. THIS WILL PUT THE HUMELINE AHEAD OF CORK LINE.



- Hummer Line
- Fisheyes
- Fish Boxes
- Radial Escape Devices
- Square Mesh Panels
- Lights



Questions



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Department of Environmental Quality



Marine Fisheries Commission Management Strategy



- Convene a stakeholder group
- Initiate Industry testing
- Goal of 40-percent reduction
- Ocean and internal waters
- Three years
- Control net:
 - State Fisheye
 - Federally approved turtle excluder device
 - 1 1/2 inch stretch mesh tailbag



Funding

- MFC Conservation Fund
- In-kind contributions from the industry
- Saltonstall-Kennedy Grant Program
- NOAA's Bycatch Reduction Engineering Program
- National Fish and Wildlife Foundation's Fishery Innovation Fund
- Atlantic Coastal Fisheries Cooperative Management Act



Workgroup Meeting Summary

March 31, 2015

- Reviewed existing bycatch reduction device research
- Developed operating procedures and protocols for gear testing

January 25, 2016

- Recommended acceptable shrimp loss between 3% and 5%

January 9, 2017

January 22, 2018

April 4, 2018

- Made recommendations for consideration by the Marine Fisheries Commission



Methodology

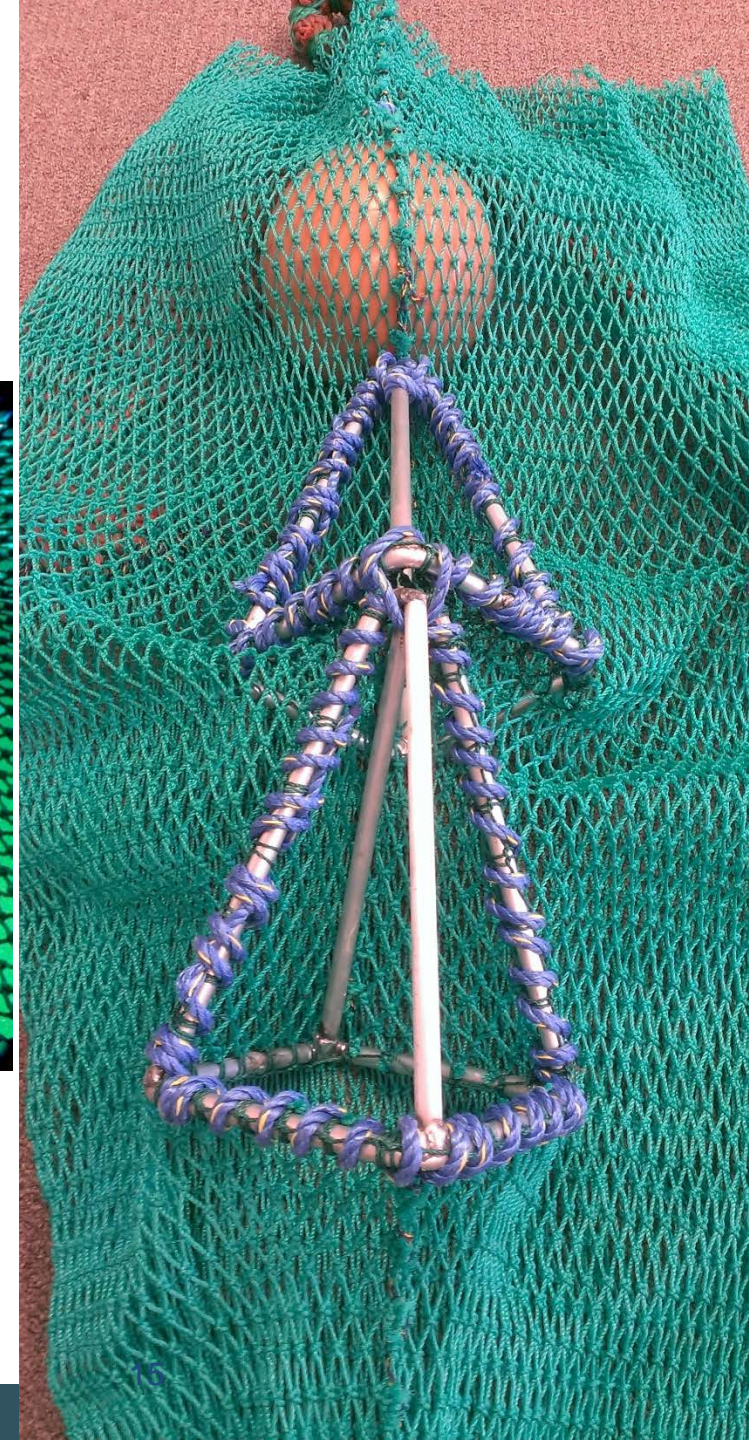
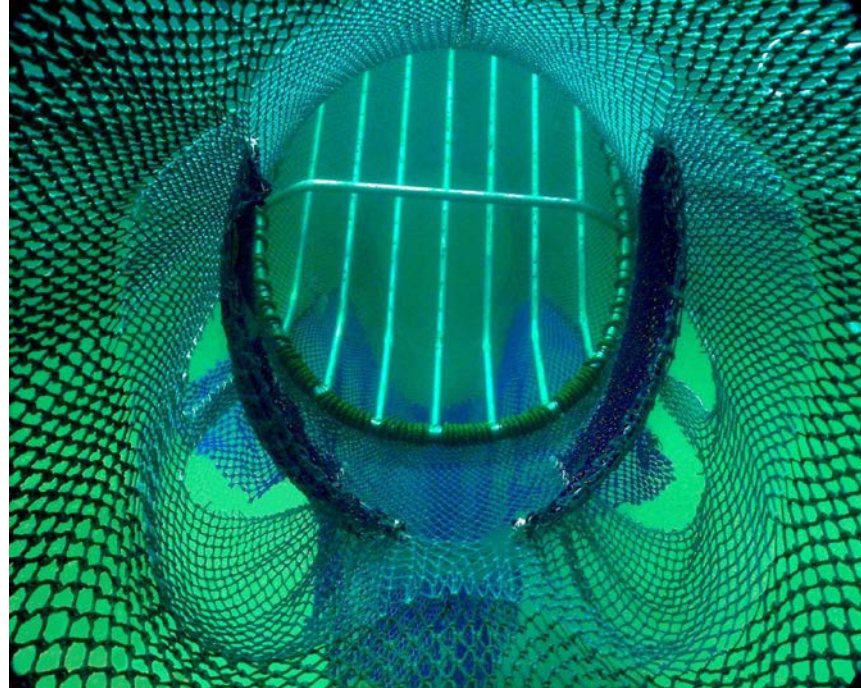
- Two observers
- Calibration
- Kept catch separate
- Whole haul sampled
- Switch gear
- Try net
- Two tests for reduction
 - T-test
 - Randomization



Gears Tested: 2015

3 large vessels inshore

- 4 inch TED, Composite Panel with fish spooker cone, and 1 1/2 inch tailbag
- 3 inch TED, single state fisheye, and 1 1/2 inch tailbag
- 3 inch TED with square mesh panel and 1 7/8 inch tailbag
- 4 inch TED, Ricky BRD, and 1 1/2 inch tailbag
- 4 inch TED, Double federal fisheyes and 1 7/8 inch tailbag





Gears Tested: 2016

2 large vessels inshore

- 4 inch TED, single state fisheye, Virgil Potter BRD, and 1 1/2 inch tailbag
- 4 inch TED, double federal fisheyes, and 1 3/4 inch tailbag
- 3 inch TED, double federal fisheyes, and 1 3/4 inch tailbag
- 4 inch TED, single state fisheye, Virgil Potter BRD, and 1 3/4 inch tailbag

Gears Tested: 2017

1 small vessel inshore

- 3 inch TED, single state fisheye, and 1 1/2 inch tailbag
- 3 inch TED, single state fisheye, and 1 5/8 inch tailbag

2 small vessels offshore

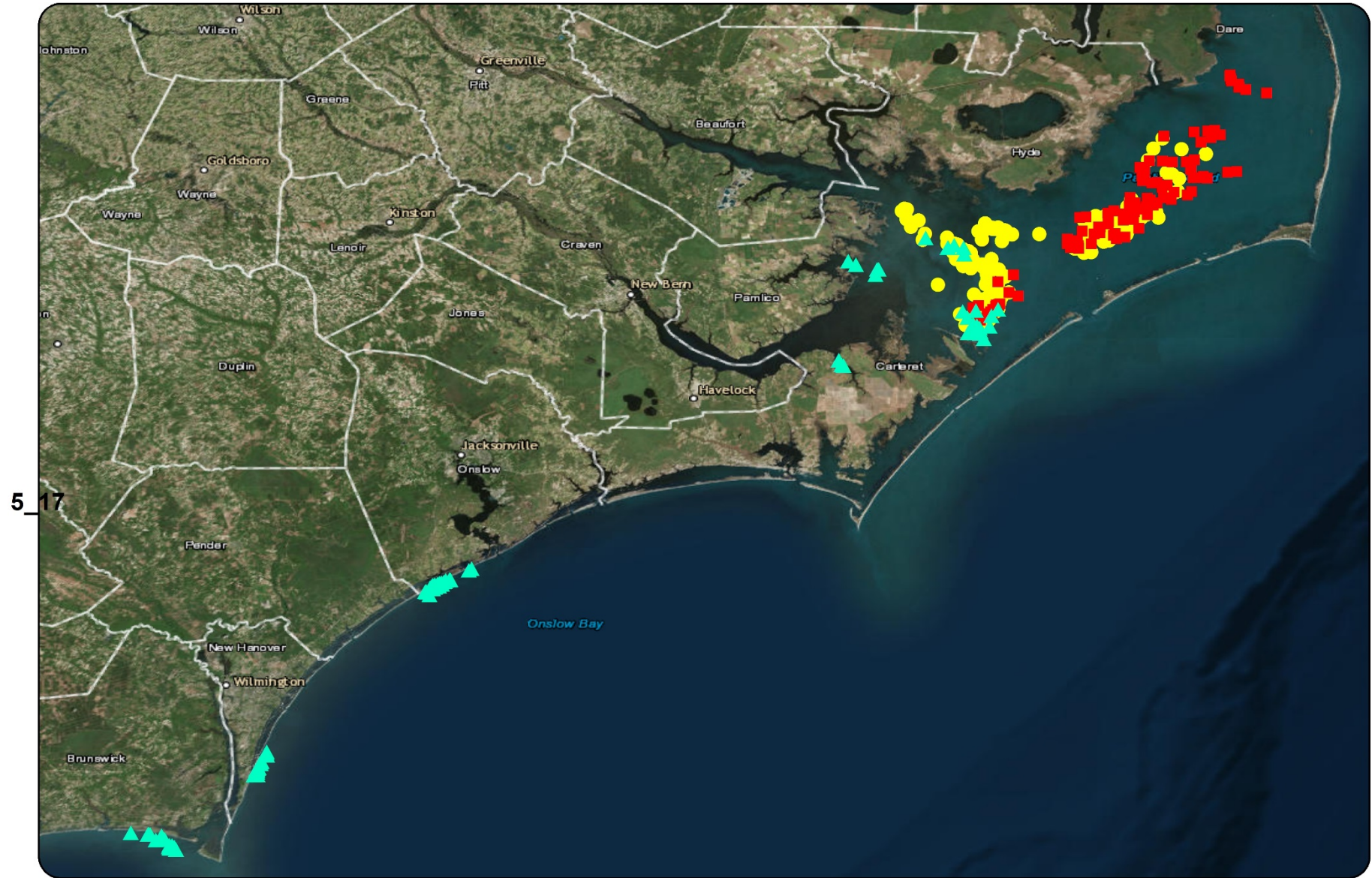
- 3 inch TED, double state fisheyes and 1 5/8 inch tailbag (summer, fall)

1 large vessel offshore

- 3 inch TED, double federal fisheyes and 1 5/8 inch tailbag



Gear Testing Locations: 2015-2017



5_17



Industry Workgroup BRD Testing 2015-2017



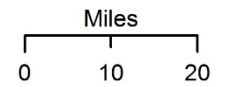
2015



2016



2017



2015 Results

Gear	Percent Change			
	Randomization		T-test	
	Fish	Shrimp	Fish	Shrimp
4" TED, Composite Panel, 1 1/2" TB	-27.6	-3.13	-25.8	-0.654
3" TED, 1 State FE, 1 1/2" TB	-20.4	-5.63	-16.2	-7.35
3" TED, Square Mesh Panel, 1 7/8" TB	-27.5	-3.04	-25.3	-1.94
4" TED, Ricky BRD, 1 1/2" TB	-4.55	-6.06	-6.61	-9.87
4" TED, 2 Federal FE, 1 7/8" TB	-40.1	2.16	-40.8	0.999

2016 Results

Gear	Percent Change			
	Randomization		T-test	
	Fish	Shrimp	Fish	Shrimp
4" TED, 1 State FE, Virgil Potter BRD, 1 ½" TB	-28.5	8.51	-26.9	9.92
4" TED, 2 Federal FE, 1 ¾" TB	-54.0	-16.2	-57.2	-12.1
3" TED, 2 Federal FE, 1 ¾" TB	-44.9	-4.85	-44.9	-4.85
4" TED, 1 State FE, Virgil Potter BRD, 1 ¾" TB	-44.3	-5.78	-43.2	-5.46

2017 Results

Gear	Percent Change			
	Randomization		T-test	
	Fish	Shrimp	Fish	Shrimp
3" TED, 1 State FE, 1 ½" TB	5.06	-7.79	-	-
3" TED, 1 State FE, 1 5/8" TB	-20.4	-5.63	-22.8	-7.35
3" TED, 2 State FE, 1 5/8" TB (summer)	-32.6	-6.64	-32.6	-6.80
3" TED, 2 State FE, 1 5/8" TB (fall)	-4.58	-14.8	-4.57	-14.9
3" TED, 2 Federal FE, 1 5/8" TB	-4.55	-6.06	-6.61	-9.87

Double federal fisheyes, 1 7/8-inch tailbag and 4-inch TED

- + Significantly reduces finfish bycatch (t-test: -40.8%, random: -40.1%)
- + Net gain in shrimp observed, not significant (t-test: +1%, random: +2.2%)
- + **Reduces culling time due to less bycatch**
- + **Implements actions of Amendment 1 to the Shrimp FMP**
- Cost associated with purchasing and installing gear (+\$600 per net)
- **Untested on smaller vessels, skimmer trawls, and in Atlantic Ocean**



Double federal fisheyes, 1 3/4-inch tailbag and 4-inch TED

- + Significantly reduces finfish bycatch (t-test: -57.2%, random: -54.0%)
- + Reduces non-shrimp invertebrate bycatch, not significant (t-test: -15.7%, random: -4.9%)
- + **Reduces culling time due to less bycatch**
- + **Implements actions of Amendment 1 to the Shrimp FMP**
- Shrimp losses greater than 5%, not significant (t-test: -12.1%, random: -16.2%)
- Cost associated with purchasing and installing new gear (+\$600 per net)
- **Untested on smaller vessels, skimmer trawls, and in the Atlantic Ocean**



Double federal fisheyes, 1 3/4-inch tailbag, and 3-inch TED

- + Significantly reduces finfish bycatch (t-test and random: -44.9%)
- + Observed shrimp losses less than 5%, not significant (t-test and random: -4.9%)
- + Reduces non-shrimp invertebrate bycatch, not significant (t-test and random: -13.3%)
- + Reduces elasmobranch bycatch, not significant (t-test and random: -18.6%)
- + Potential reductions in debris and jellyfish
- + **Reduces culling time due to less bycatch**
- + **Implements actions of Amendment 1 to the Shrimp FMP**
- Cost associated with purchasing and installing gear (+\$1,250 per net)
- Potential fouling issues in areas and times of high grass concentrations
- **Untested on smaller vessels, skimmer trawls, and in the Atlantic Ocean**



Single state fisheye, 1 3/4-inch tailbag, 4-inch TED, and Virgil Potter BRD

- + Significantly reduces finfish bycatch (t-test: -43.2%, random: -44.3%)
- + **Reduces culling time due to less bycatch**
- + **Implements actions of Amendment 1 to the Shrimp FMP**
- Costs associated with purchasing and installing new gear (+\$800 per net)
- Shrimp losses greater than 5%, not significant (t-test: -5.5%, random: -5.8%)
- **Untested on smaller vessels, skimmer trawls, and in the Atlantic Ocean**



Workgroup Recommendations

- Does not want to go on record recommending a range of acceptable shrimp loss; if finfish bycatch reduction is significant, a larger range could be acceptable (beyond range used by workgroup of 3 to 5 %)
- Does want to recommend continued collaborative bycatch reduction research, specifically continuance of the North Carolina Shrimp Bycatch Reduction Industry Workgroup, requesting that funding for gear testing possibly come from surplus funds from increased license fees (i.e. Commercial Fishing Resources Fund). Industry continues to be willing to provide in-kind contributions.



Workgroup Recommendations

- Does endorse for use on otter trawls fishing in inside waters (in areas where a combined head rope of 90 feet or greater is allowed as identified in the Shrimp Fishery Management Plan) the four combinations of bycatch reducing gears that met the target of 40% bycatch reduction, but specifically recommends:
- Use of the combination gear of double federal fisheyes, 4-inch turtle excluder device, and a 1 3/4 inch tailbag, again, in inside waters where an otter trawl with a combined head rope of 90 feet or greater is allowed. (Specific intent is not to have this change applied to other areas open to otter trawls, channel nets, and skimmer trawls until further bycatch reduction testing has been completed.)
- Recommends the North Carolina Division of Marine Fisheries explores valid survey techniques to gather information on current bycatch reduction devices being used by industry.

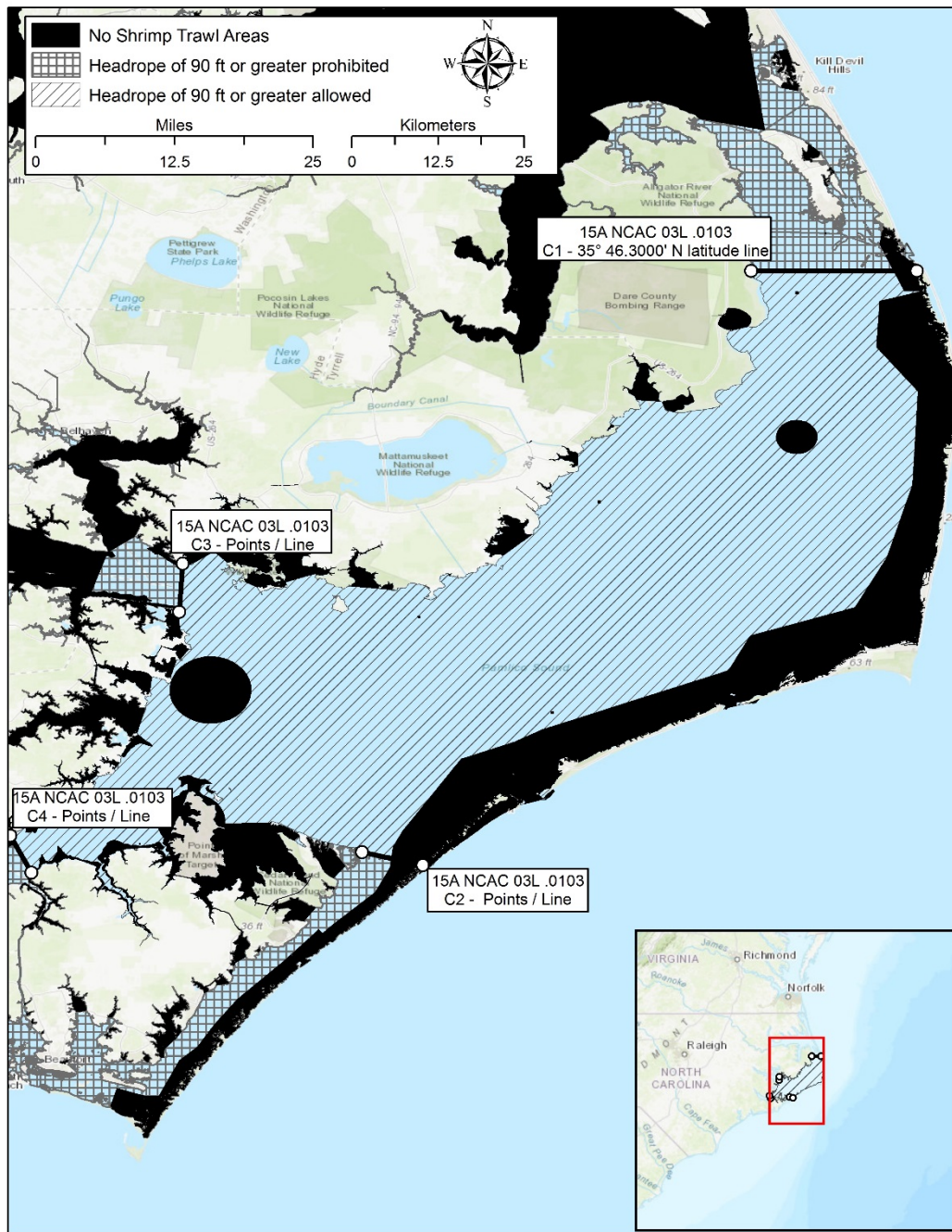


Additional Comments from Workgroup Members

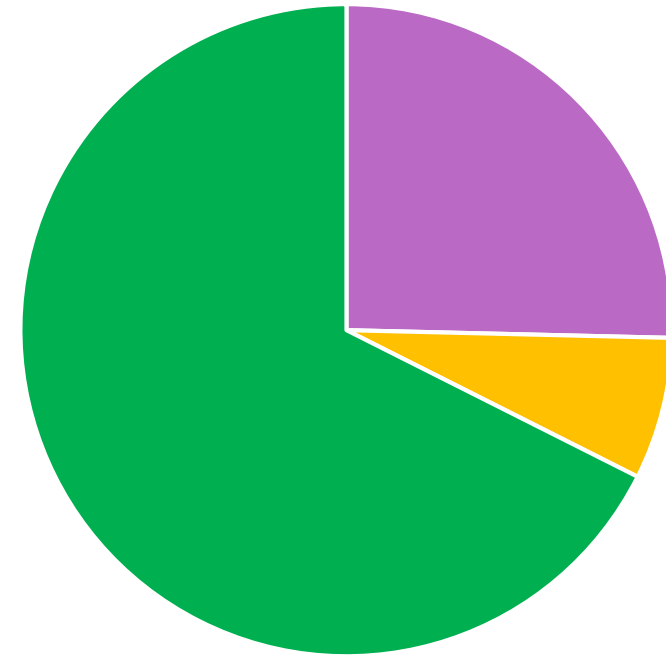
- Phase-in period
- Reservations on more than 5 percent shrimp loss
- Support not setting arbitrary shrimp loss levels
- Support for reduced bar spaced TEDs but defer to those working affected areas
- The double federal fisheye and 1 3/4 inch tailbag produced desired goal and should not be a burden for affected boats
- 1 3/4 inch tailbag not tested on smaller boats
 - Anecdotal testing showed shrimp loss on 21/25 and 16/20 count shrimp
- More testing on small vessels
 - Allow more time to find working combination for small vessels



Map of Area Affected



2008-2017 Average Landings By Area



■ Ocean
 ■ Other
 ■ Pamlico Sound





Questions

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