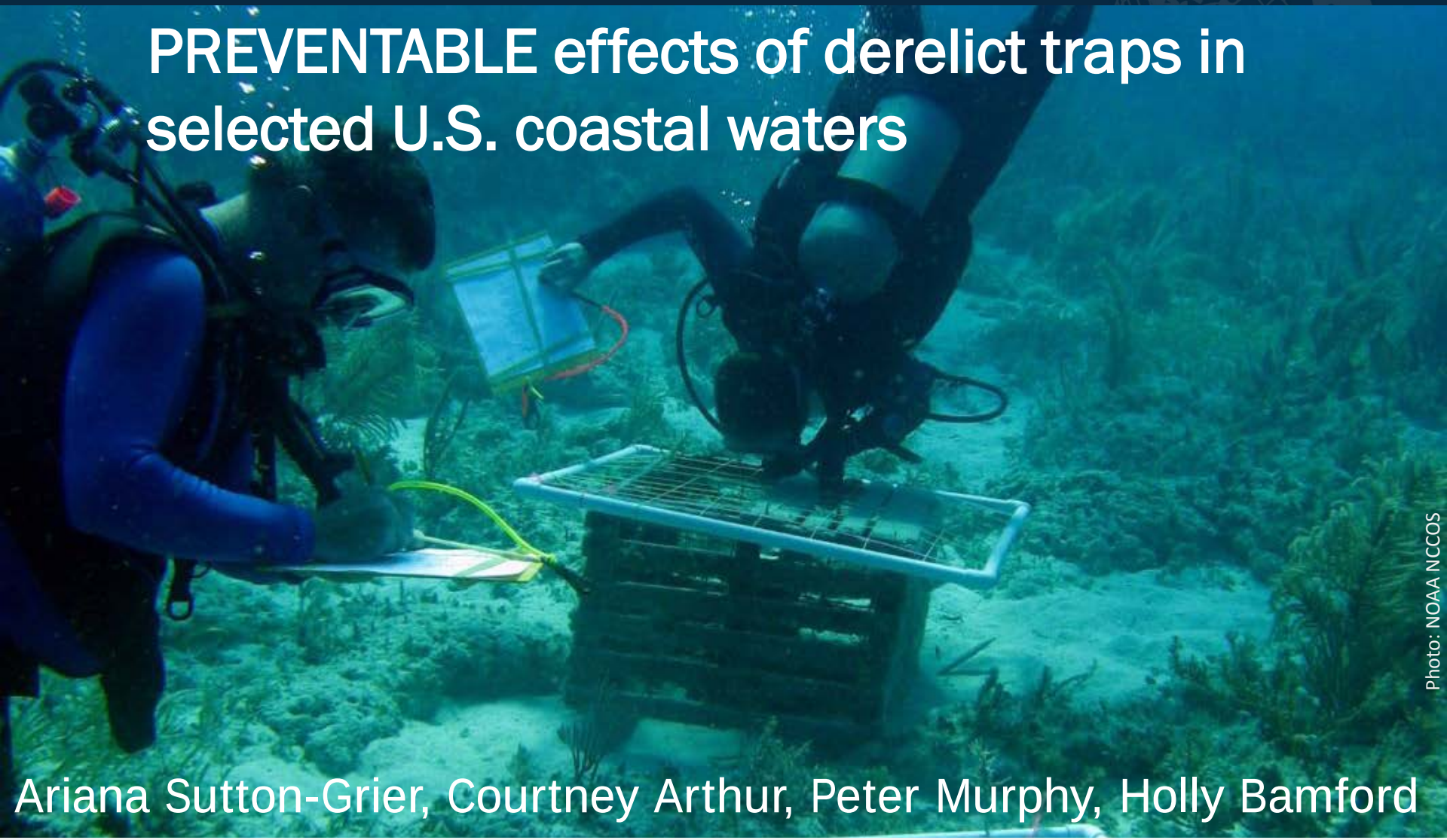
# Out of sight but not out of mind



## PREVENTABLE effects of derelict traps in selected U.S. coastal waters

Photo: NOAA NCCOS

Ariana Sutton-Grier, Courtney Arthur, Peter Murphy, Holly Bamford

**Arthur, C., Sutton-Grier, A.E., Murphy, P., and Bamford, H. (2014).** Out of sight but not out of mind: Harmful effects of derelict traps in selected U.S. coastal waters. Marine Pollution Bulletin. DOI: 10.1016/j.marpolbul.2014.06.050

# Marine Debris Is Harmful

Photo: Shannon Alexander, Bay Country Kayaking

... and PREVENTABLE

# NOAA Marine Debris Program

## Vision

The global ocean and its coasts, users, and inhabitants free from the impacts of marine debris

## Program Pillars

Removal
Research
Prevention through Education and Outreach
Emergency Response
Regional Coordination

# NOAA Marine Debris Program

## Research Strategy (2012-2016)

Focus prevention and reduction efforts on areas of greatest concern

## Actions

Develop methods and technology to assess marine debris abundance and behavior

Investigate physical, chemical, and societal impacts of marine debris

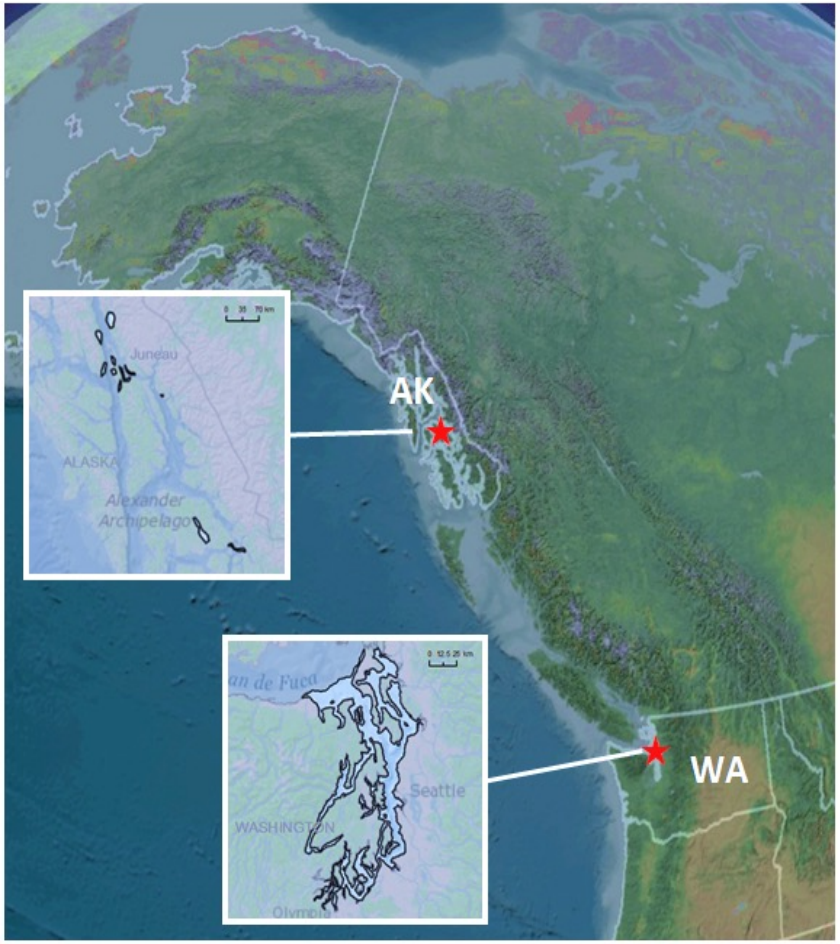
# Distribution, abundance, and impacts of derelict fishing traps along the US coast

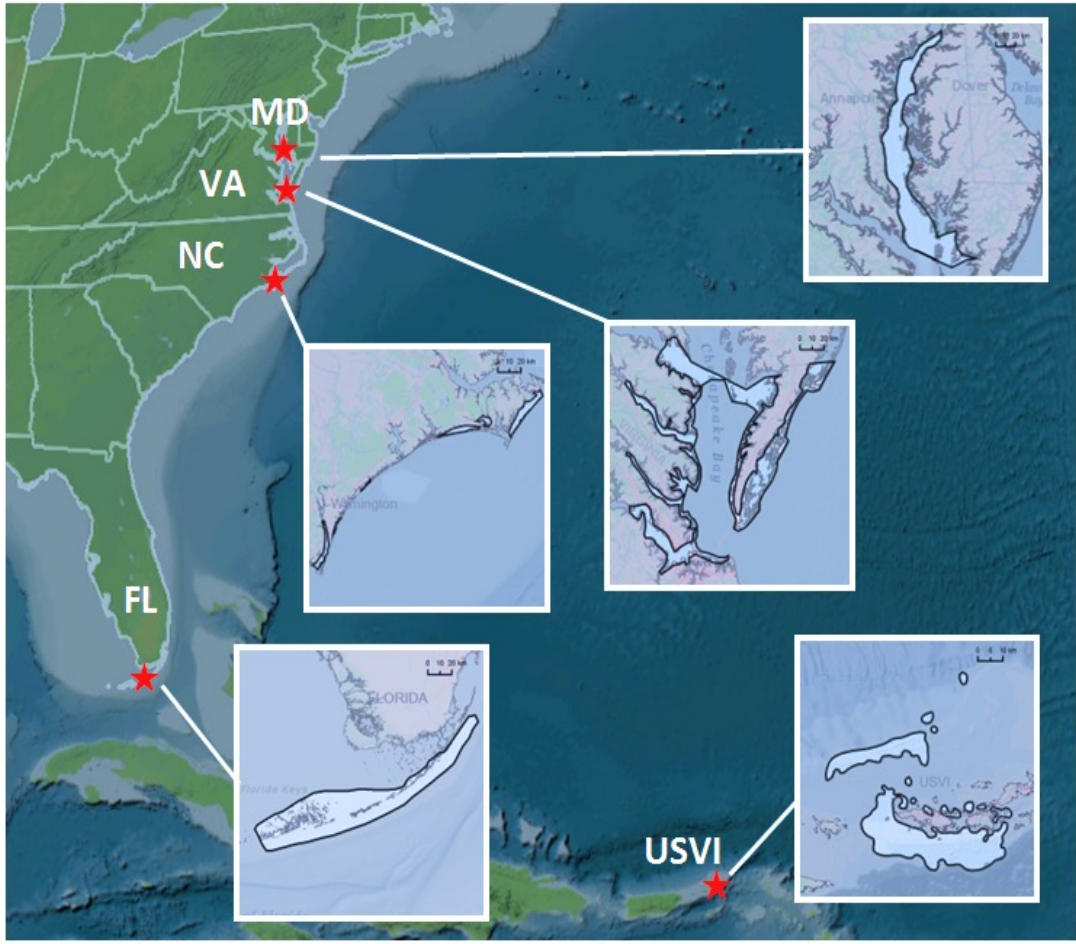
Original studies conducted surveys of derelict fishing traps (DFTs) and in-situ experiments to estimate effects on habitat + fisheries

- How many DFTs exist in each fishery?
- What are DFT impacts to fishermen, target and non-target organisms, and habitat?

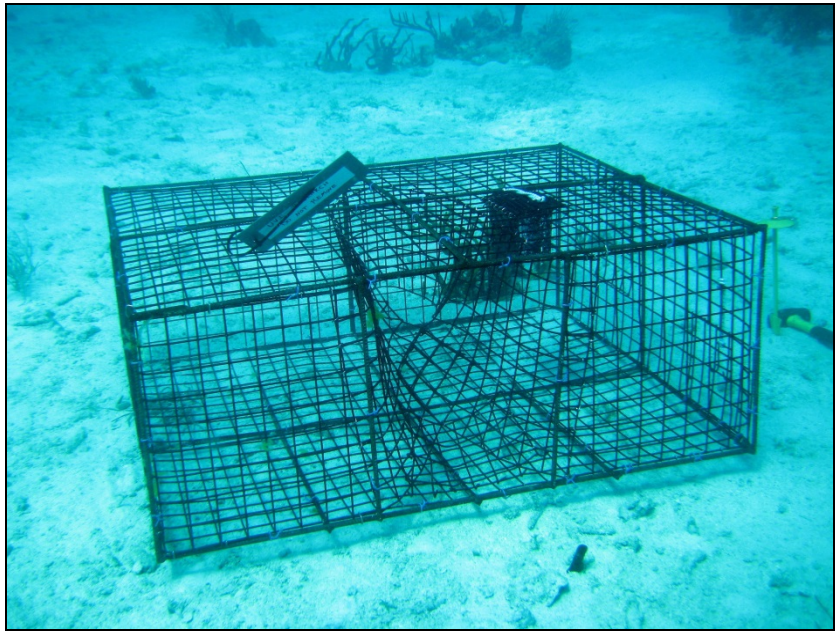
**This synthesis looks comprehensively across regions.**

# Distribution, abundance, and impacts of derelict fishing traps along the US coast



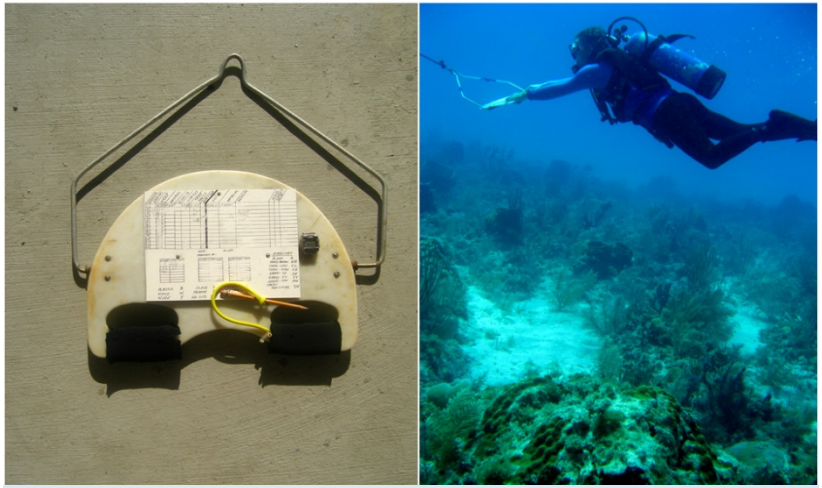



# Different types of traps used in this study

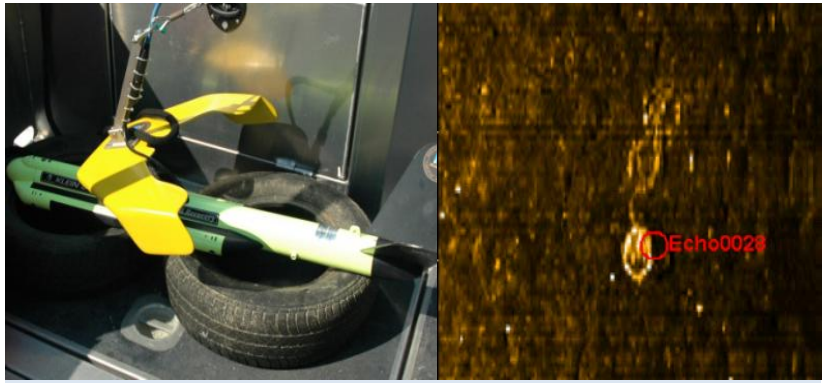


# Detection Methods

- Assessment goals require reliable trap detection and quantification
- Best method depends on:
  - Depth
  - Water clarity
  - Bottom habitat
  - Benthic topography
  - Cost, *including equipment, infrastructure, and method development*
- Based on these factors, we derived a matrix to guide method selection.



Tow Board Surveys in Florida Keys




Sonar Surveys in Alaska (+VA, MD, NC, USVI)

# Detection Methods – Selection Matrix

| METHOD | Key Limitations | Method Used *In…* | Water Depth *Surface to sea-floor* | *Area Coverage Swath width* |
|---|---|---|---|---|
| **Side Scan Sonar - Towed** | Bottom variability, equipment needs | Alaska, Puget Sound, Chesapeake Bay | 2 - 600 m | 20-50 m |
| **Side Scan Sonar – AUV** | Cost, equipment needs, bottom variability | USVI | 5 – 600 m | 20-50 m |
| **Side Scan Sonar - Hull** | Water depth, post processing detail | Chesapeake Bay, North Carolina | 1 - 10 m | 20-25 m |
| **SCUBA Survey** | Geo-reference, water depth, water clarity | Puget Sound, Florida Keys, Alaska | 3 - 30 m | Visibility dependent |
| **Diver Tow** | Water depth, temperature, clarity, geo reference | Florida Keys | 3 – 30 m | 4 m (per diver) |
| **Camera** | Water clarity, visual range | USVI, Alaska | Visibility dependent | Visibility dependent |

# Number of derelict fishing traps per sq. km.

| Species | Study Location | NUMBER of DFTs/km2 |
|---|---|---|
| Dungeness crab | SE Alaska | 10<br>(9.7-10.7) |
| | Puget Sound, Washington | 44 |
| Blue crab | SE North Carolina | 22<br>(2.7-65.3) |
| | Chesapeake Bay, Maryland | 47<br>(27.7-75.3) |
| | Chesapeake Bay, Virginia | 13-17 |
| Spiny lobster | Florida Keys | 20.6 |
| Fish | St John Island, USVI | 5 |

**Arthur and Sutton-Grier et al. (2014).** Out of sight but not out of mind: Harmful effects of derelict traps in selected U.S. coastal waters. Marine Pollution Bulletin. DOI: 10.1016/j.marpolbul.2014.06.050

# Percent of ghost fishing DFTs (%)

| Species | Study Location | Percent DFTs GHOST FISHING |
|---|---|---|
| Dungeness crab | SE Alaska | 33 |
| | Puget Sound, Washington | 32 |
| Blue crab | SE North Carolina | 37 |
| | Chesapeake Bay, Maryland | ~40 |
| | Chesapeake Bay, Virginia | ~35 |
| Spiny lobster | Florida Keys | ~18 |
| Fish | St John Island, USVI | 5 |

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# Estimated total captured (or dead) individuals per sq km per year

| Species | Study Location | Estimated total CAPTURED or DEAD individuals/km2/yr |
|---|---|---|
| Dungeness crab | SE Alaska | 13 (captured) |
| | Puget Sound, Washington | 690 (captured)<br>296 (dead) |
| Blue crab | SE North Carolina | -- |
| | Chesapeake Bay, Maryland | 376 (dead) |
| | Chesapeake Bay, Virginia | 268 (captured) |
| Spiny lobster | Florida Keys | 36 (dead) |
| Fish | St John Island, USVI | 19 (captured) |

**Arthur and Sutton-Grier et al. (2014).** Out of sight but not out of mind: Harmful effects of derelict traps in selected U.S. coastal waters. Marine Pollution Bulletin. DOI: 10.1016/j.marpolbul.2014.06.050

# Trap fouling + degradation in the Rhode River, Chesapeake Bay, Maryland

Month 0

Month 5

Month 7

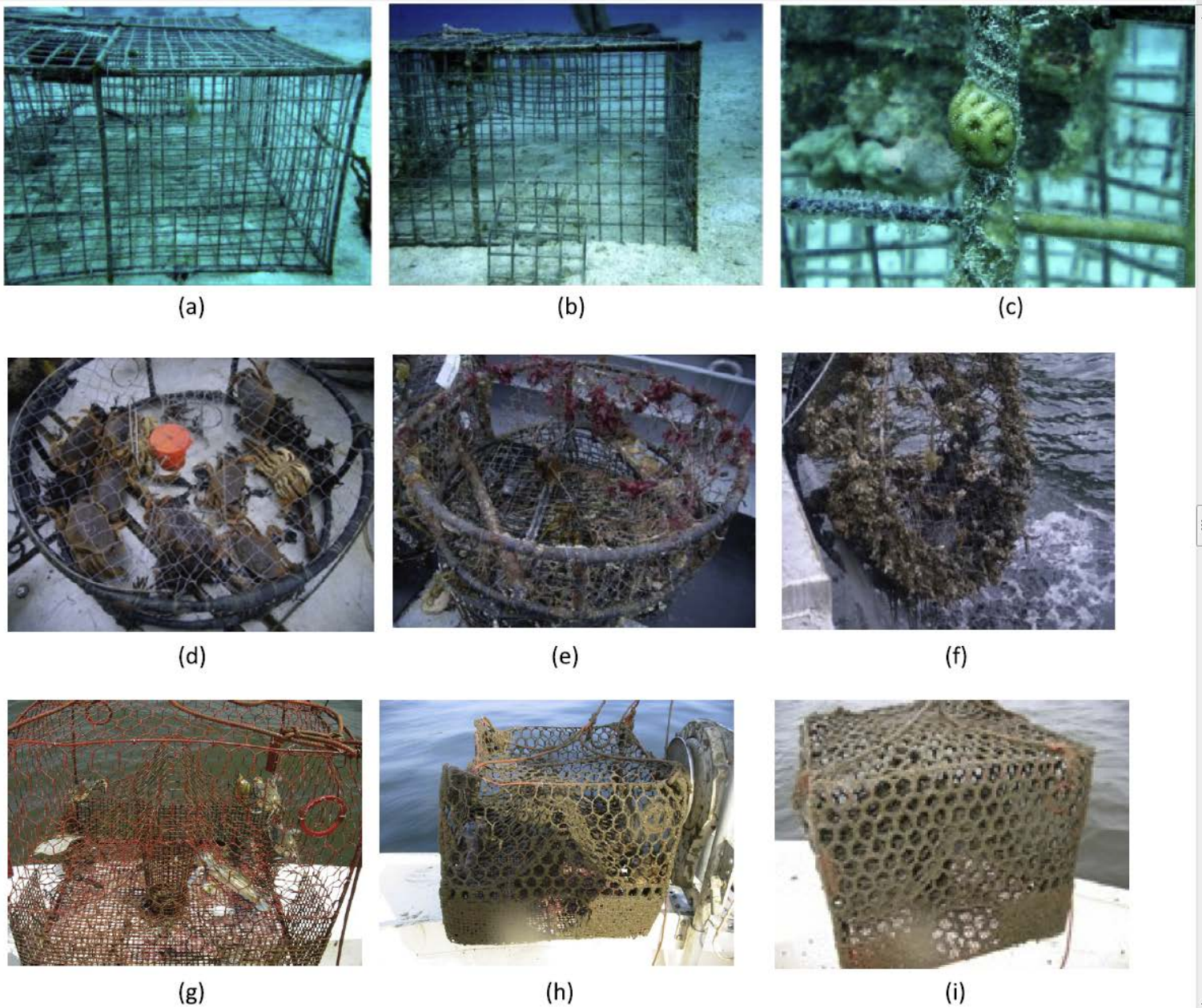
Examine the regional context and challenges resulting in the loss of DFTs to drive effective policy solutions. Educate fishing communities.

# Estimated time DFTs are ghost fishing (yr)

| Species | Study Location | Estimated time DFTs are GHOST FISHING (yr) |
|---|---|---|
| Dungeness crab | SE Alaska | 6 + |
| | Puget Sound, Washington | 0.3 – 2.2 |
| Blue crab | SE North Carolina | 2.09 (+/- 1.3) |
| | Chesapeake Bay, Maryland | 1.17 |
| | Chesapeake Bay, Virginia | 1 – 7 |
| Spiny lobster | Florida Keys | 1.4 (+/- 0.4) |
| Fish | St John Island, USVI | 0.33 |

Arthur and Sutton-Grier et al., *in press*. Out of sight but not out of mind: Harmful effects of derelict traps in selected U.S. coastal waters. Marine Pollution Bulletin. DOI: 10.1016/j.marpolbul.2014.06.050

# Traps degrade slower than expected



# Reasons for Loss

**Accidental loss** is caused by

- storms
- boat traffic
  - high use areas
  - cruise ships

**Intentional loss** is caused by

- disposal of obsolete traps overboard due to cost of disposal convenience
- vandalism/competition

Reduce accidental loss with separate boat lanes and designated fishing areas.

Educate fishers about the impacts of DFTs to decrease intentional loss.

# Indiscriminate Harvest: Harm to Organims

Target & non-target

Terrapin tragedies

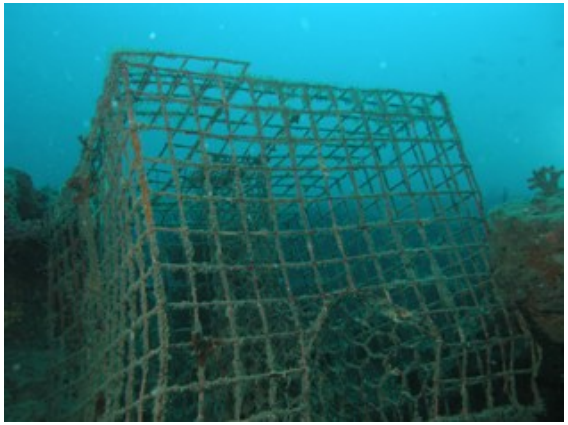
Males & females

Reduce impacts of DFTs through research with fishing industry to develop best options for construction that reduce ghost fishing without reducing catch.

# Harm to coastal and marine habitats

Improper storage

Storm debris



Habitat smothered

Reduce accidental or purposeful losses of traps.
Target removals to sensitive areas.

# Are some derelict traps … beneficial?

Consider all costs and benefits before removal

# Economic impacts

Puget Sound: 178,874 harvestable Dungeness crab are killed each year by DFTs ($744,000) or 4.5% of average annual harvest (Antonelis et al., 2011)

Alaska: 3% of regional commercial harvest (Maselko et al., 2013)

**Virginia Chesapeake Bay:** 913,000 crabs every year (worth $304,000, or ~1% of the annual commercial harvest)

Other Costs

- Cost to fishers: trap cost in USVI where ~500 traps lost each year at ~$200 each, cost of $100,000

# Policy Recommendations

This is a regional issue, examine the regional context and challenges

Collaborate with fishing industry to develop best gear options

| | |
|---|---|
| Increase spatial planning to reduce accidental loss | Standardize removal techniques |
| Provide low-cost disposal options | Ensure escape panels are present and function as intended |
| Educate fishing communities | Supplement funding for removal @locations with high loss rates |

# Removal and Disposal Options
# Fishing For Energy, Sustainable Ports Program

Cost-free solution for fishermen to dispose of old, derelict, or unusable fishing gear

2.5 million pounds of gear disposed since 2008

FISHING FOR ENERGY

NOAA

# Research Needs

Understand the impacts on fishery populations

Understand the cost to commercial fisheries

| | |
|---|---|
| Collaborate on trap design with fishing industry | Estimate impact on species of concern |
| Causes/motivations for gear loss, complimentary social science → regional solutions | In most sensitive areas, explore alternative harvesting techniques |
| Movement and behavior of traps in different environments | Standardize metrics to inform future spatial comparisons and meta-analyses |

# Highlights / Take Home Messages

DFTs are pervasive, regionally specific, and preventable

We need collaboration between the fishing industry and resource managers to minimize this problem in the US

Understanding the full effects of DFTs on fishery stocks and cost to fishermen require more detailed studies - our estimates are conservative

Gear becomes lost, abandoned, or derelict due to many causes, and there won't be a "one size fits all" solution

# Marine Debris Program

## THANK YOU!

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...and all marine debris champions!

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# Questions?

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