Stock Assessments: Group Discussion Topics

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Results of recent focus session with fishermen: What does NMFS do with all those Observer Data?

F/V Santa Maria, in Nantucket Lightship Closed Area, August 1999--Results of a single 10 minute tow, one dredge

Differing Perceptions of Reality

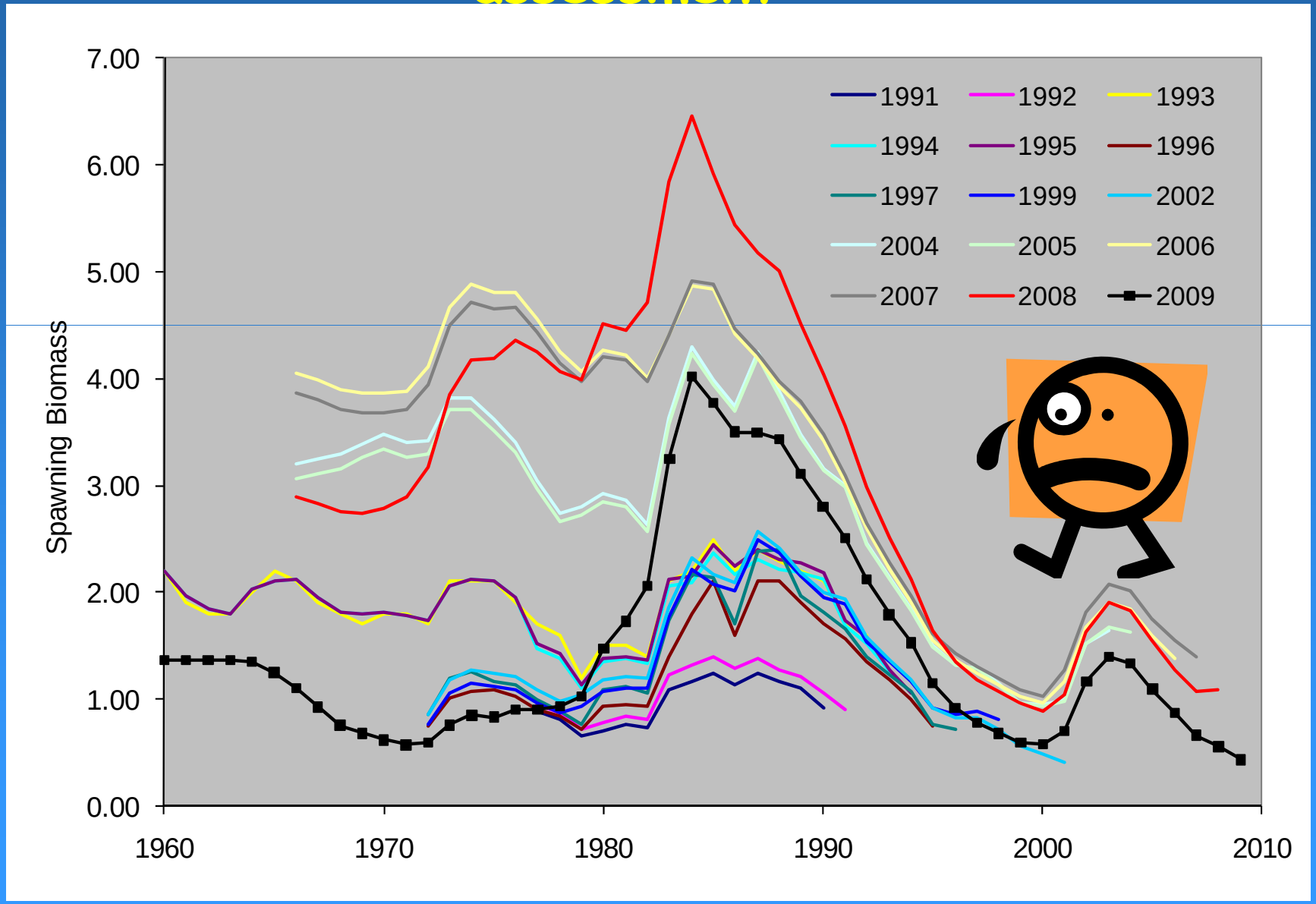
"No individual experiences the average condition"

• ***FISHERMEN***	• ***SCIENTISTS***
• Real-time Observations	• Lagged Observations
• Clustered	• Synoptic
• Direct Involvement	• Indirect Involvement
• Small Areas	• Large Areas
• Goal-Oriented Sampling	• Probablistic Sampling
• Year-round sampling	• Intermittent Snapshots

Discussion Questions

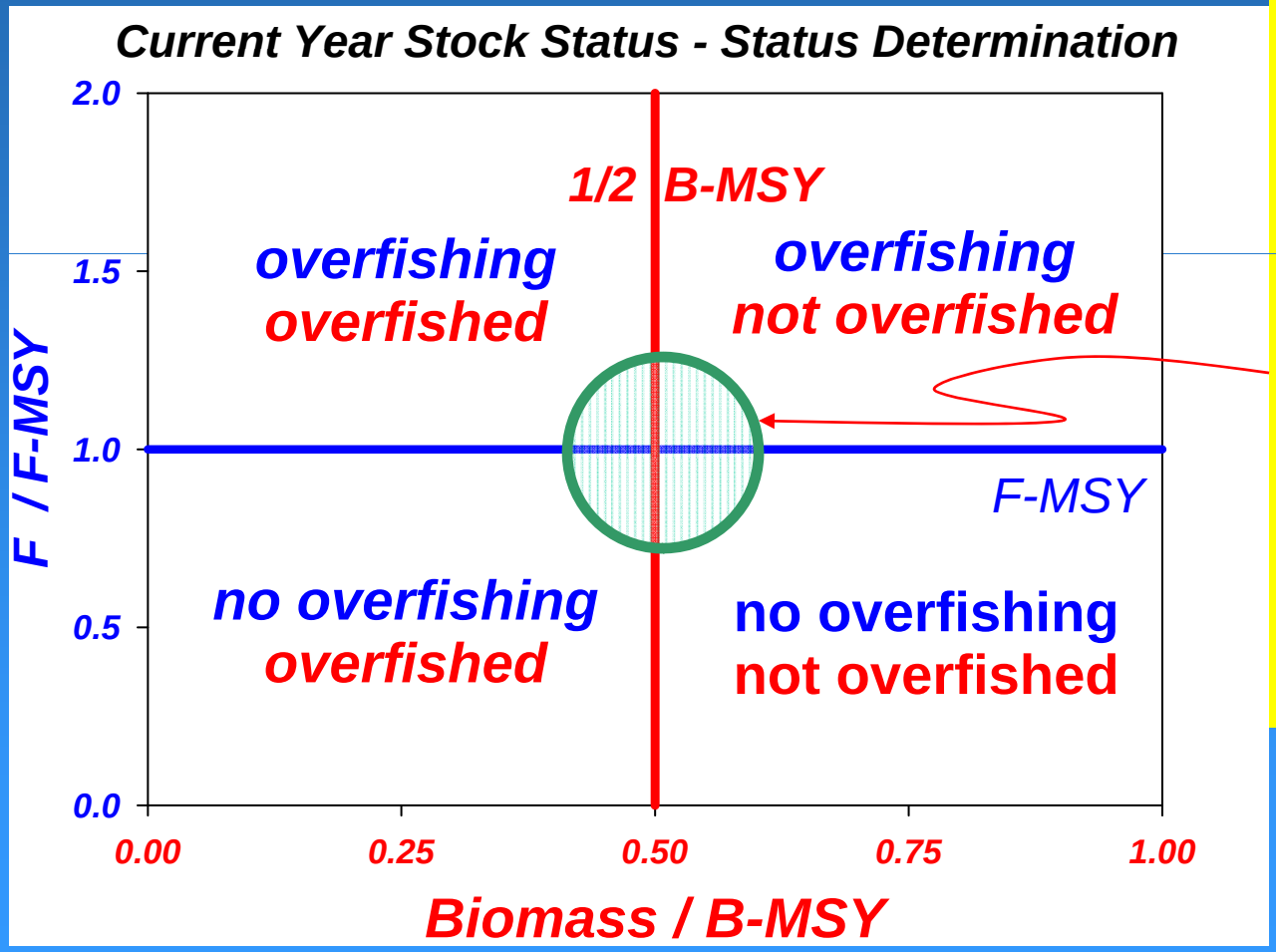
- How do we deal with all the uncertainty? Is there a difference between scientific uncertainty and ordinary ignorance?
- Can we separately treat scientific uncertainty and management uncertainty? Are they correlated?
- Can we reduce the unintended consequences of management measures?
- Where does cooperative research fit into stock assessments?
- Modern management is a data hog—How do you provide incentives for accurate and timely data?

Repeats of the Pacific whiting stock assessment



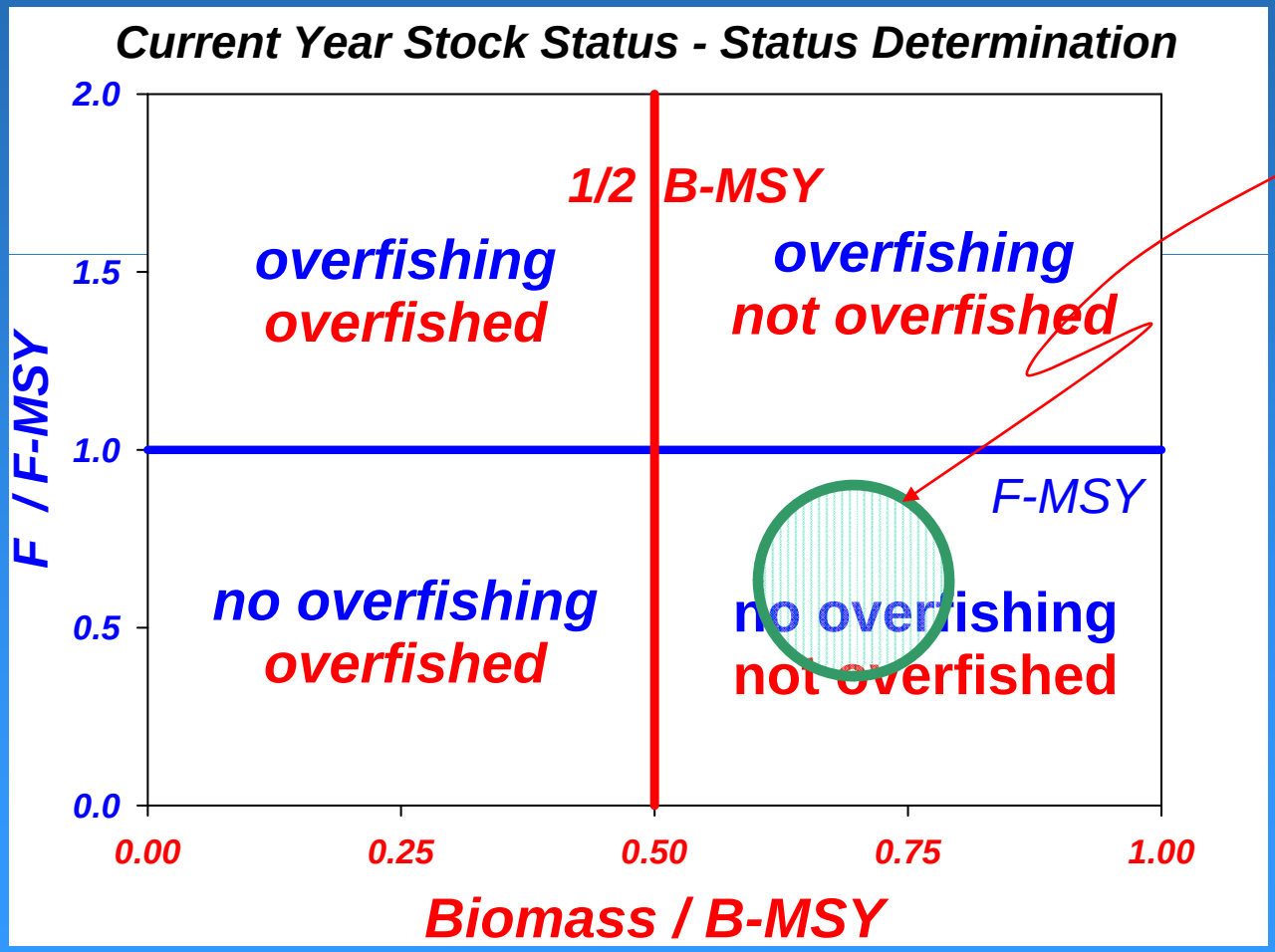
Courtesy Steve Ralston

Where do you want to manage the resource?



Managing at the margin makes changes in stock status very likely given the expected variation in assessments. In this instance, 75% of the outcomes are bad.

Where do you want to manage the resource?



Managing AWAY from the margin makes changes in stock status less likely and increases planning time for management and business

Risk Assessment

- What harvest policy would:
  - Have no more than a Y% chance of exceeding the true overfishing level in each of the next several years, taking into account scientific uncertainty in calculating biomass and management uncertainty in controlling catch;
  - Have at least a X% of leaving the stock above the target level of abundance some specified year into the future;
  - Produce Z level of catch and benefits

P* approach

- Define P* as the acceptable probability of overfishing

- Smaller P* provides larger buffer against overfishing

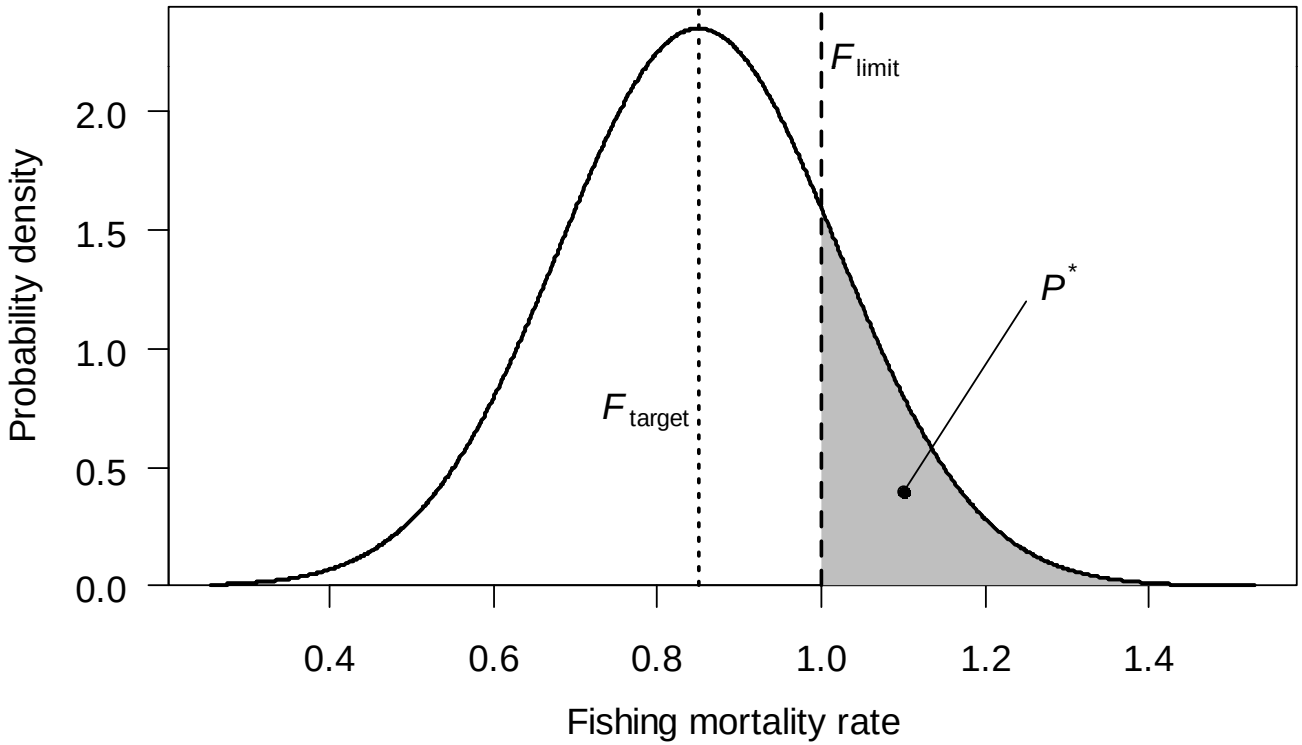
- Methods in this talk treat P* as input

P* background

- Key to this discussion are *targets* and *limits*
  - Targets are management quantities to be achieved
  - Limits are bounds on exploitation not to be exceeded

Caddy & McGarvey (1996) approach to setting a target fishing rate

$$P^* = \Pr(F_t > F_{\text{limit}}) = \int_{F_{\text{limit}}}^{\infty} \phi_{F_t}(F)\,dF$$



Courtesy—Shertzer,Prager, Williams

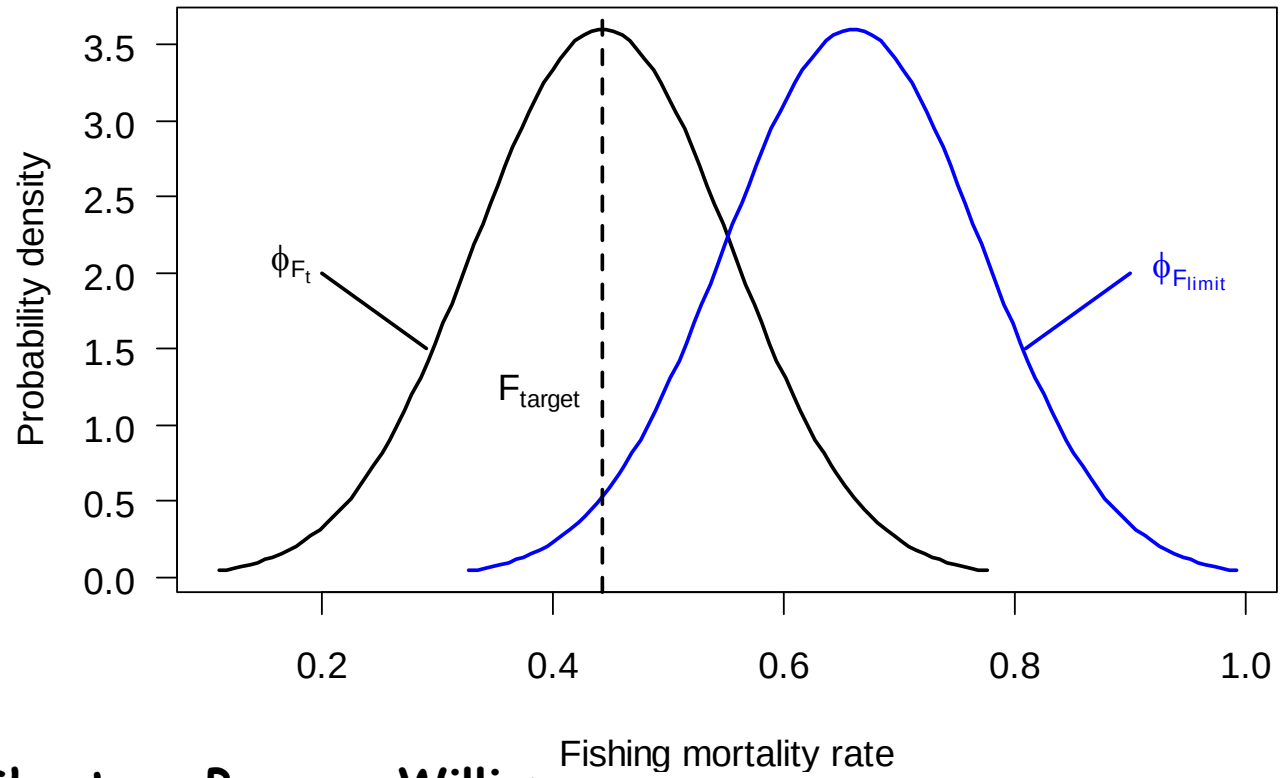
P* background

- Prager et al. (NAJFM, 2003) extended the Caddy & McGarvey approach:
  - to include uncertainty in the limit fishing rate, as well as the target
  - to cast reference points as ratios
  - to base reference points on biomass, as well as fishing rate

Courtesy—Shertzer,Prager, Williams

Prager et al. (2003) approach

$$P^* = \Pr(F_t > F_{\text{limit}}) = \int_0^\infty \left[\int_F^\infty \phi_{F_t}(\theta)\, d\theta \right] \phi_{F_{\text{limit}}}(F)\, dF$$



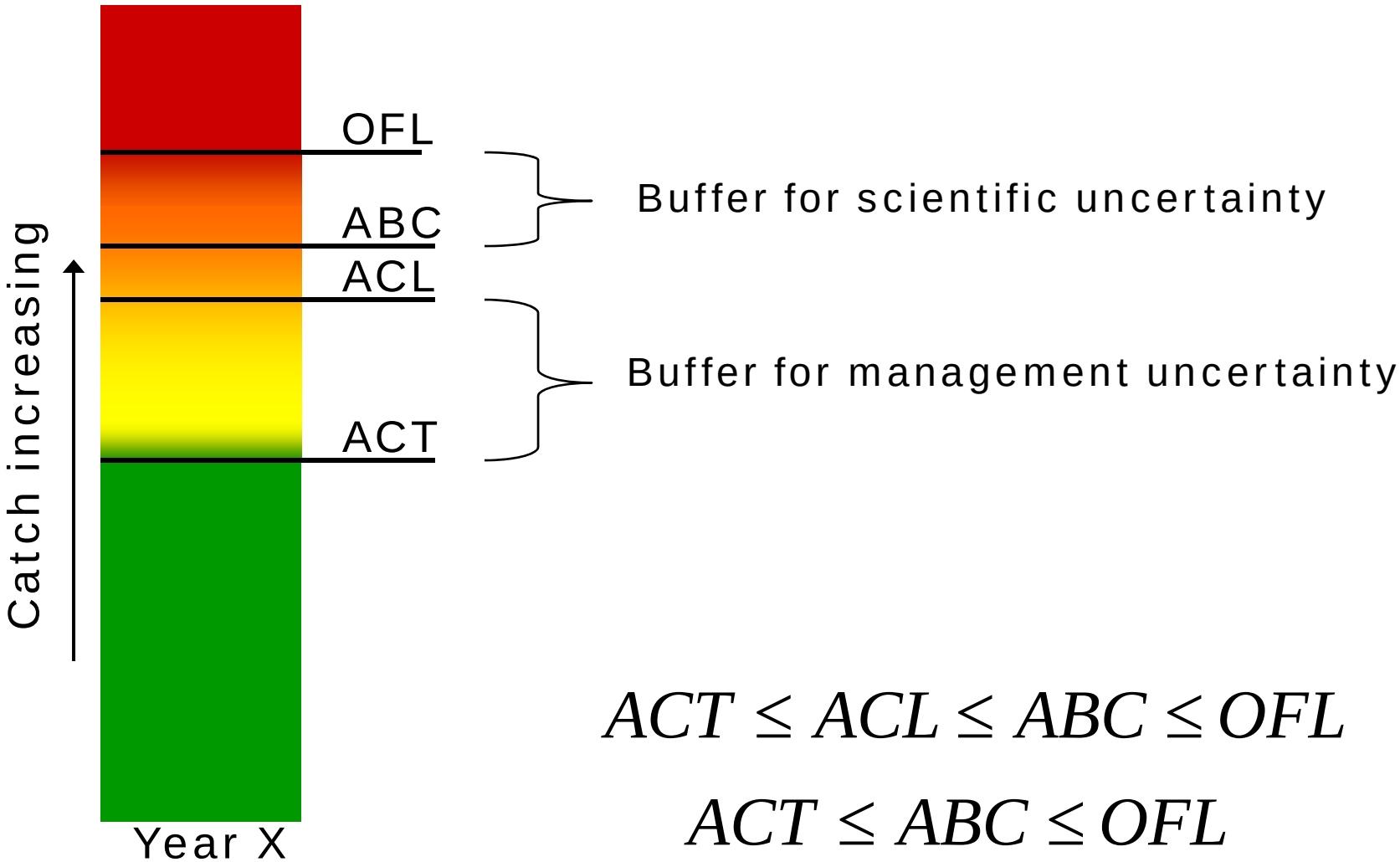
Courtesy—Shertzer,Prager, Williams

NS1 Guidelines for implementing the MSRA

- MSRA specifies —
  - Councils will set Annual Catch Limits (ACLs)
  - ACLs cannot exceed recommendations of the Councils' scientific advisors (SSCs, in practice)
- NS1 Guidelines specify —
  - SSCs will set acceptable biological catch (ABC)
    - not to exceed the overfishing limit (OFL)
    - accounts for scientific uncertainty
  - Council's will set an Annual Catch Target (ACT)
    - not to exceed the ACL
    - accounts for management uncertainty

Courtesy—Shertzer,Prager, Williams

NS1 Guidelines for implementing the MSRA

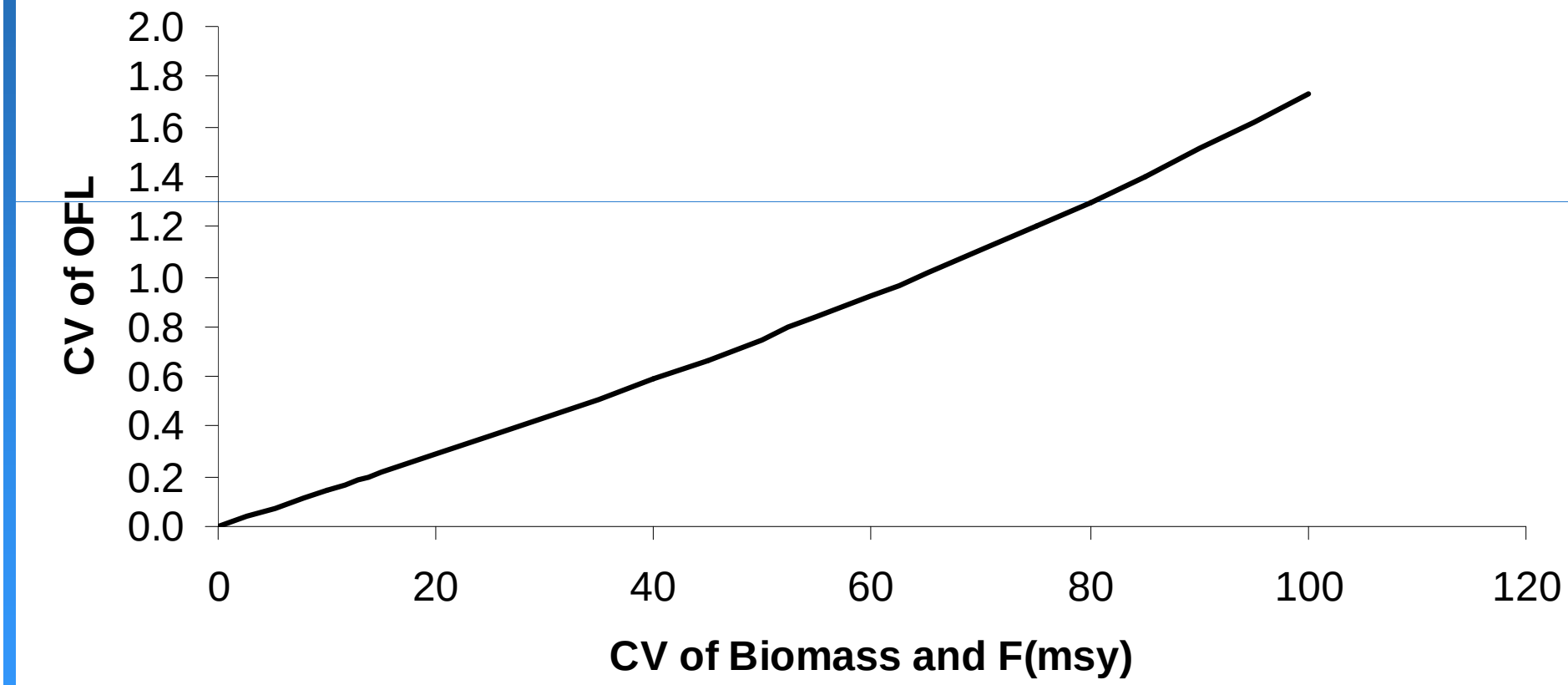


$$ACT \leq ACL \leq ABC \leq OFL$$

$$ACT \leq ABC \leq OFL$$

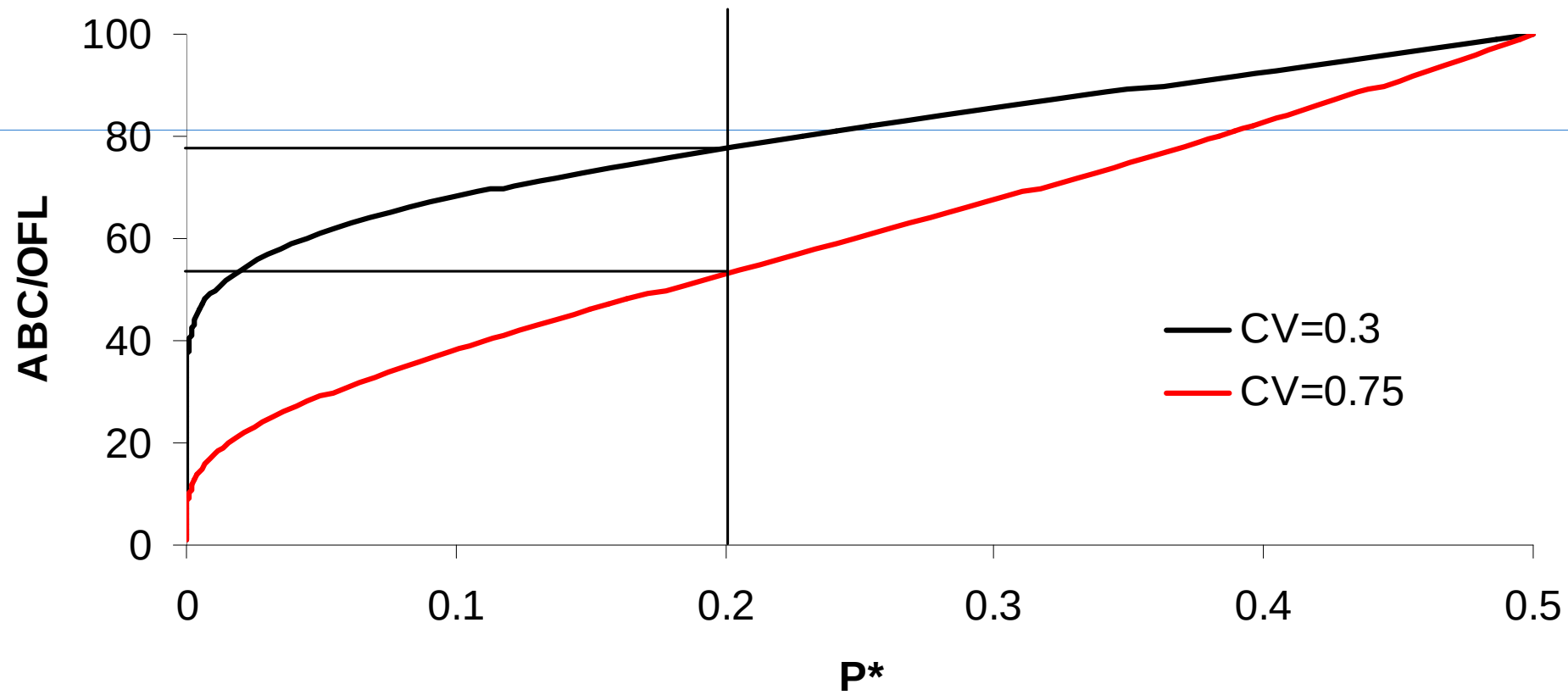
Courtesy—Shertzer,Prager, Williams

CV of OFL



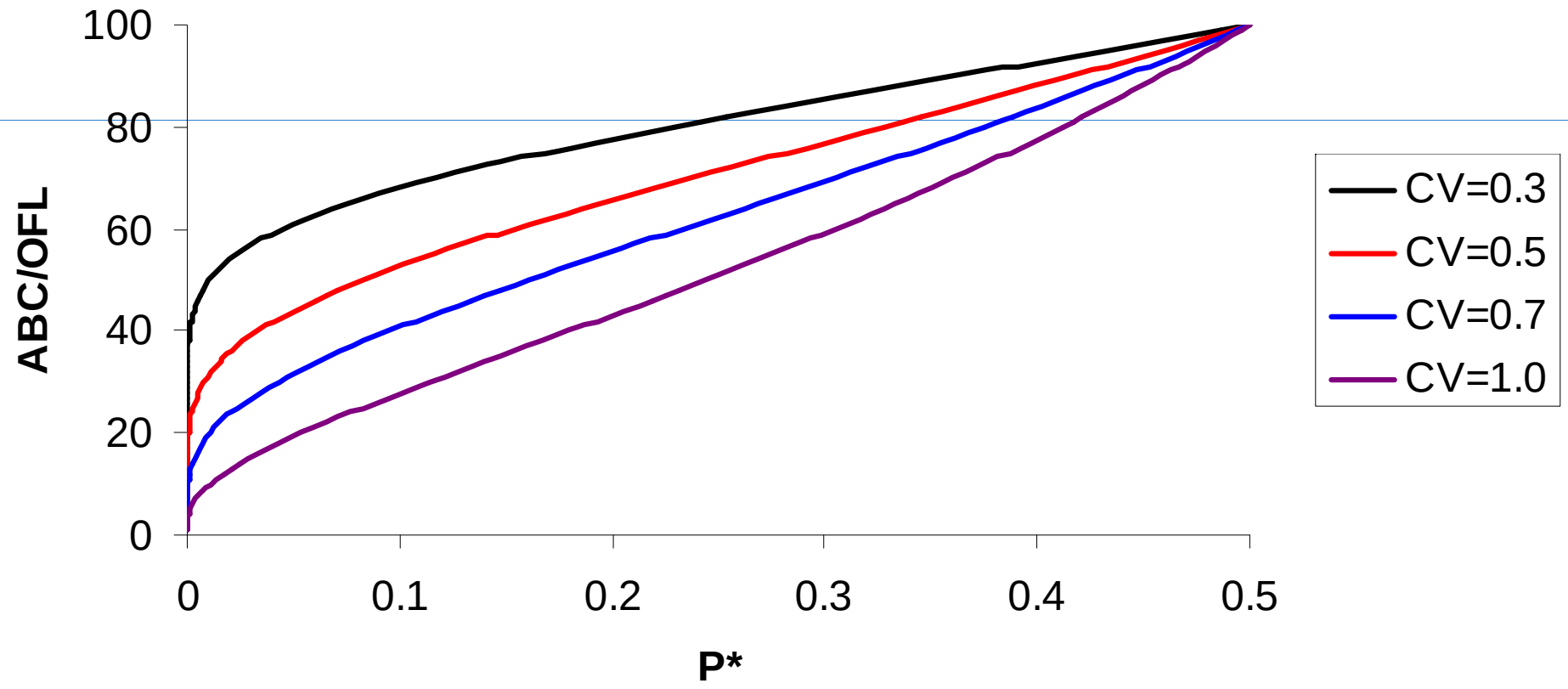
Courtesy—Wilberg

CV of OFL



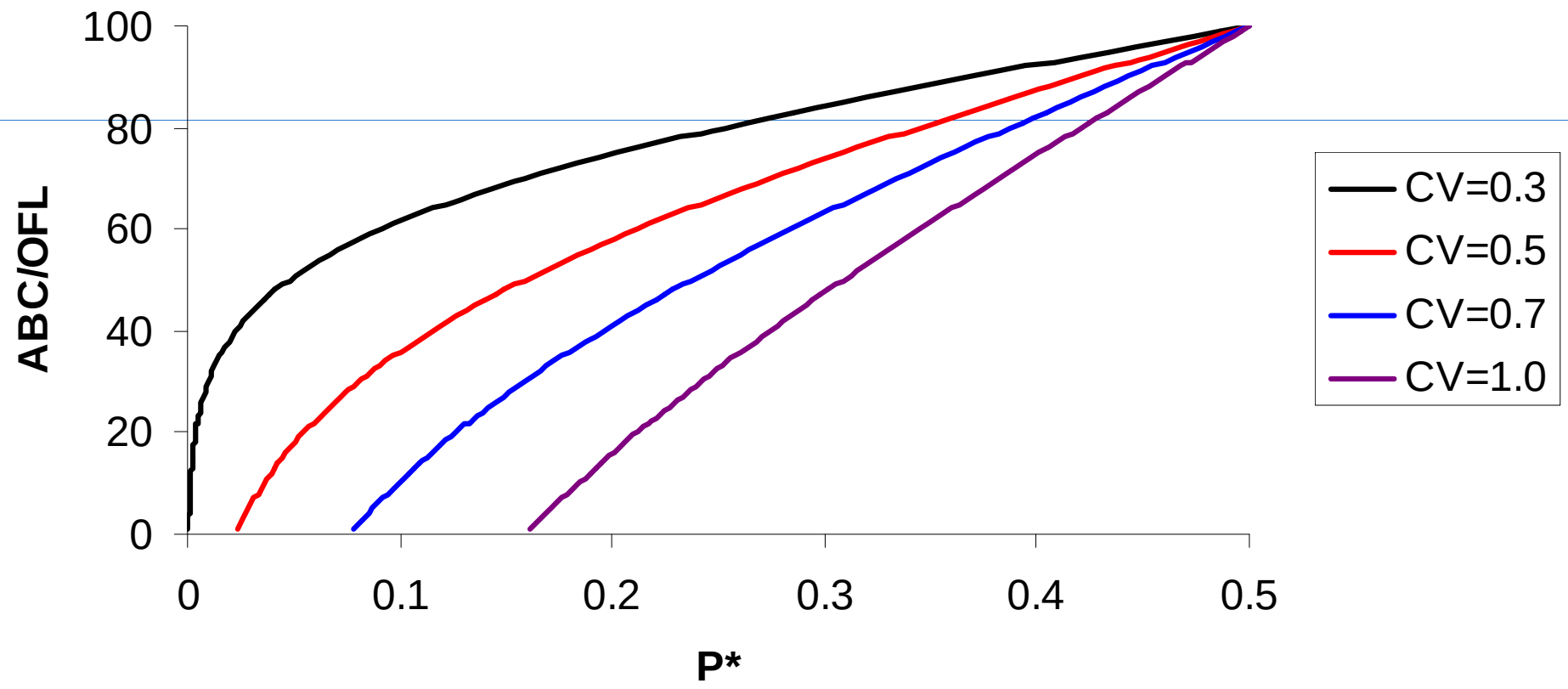
Courtesy—Wilberg

Logormal Distribution



Courtesy—Wilberg

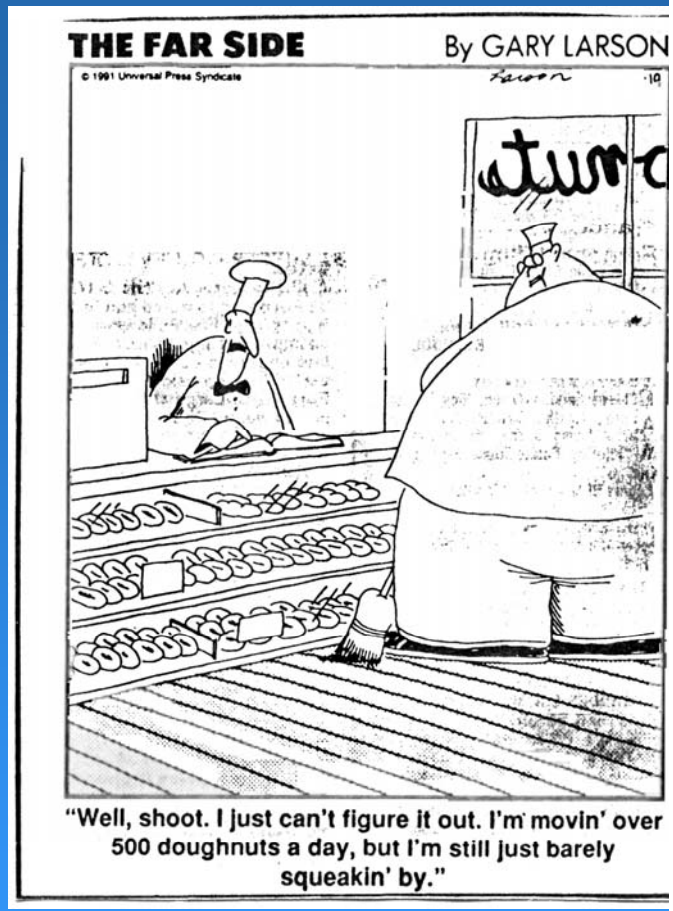
Normal Distribution



Courtesy—Wilberg

Total Catch?

- A dead fish is a dead fish; count 'em all
  - Commercial retained
  - Commercial discard
  - Recreational kept
  - Recreational released
  - %Survival of discard & released
  - Research take



Well, shoot. I just can't figure it out. I'm movin' over 500 doughnuts a day, but I'm still just barely squeakin' by.

Key Factors Contributing to Efficacy of Management Controls

- Behavior of harvesters in response to regulations
  - Changes in temporal/spatial patterns
  - Gear modifications
- Changes in bycatch/discard patterns
  - Size/sex/species highgrading
  - Is there a Heisenberg Effect?
- Compliance—Incentives for compliance?
- Accuracy and timeliness of data

Doveryai, no proveryai. Trust, but verify

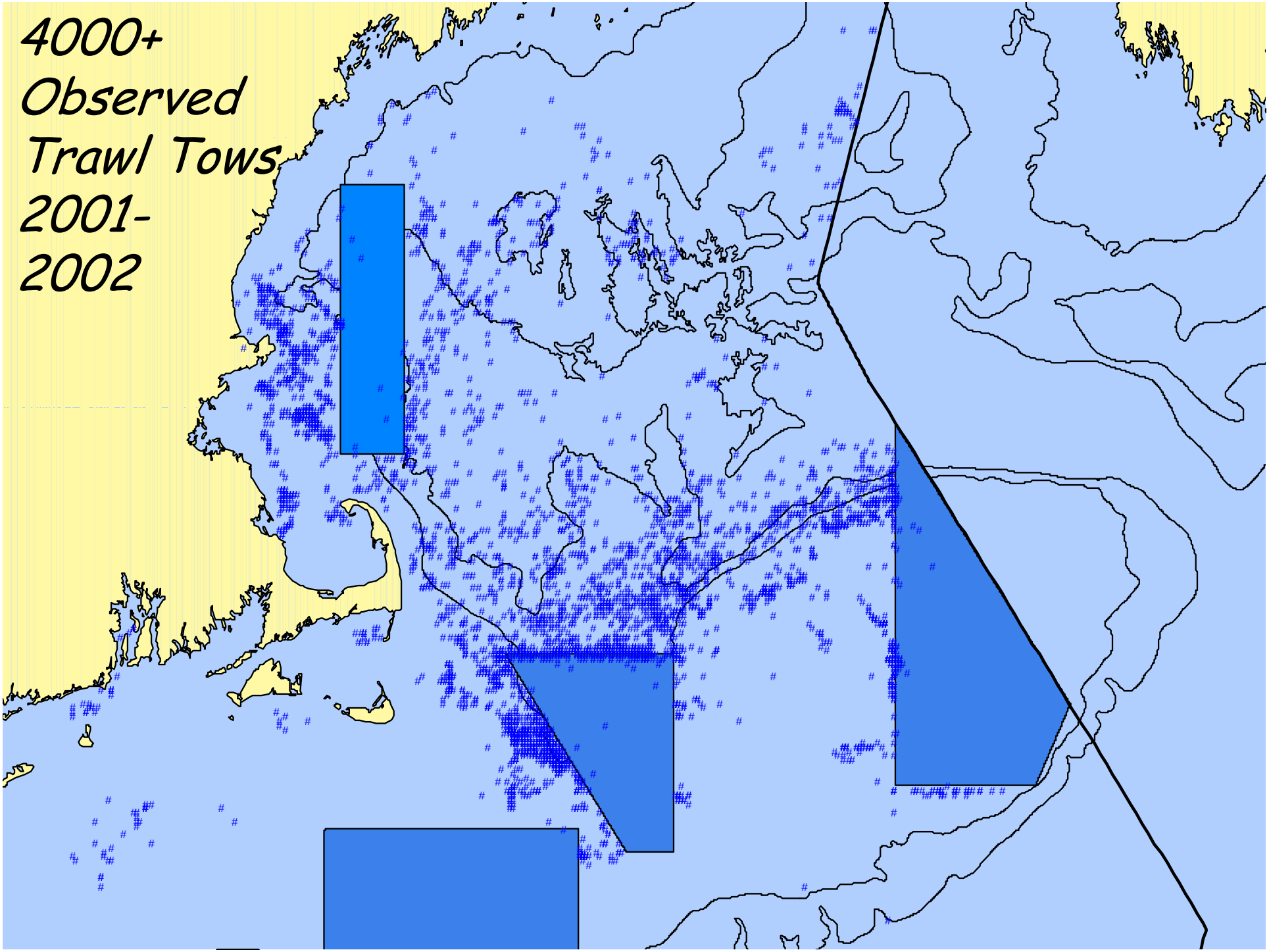
Unintended Consequences of Management

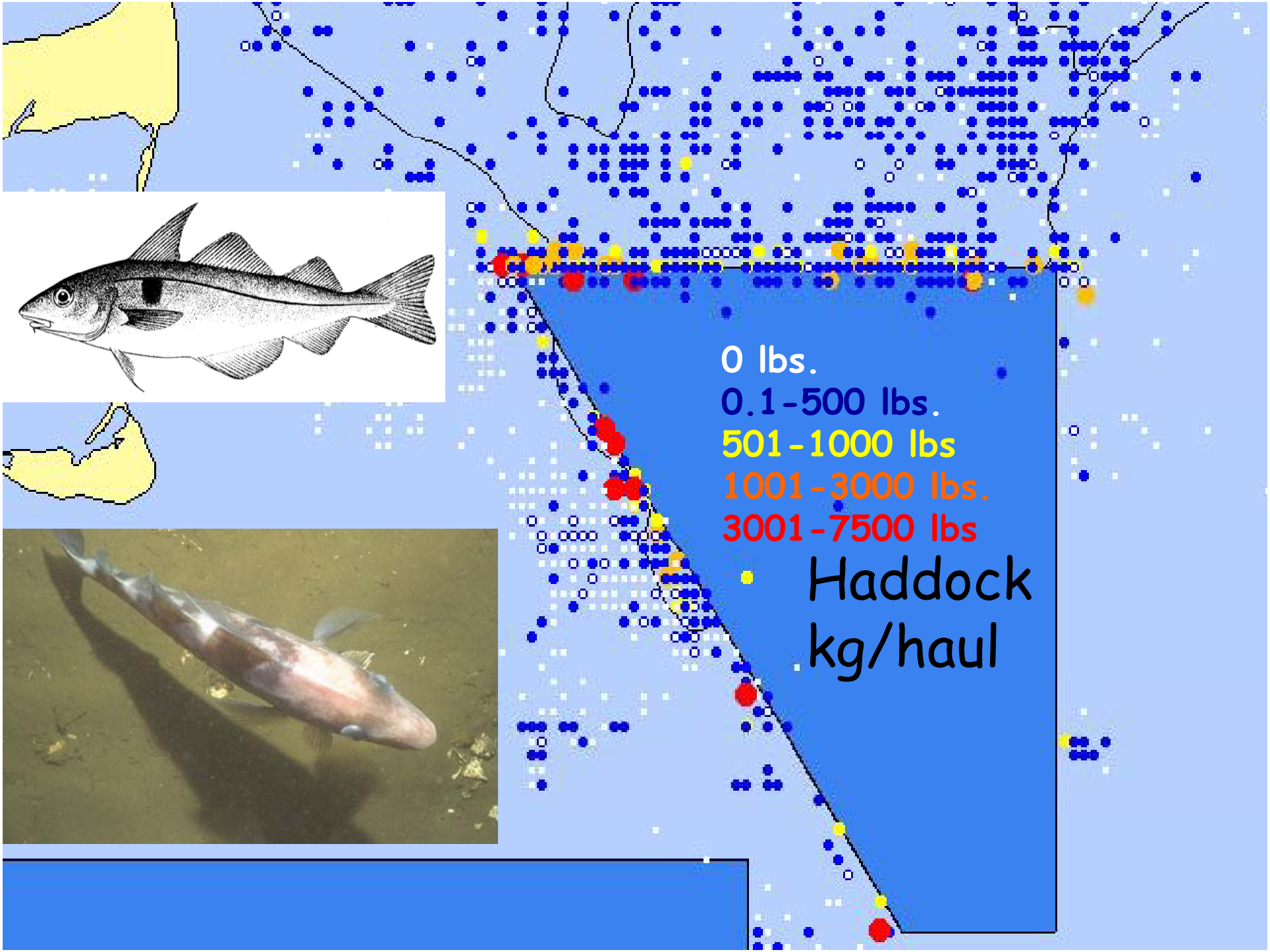
- Quotas
- Closed Areas
- Closed Seasons
- Catch Shares
- Bag Limits, Trip Limits
- Size limits
- Gear restrictions
- Limited entry, control dates
- Species specific permits within fleets

Doveryai, no proveryai.

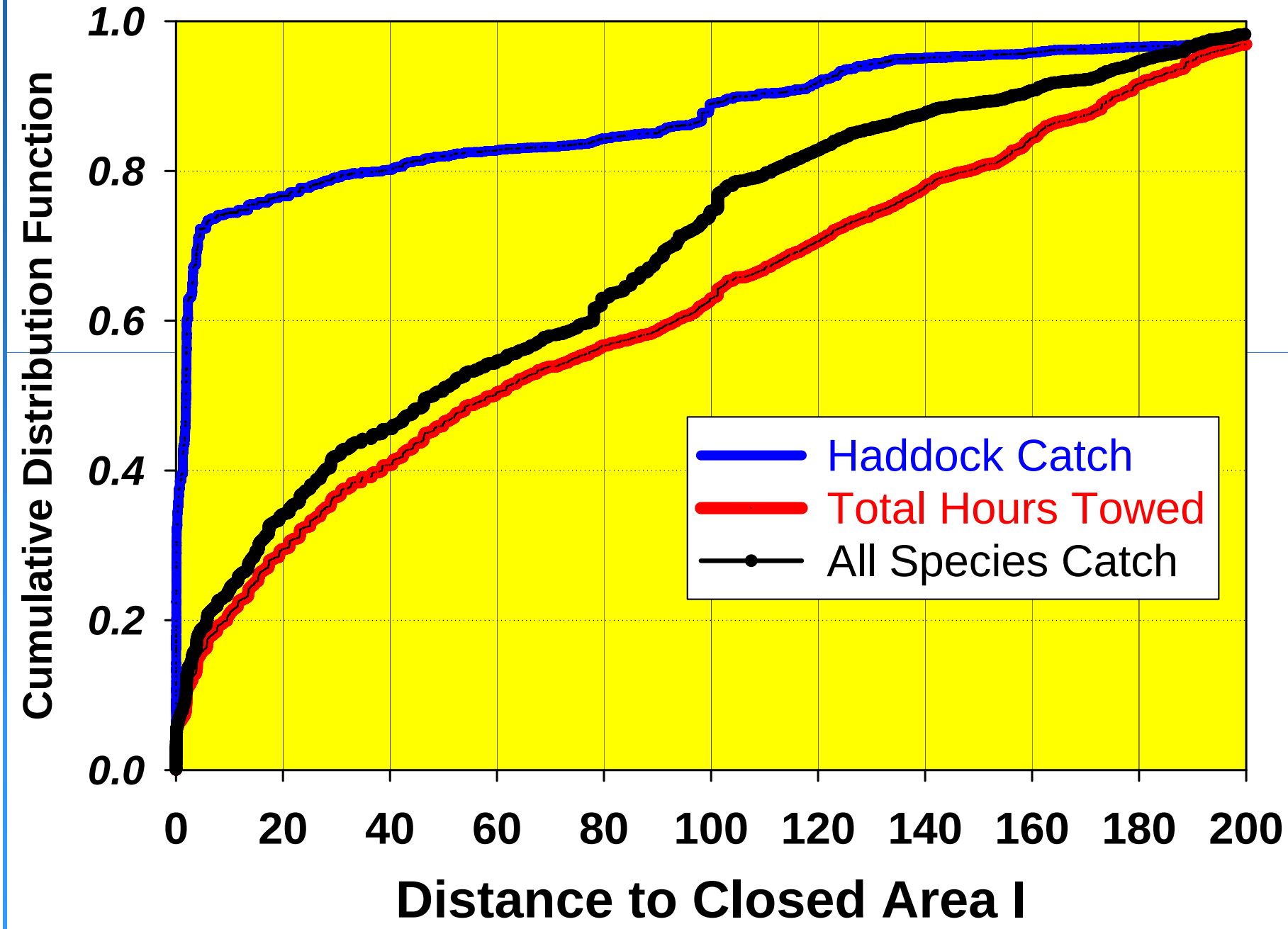
Trust, but verify

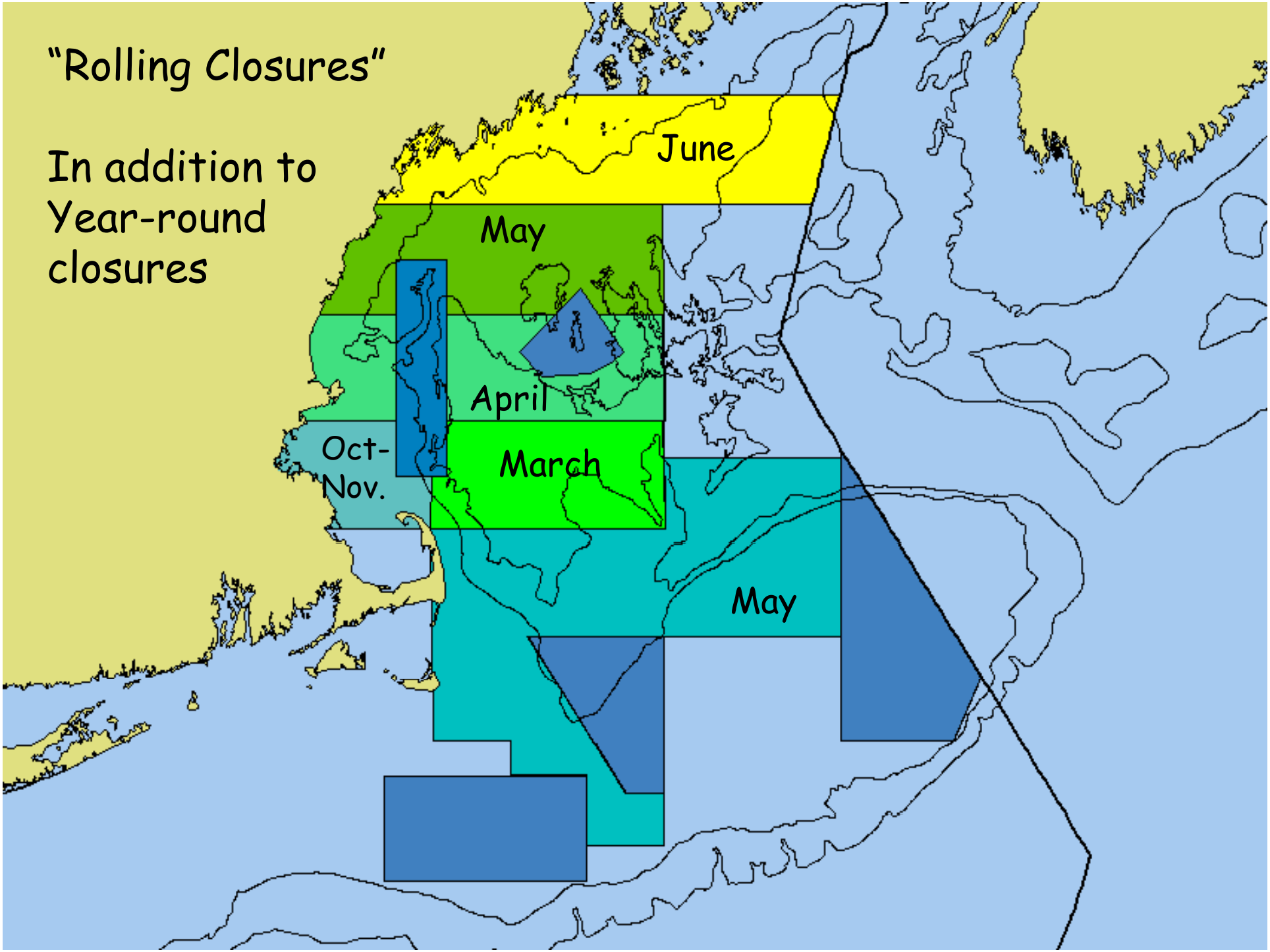
Effect of Closures on Catch Rates and distribution of fishing effort

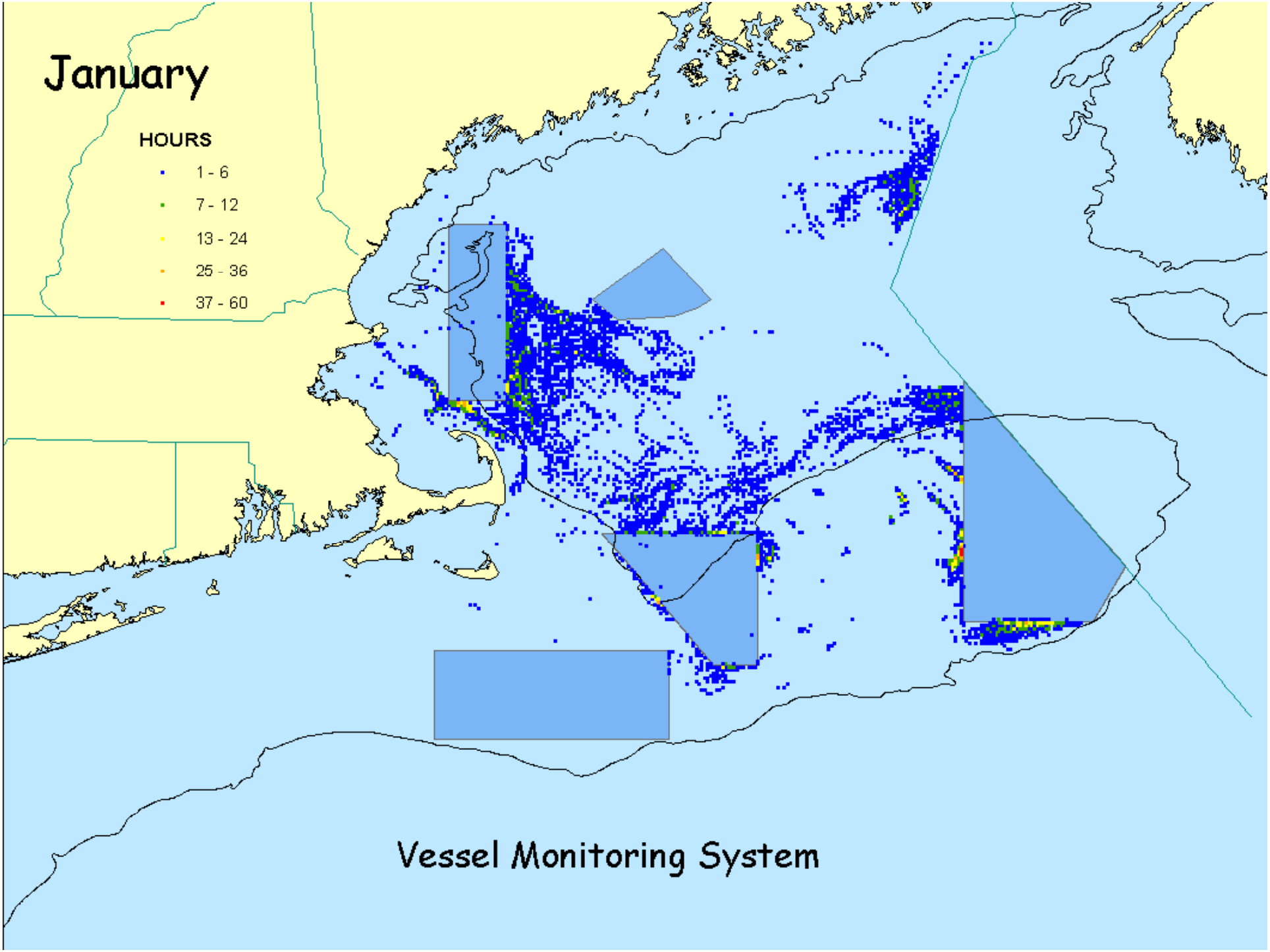

4000+
Observed
Trawl Tows
2001-
2002

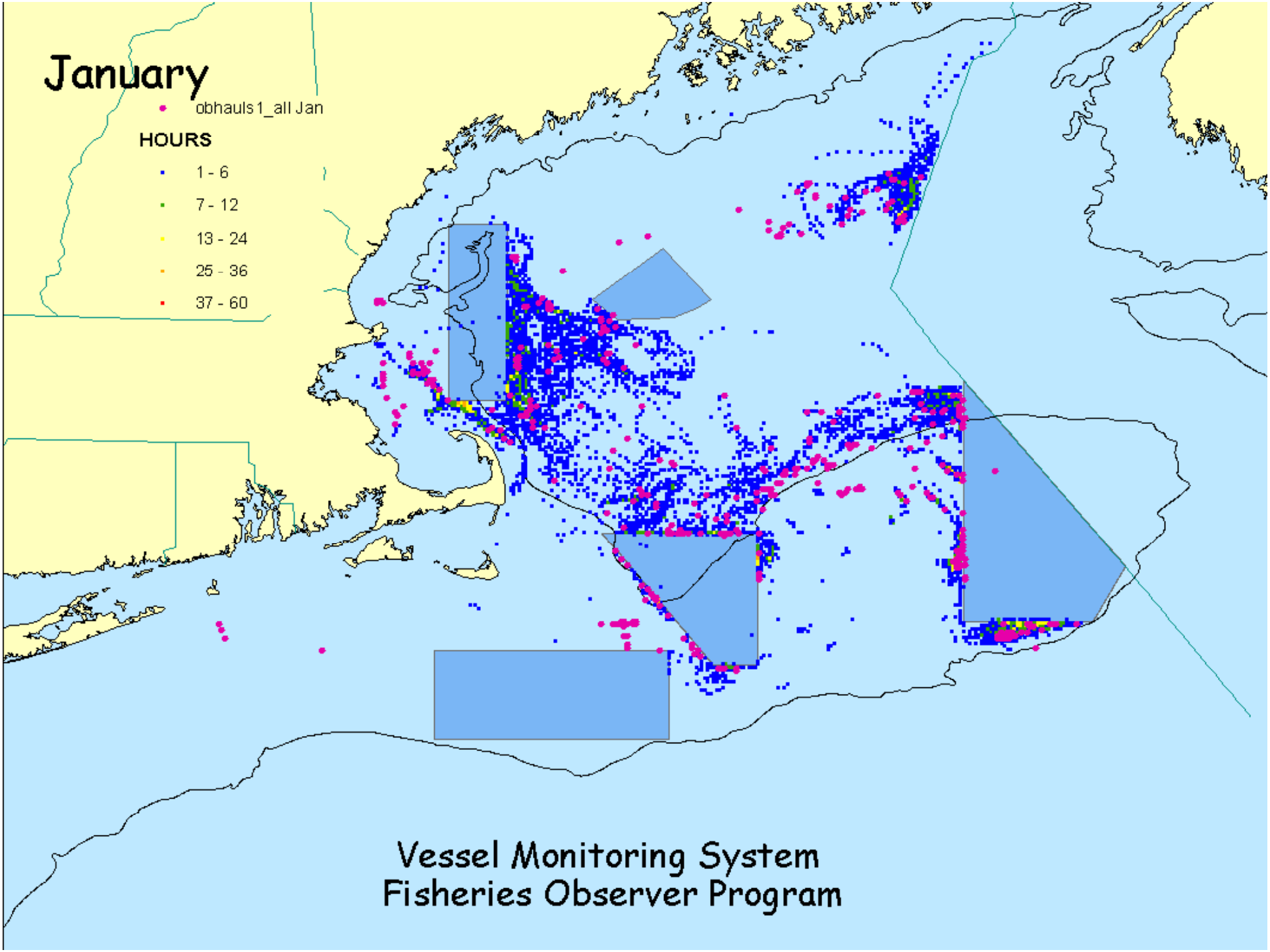

0 lbs.
0.1-500 lbs.
501-1000 lbs
1001-3000 lbs.
3001-7500 lbs
Haddock
kg/haul

How Much Catch & Effort is Proximate to CA-I?




"Rolling Closures"
In addition to Year-round closures
June
May
April
March
Oct-Nov.
May


January
HOURS
1 - 6
7 - 12
13 - 24
25 - 36
37 - 60
Vessel Monitoring System


January
obhauls1_all Jan
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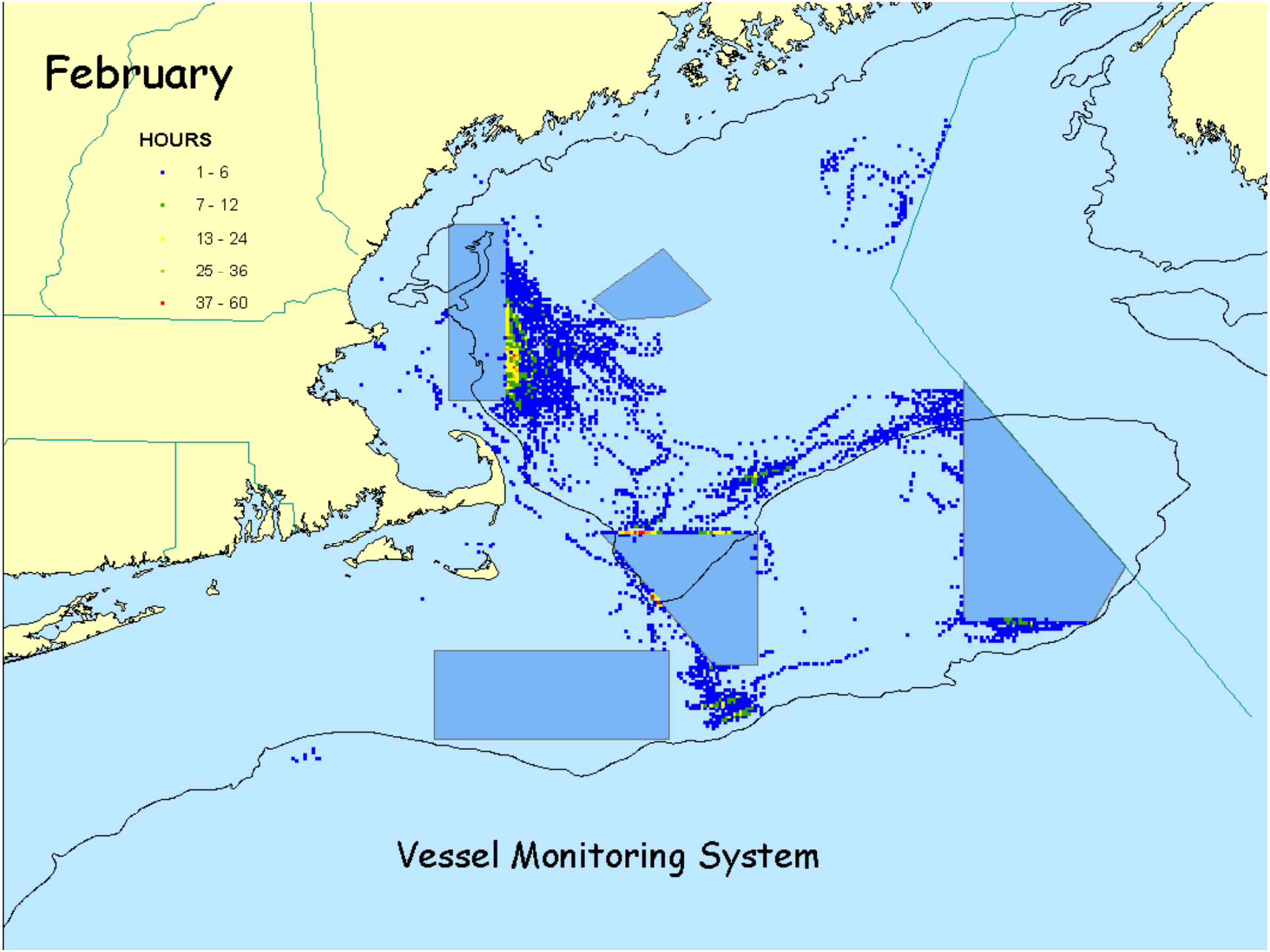
February
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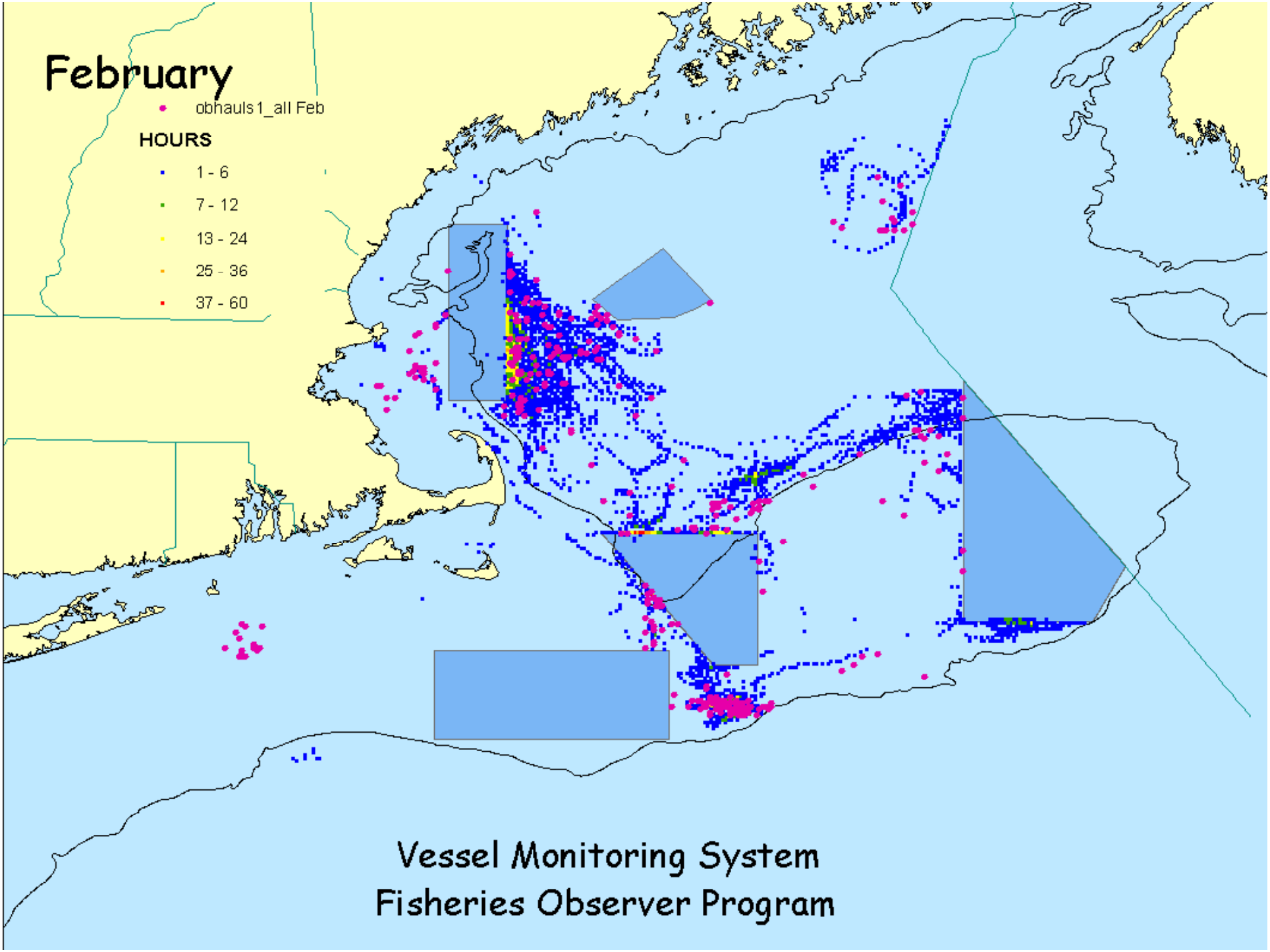
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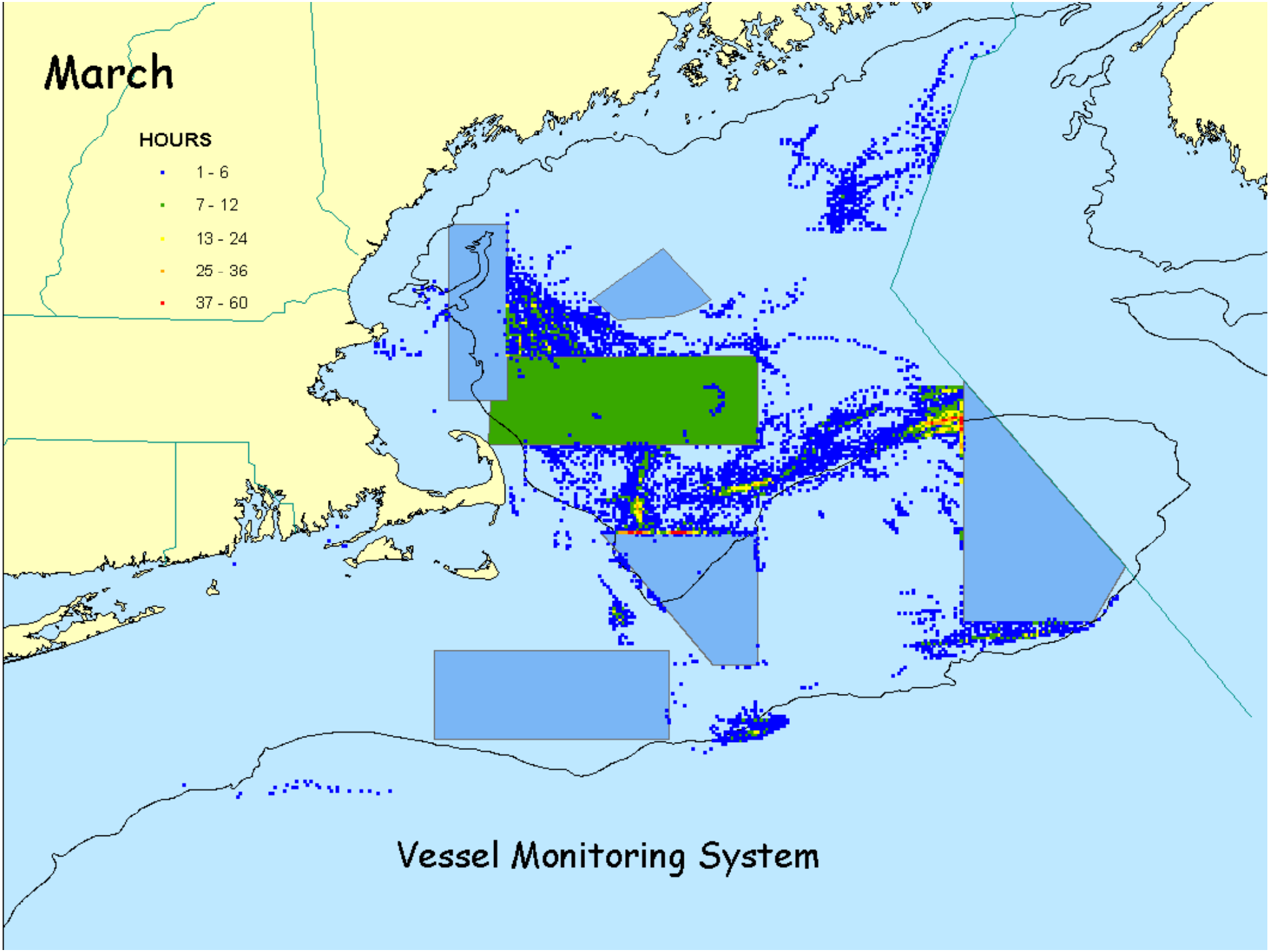
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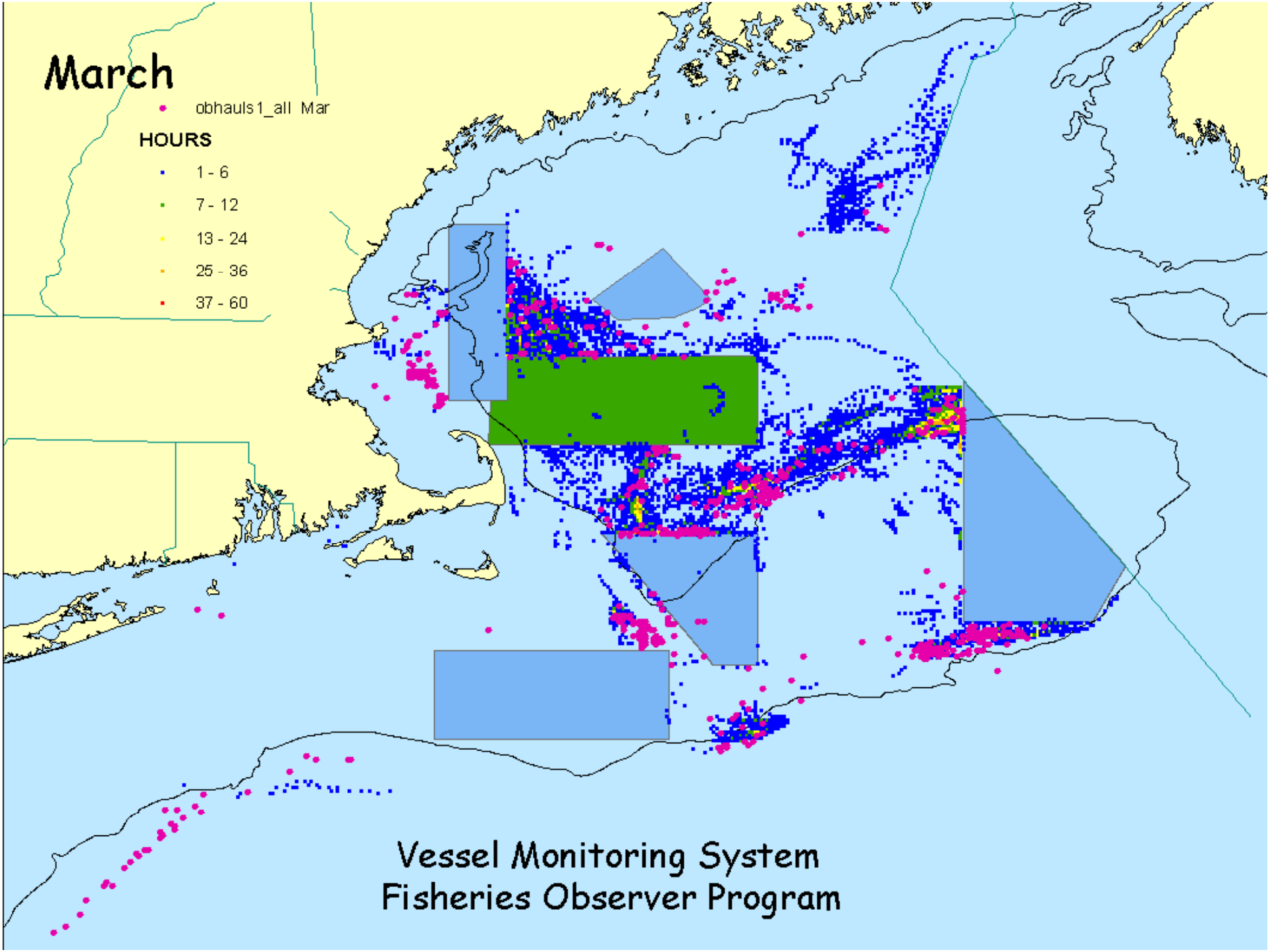
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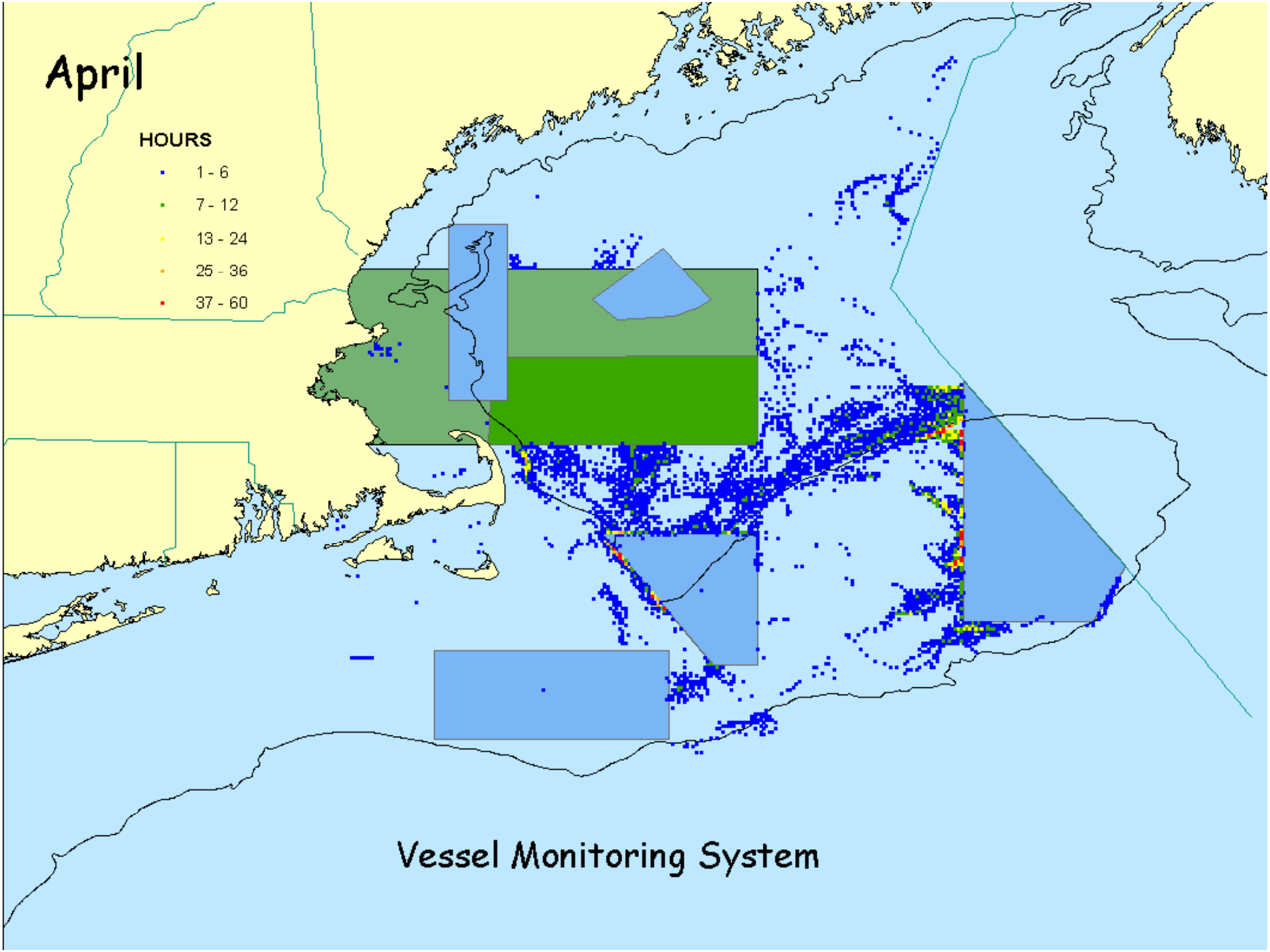
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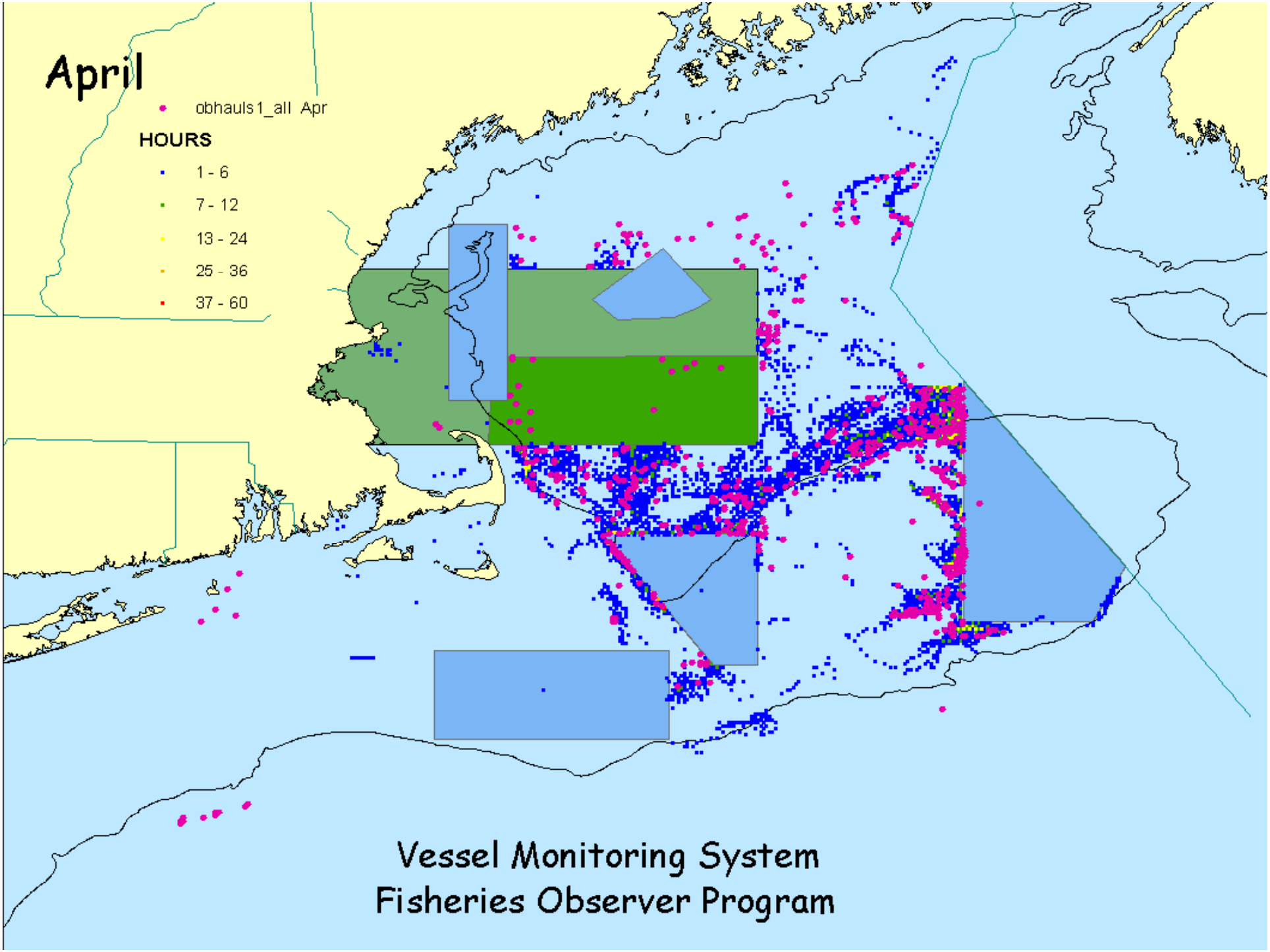
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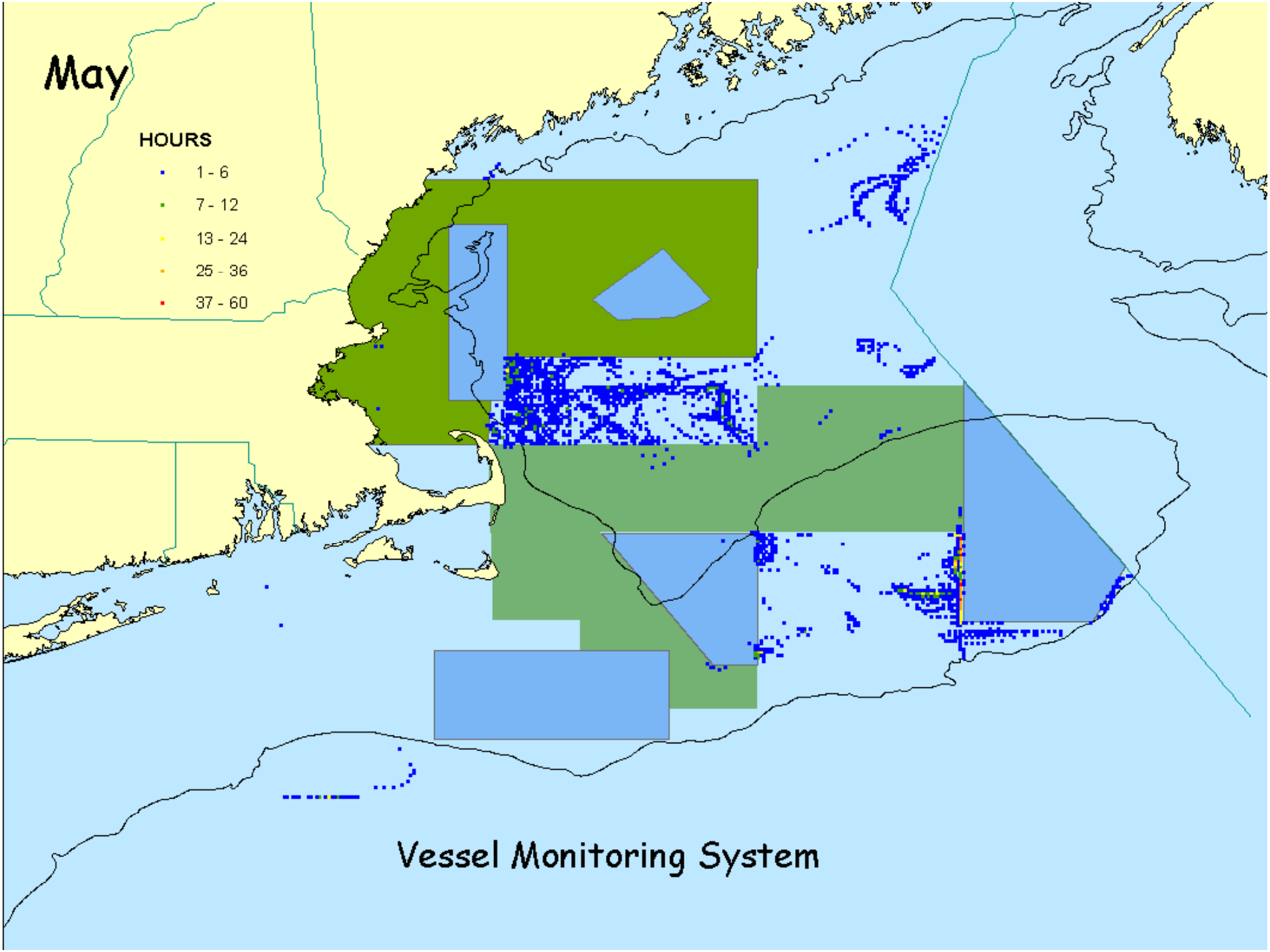
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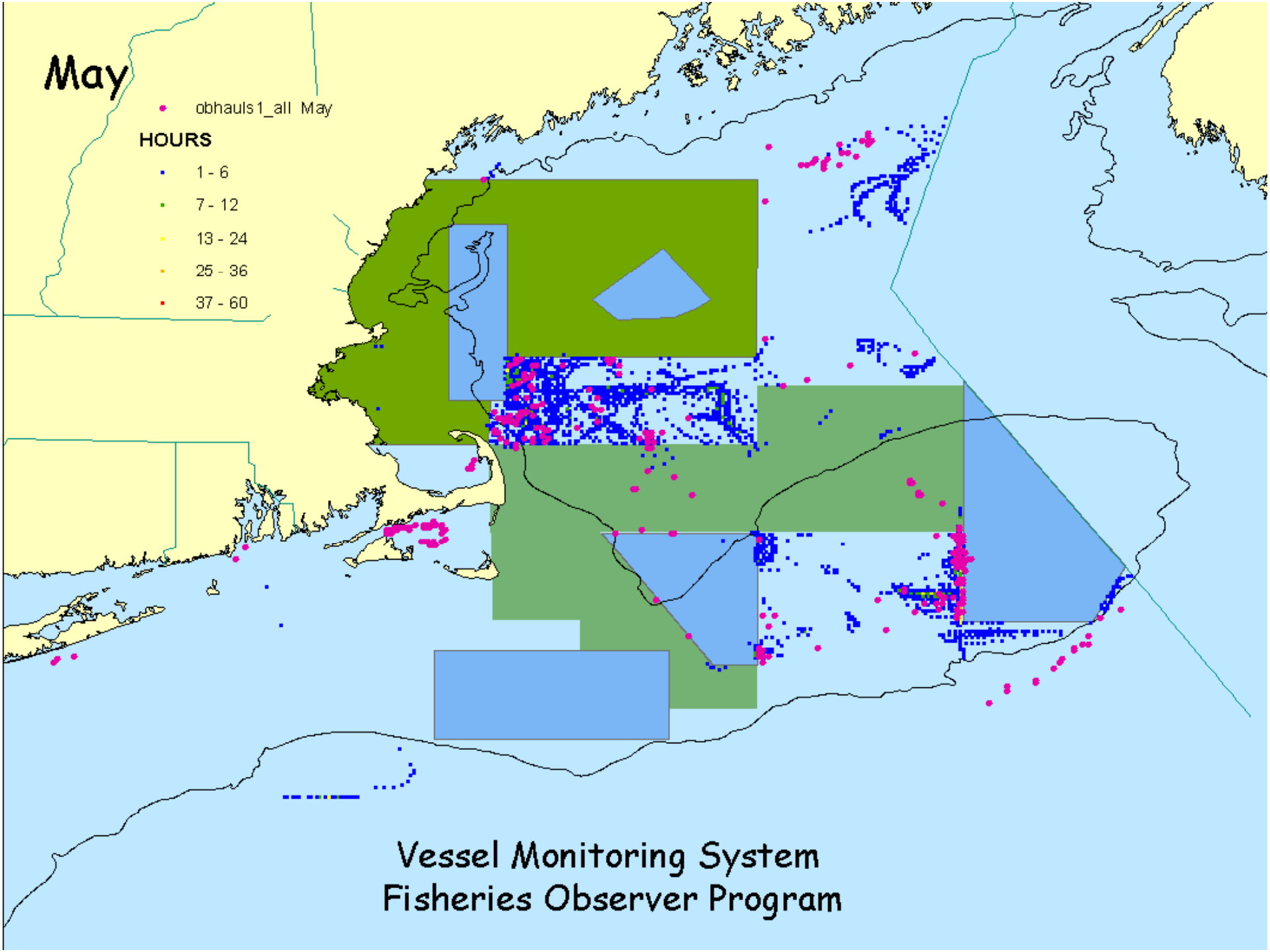
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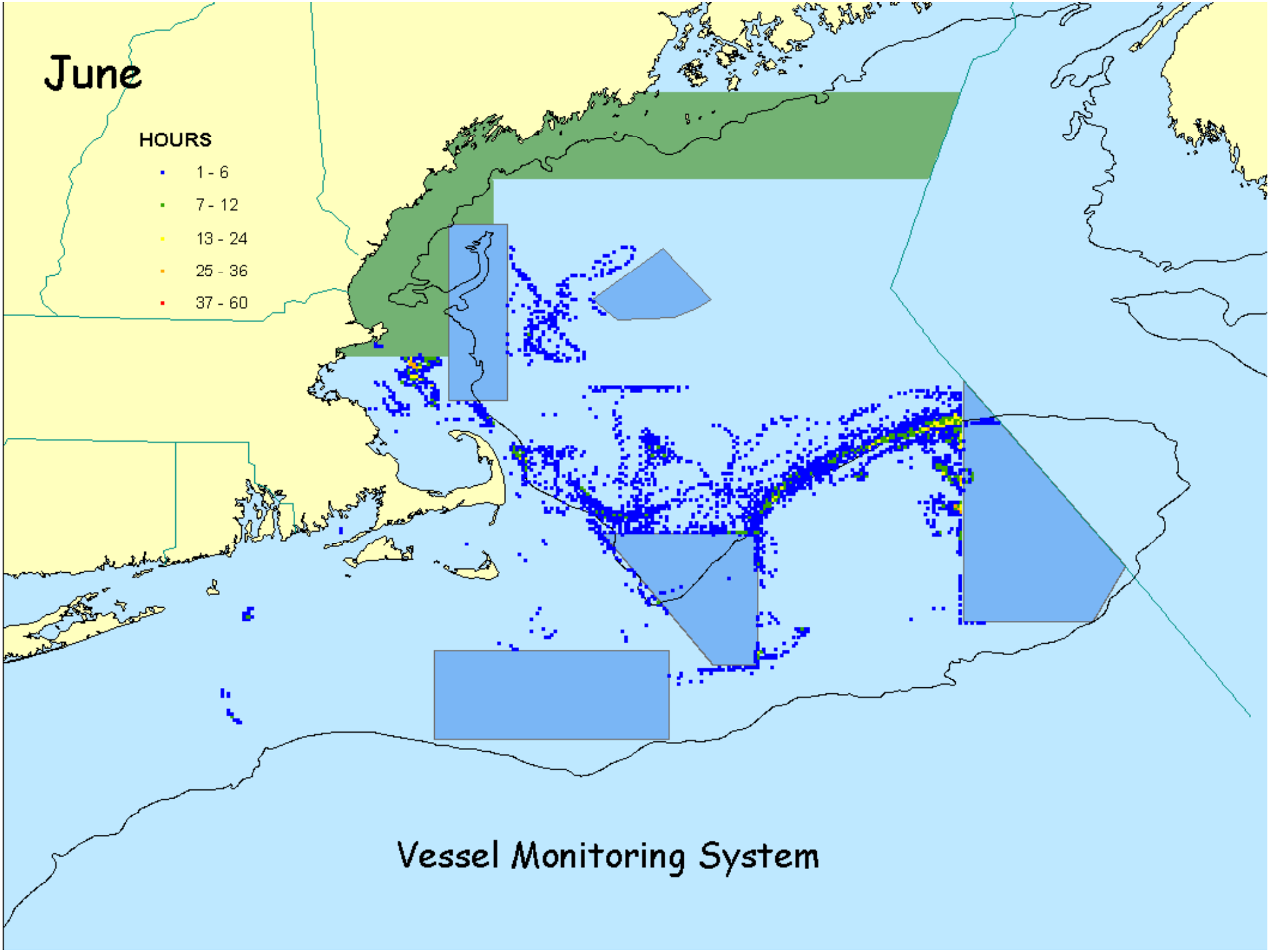
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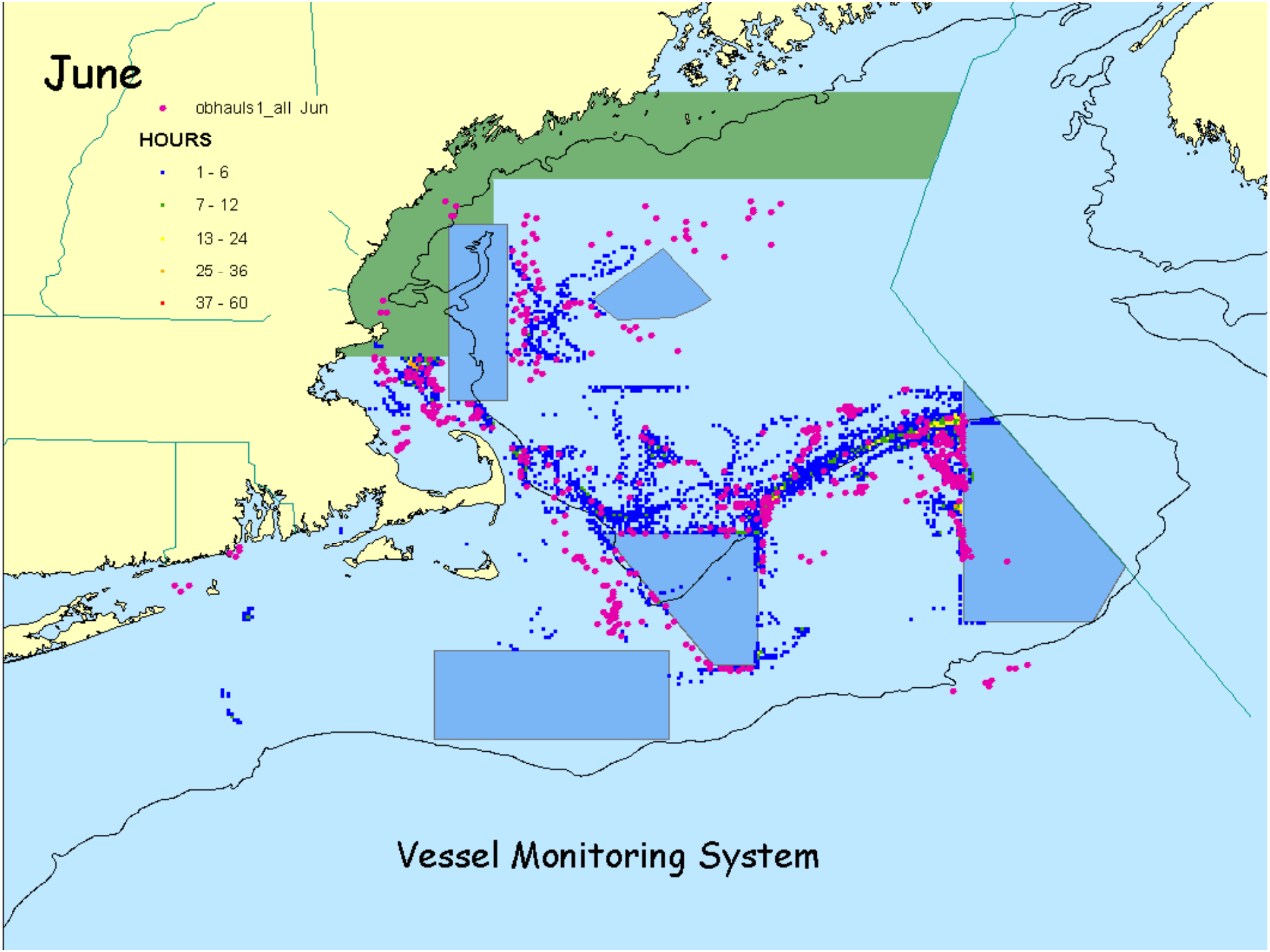
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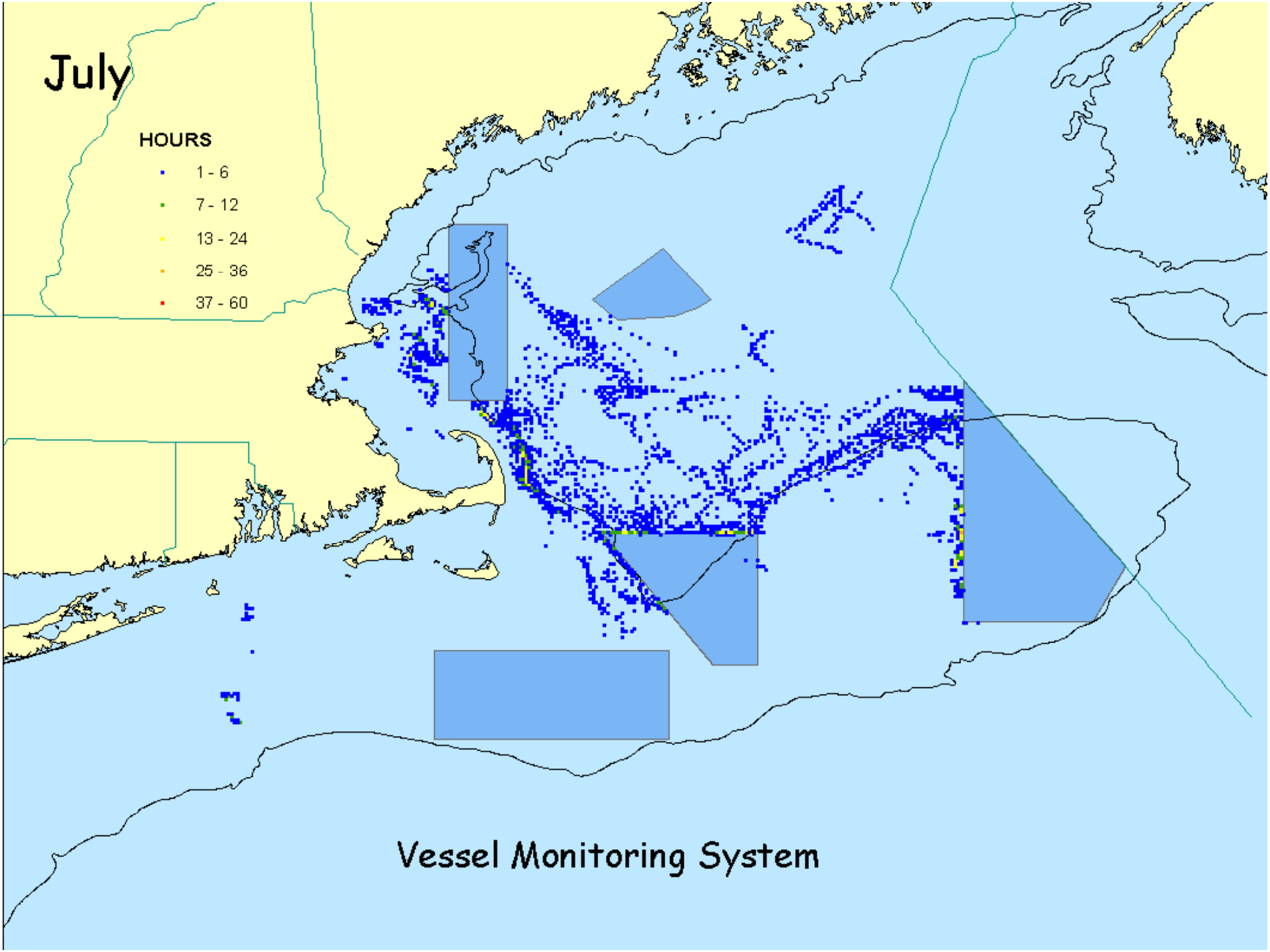
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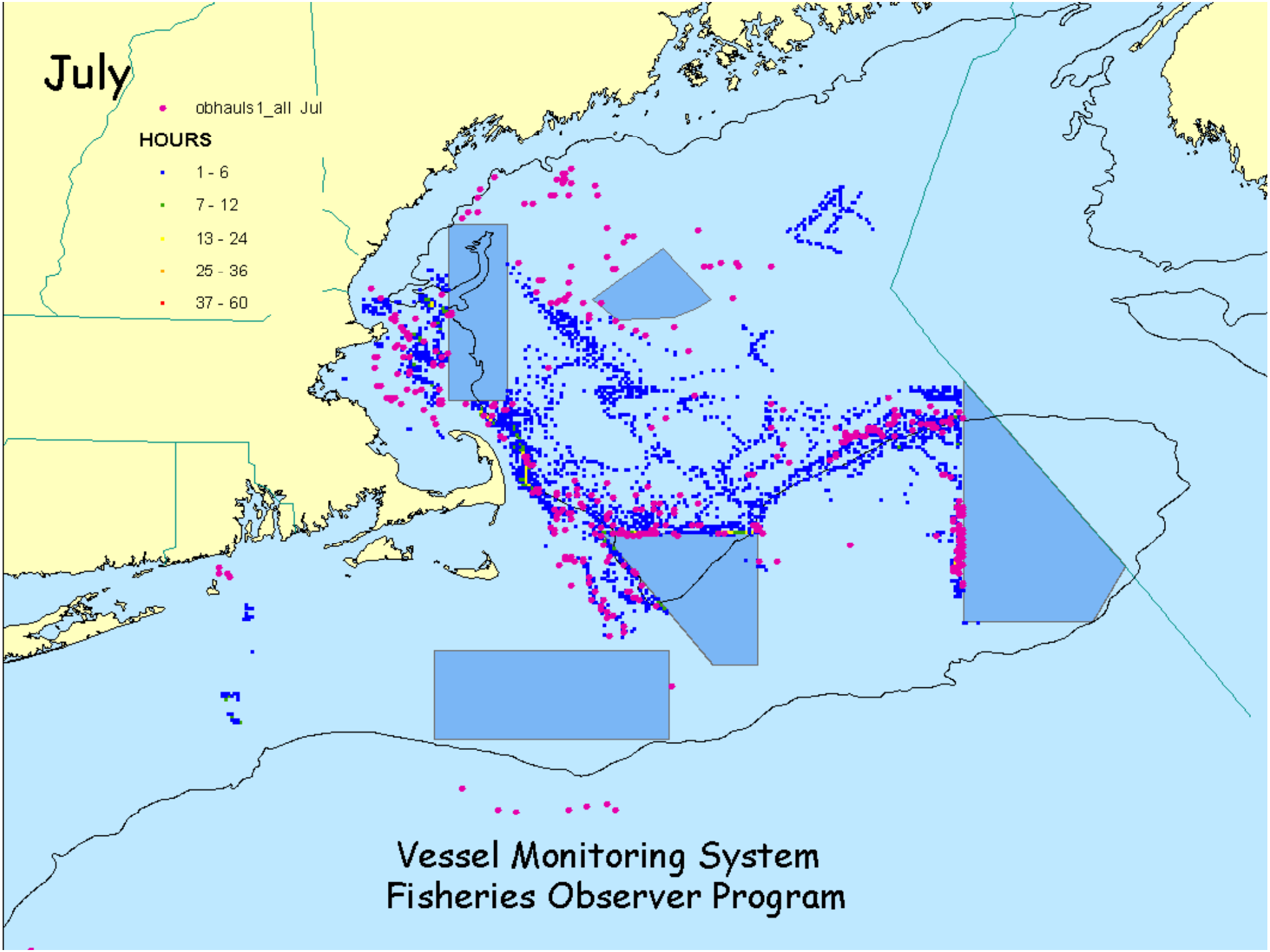
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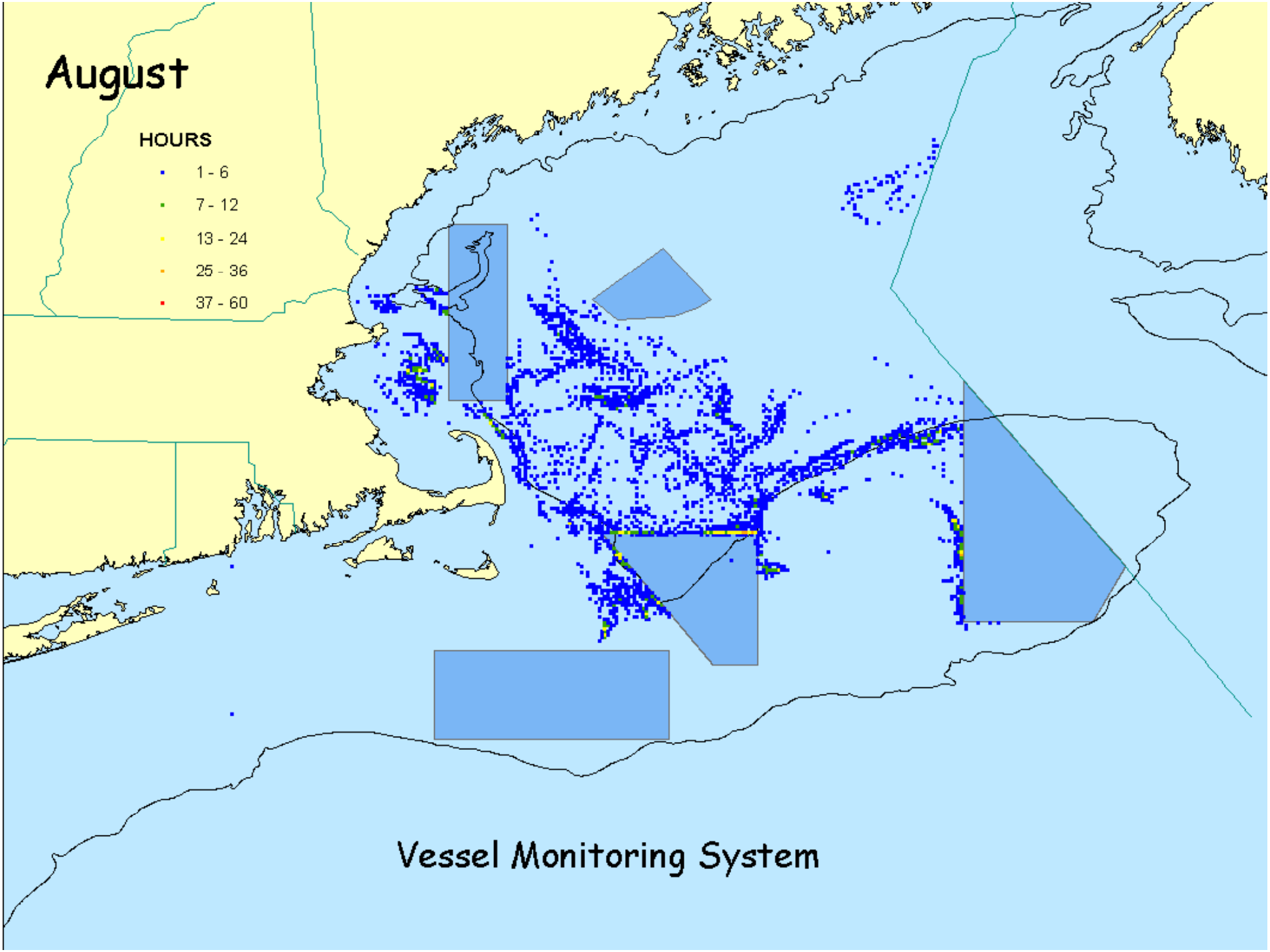
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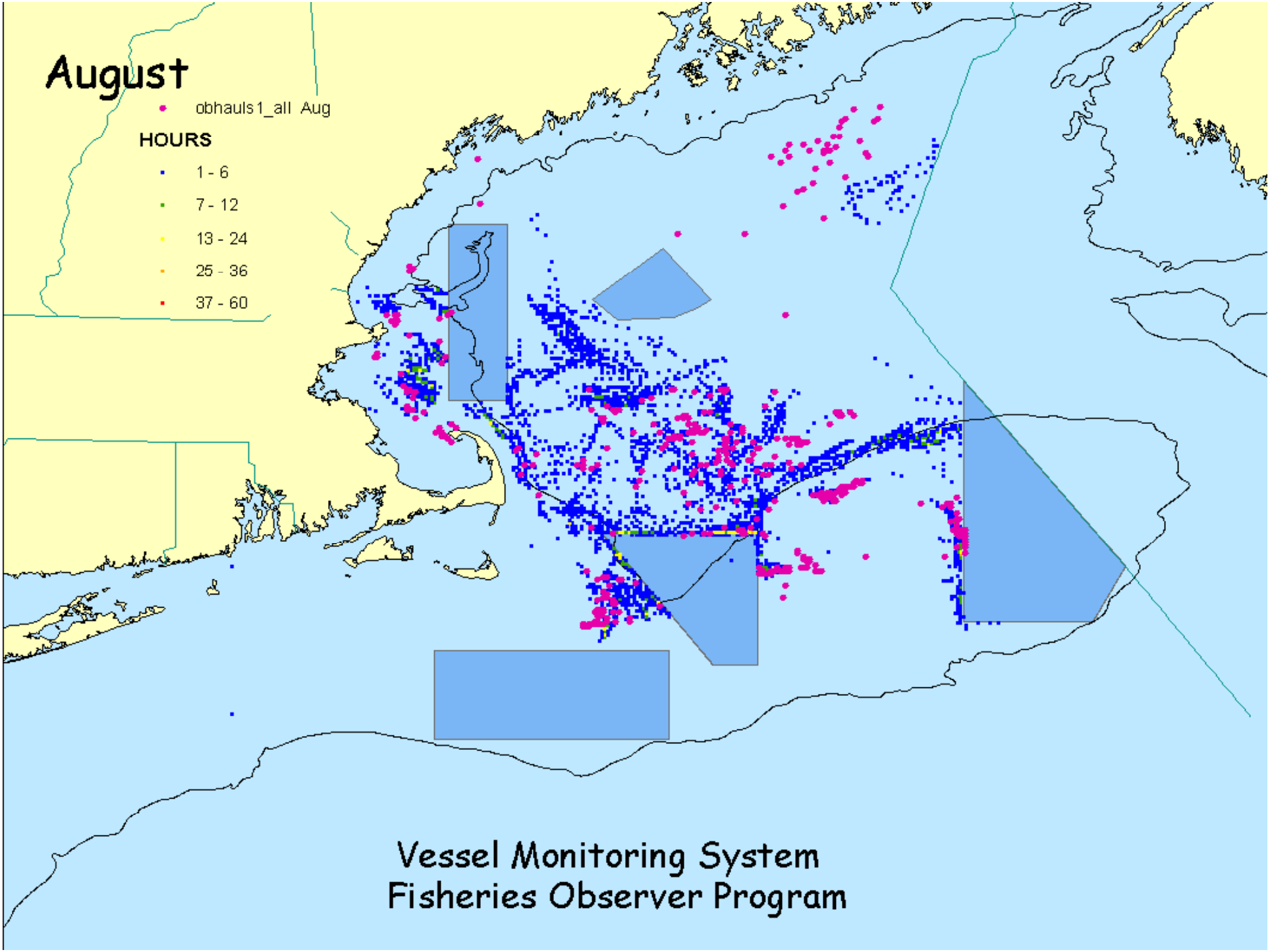
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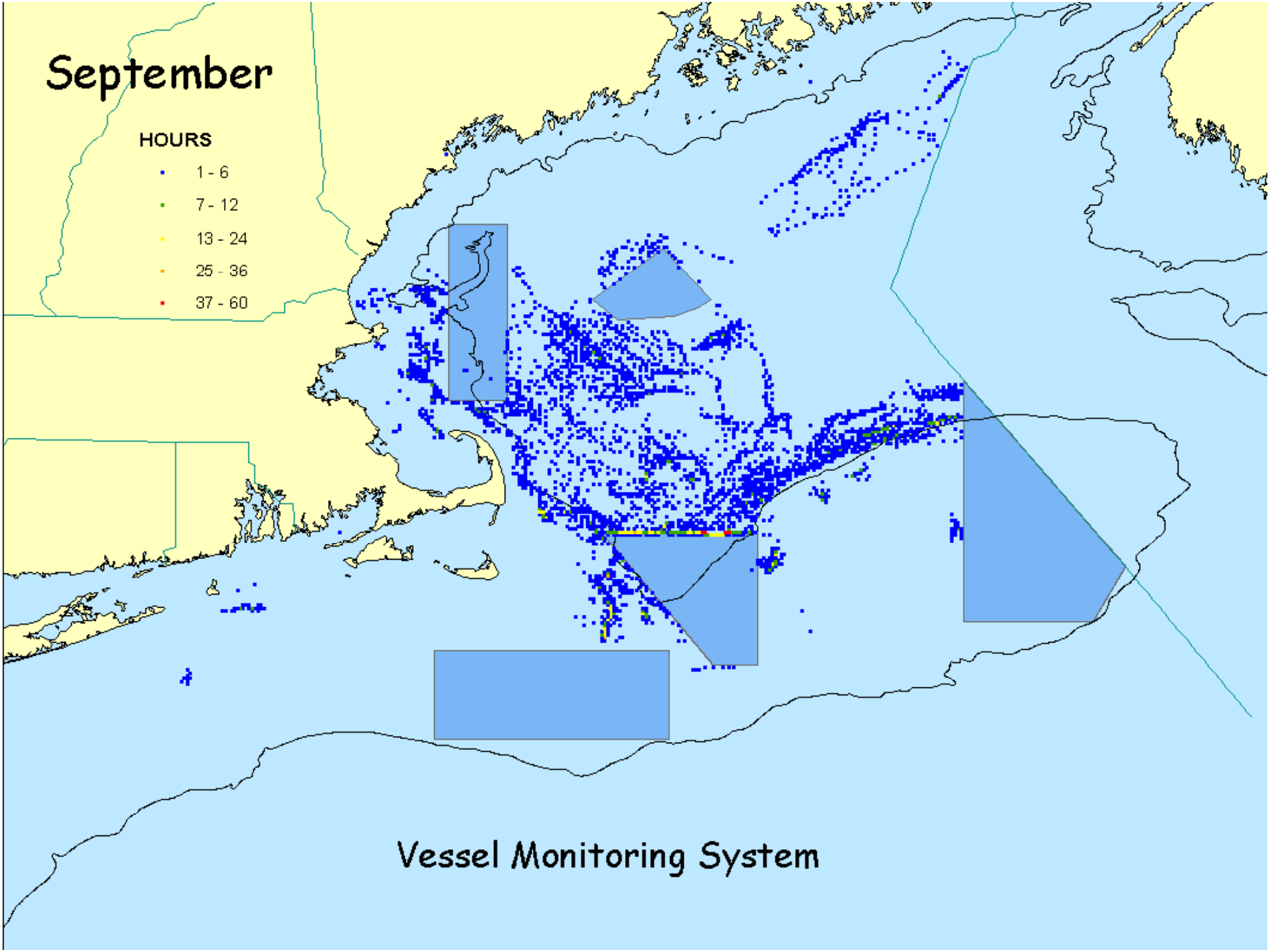
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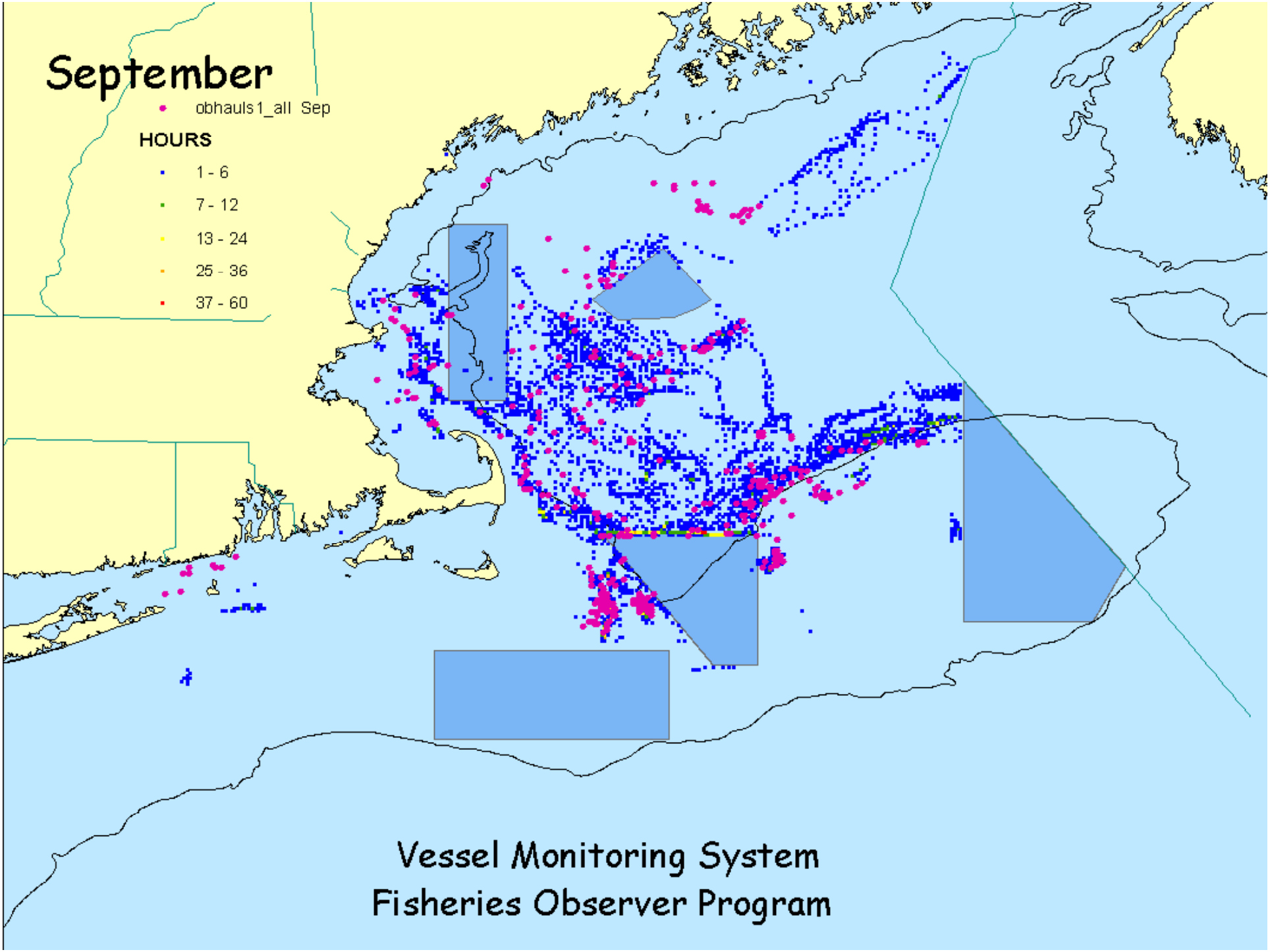
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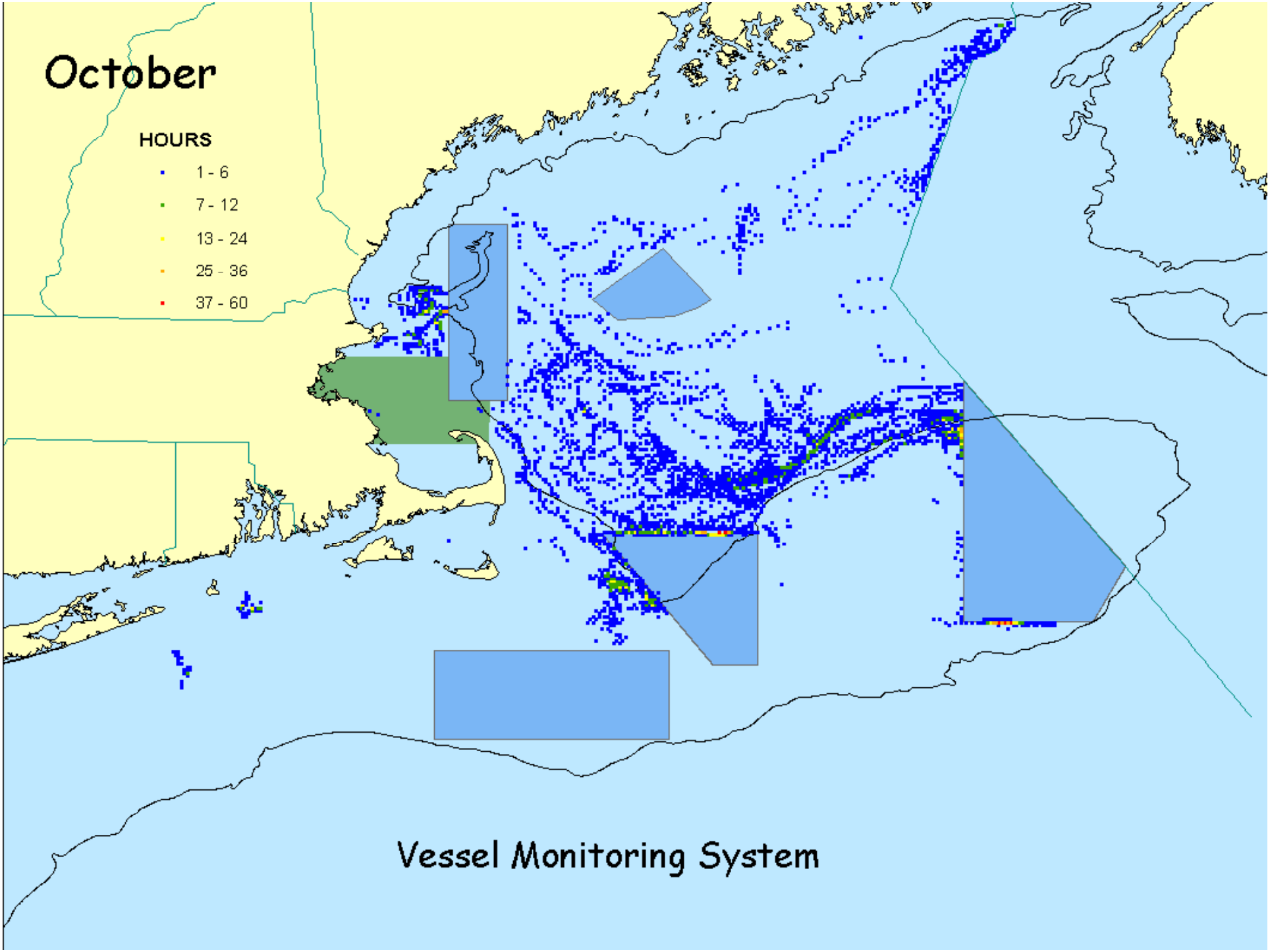
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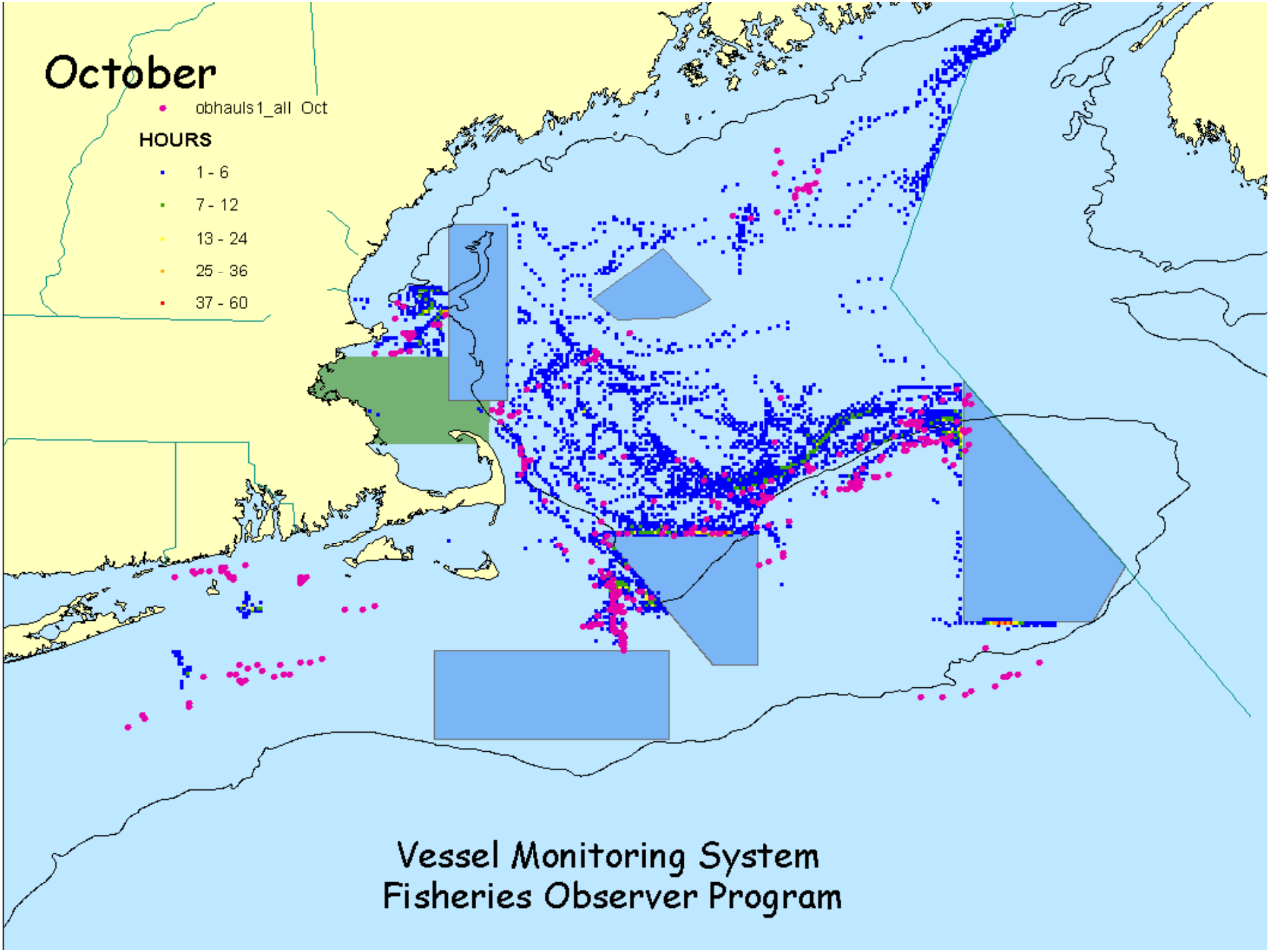
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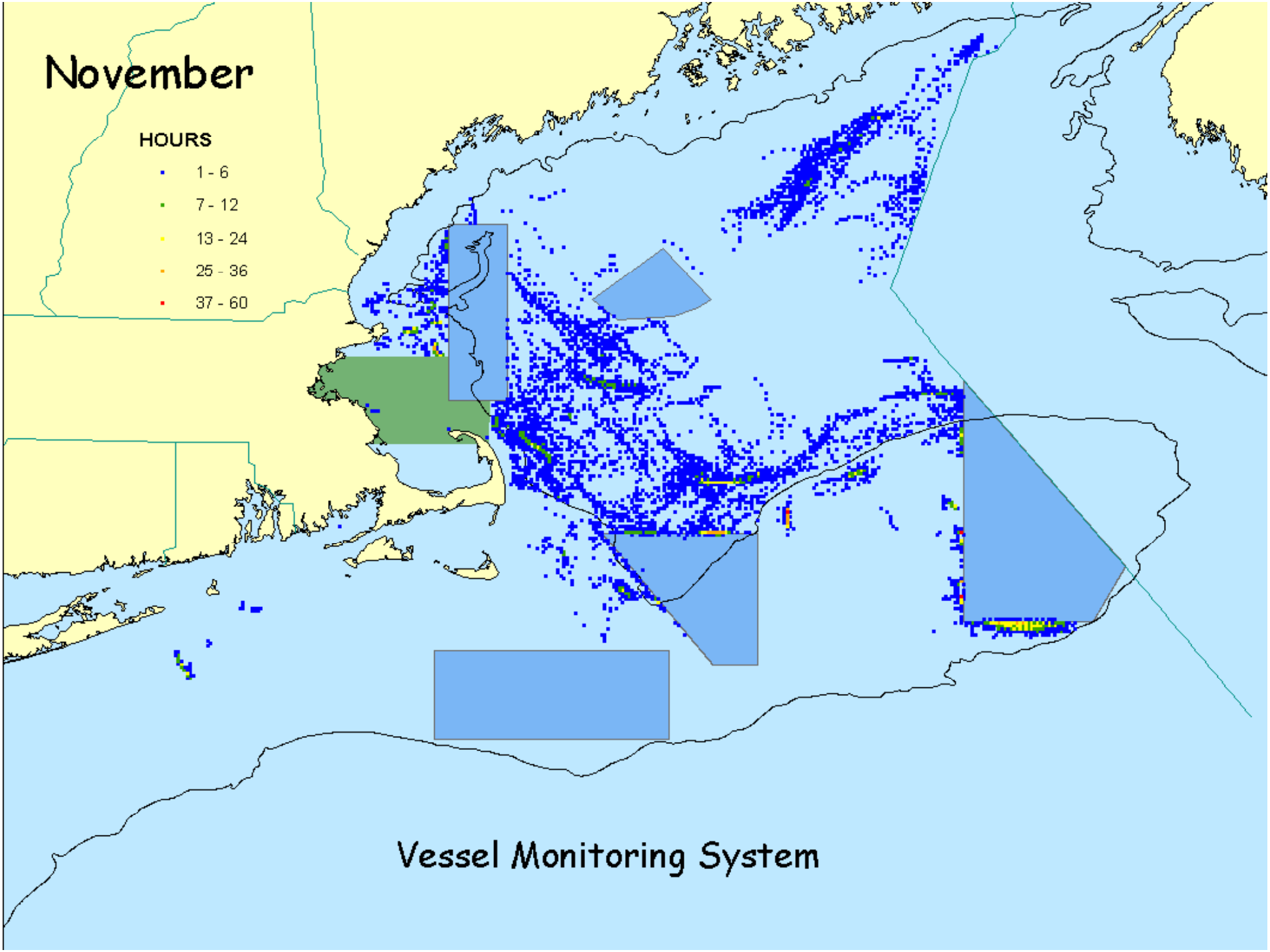
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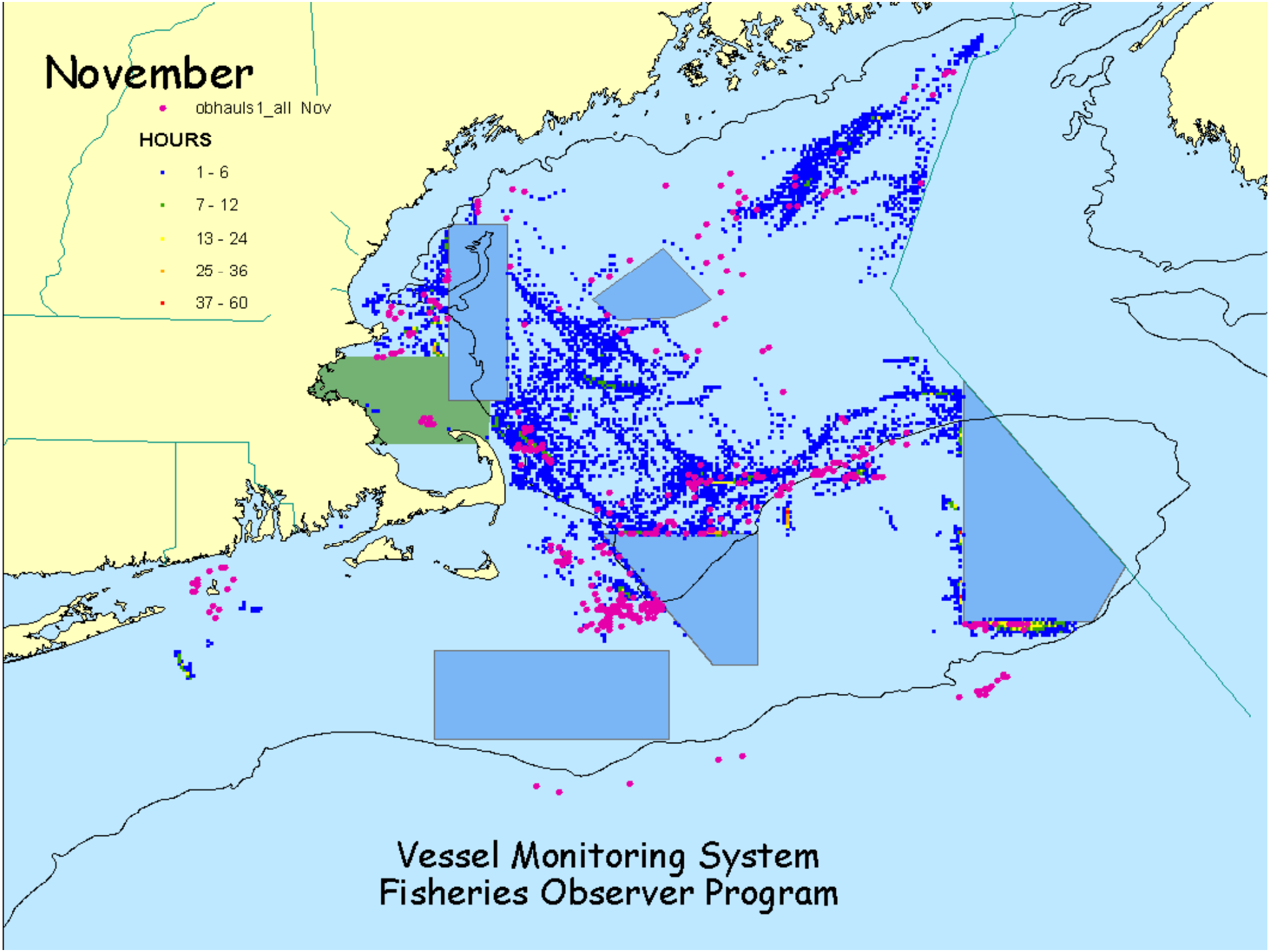
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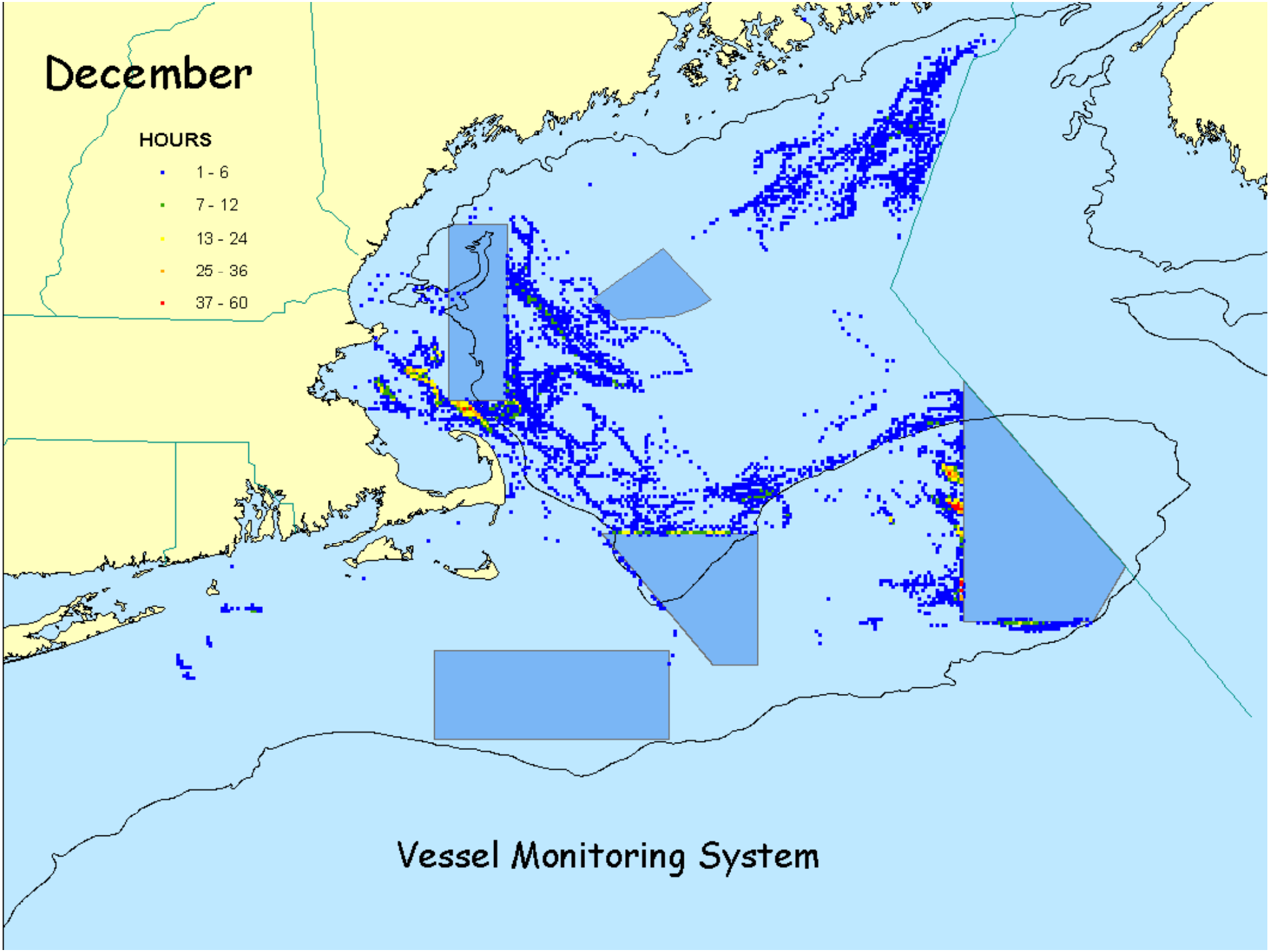
December
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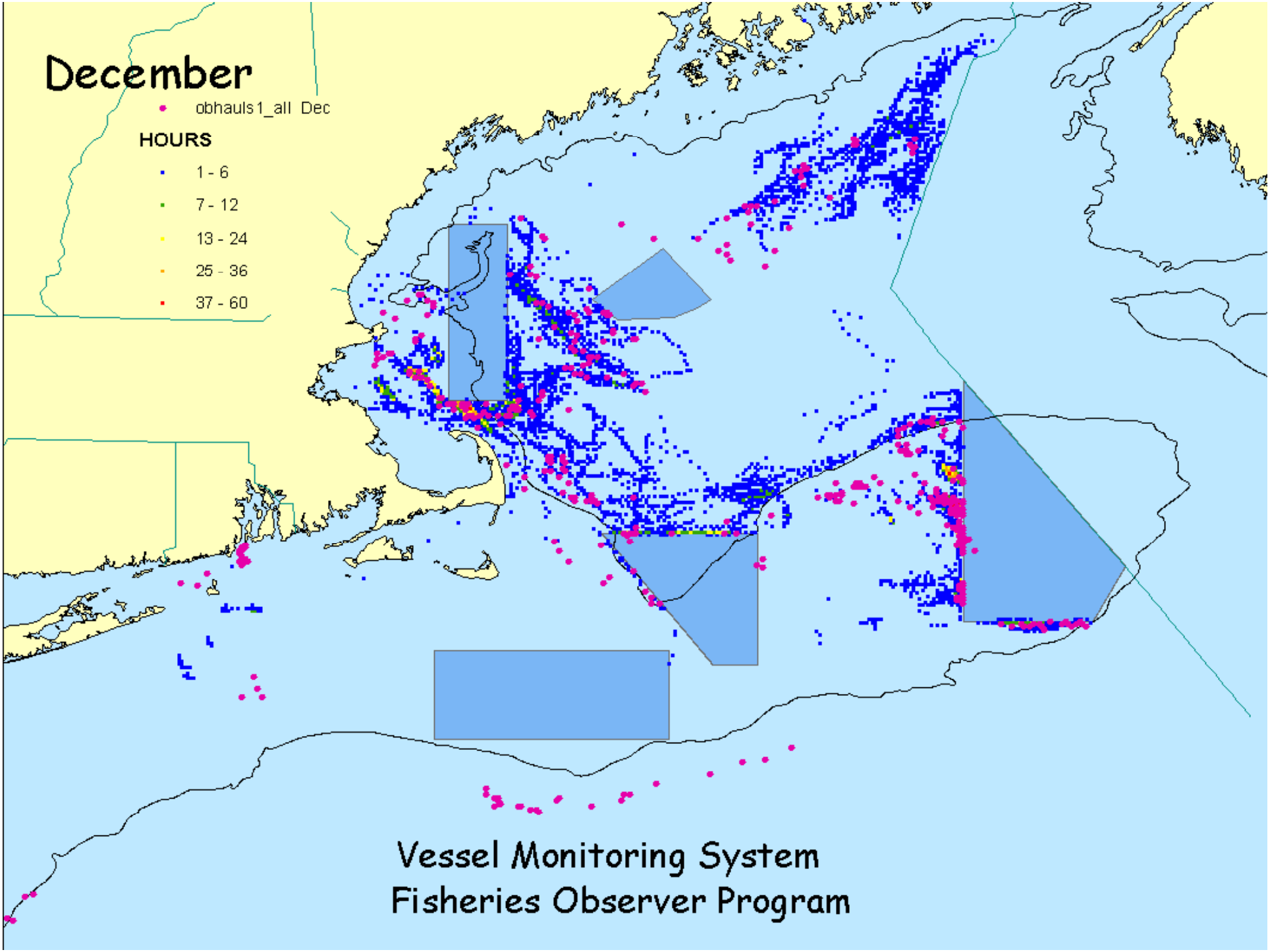
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obhauls1_all Dec
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Fisheries Observer Program

End

- *"life does not stand still while specialists put their minds in order"*

  Michael Graham, 1950.

  Address to United Nations