Challenges and opportunities for seasonal-scale forecasts for fisheries in the Gulf of Maine

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Predictive Capabilities Workshop
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Outline

• Point 1: Global
• Point 2: Gulf of Maine
• Point 3: Cod
• Point 4: Lobsters

• Acknowledgements
  • NSF Coastal SEES
    – NMFS, NOAA for data
    – Kathy Mills, Nick Record, Christina Hernandez

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The world is changing.
Don’t ignore it.
Gulf of Maine SST

- Optimally interpolated AVHRR (i.e. Reynolds et al. 2007) averaged over the Gulf of Maine
Gulf of Maine SST

• Global average: $0.01^\circ \text{ yr}^{-1}$
Gulf of Maine SST

Global average: 0.01° yr\(^{-1}\)

SST Anomaly

1980 1985 1990

0.03° yr\(^{-1}\), \(r^2=0.15\)

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Gulf of Maine SST

Gulf of Maine SST Anomalies from 1981 to 2013 (relative to 1982–2011)

0.03° yr⁻¹, r²=0.15

0.23° yr⁻¹, r²=0.49

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Gulf of Maine SST Anomalies from 1981 to 2013 (relative to 1982–2011)

0.03° yr\(^{-1}\), \(r^2=0.15\)
Gulf of Maine SST

Gulf of Maine SST Anomalies from 1981 to 2013 (relative to 1982–2011)

Area (10^7 km^2)

-0.2 0 0.2

Trend (° yr^-1)

0.03° yr^-1, r^2=0.15

Year

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Gulf of Maine SST

Gulf of Maine is whacky. Motive and opportunity for prediction.
Cod and Temperature

Age 0 cod (1,000s)

1,000

10,000


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Cod and Temperature

Age 0 cod (1,000s)

1,000 10,000


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Cod and Temperature

Age 0 cod (1,000s)

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Cod and Temperature

![Graph showing cod and temperature over time.](image)
Lobsters and Temperature

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Lobsters and Temperature

![Graph showing lobster landings over months.](image)

- Black line represents 2012 data.
- Blue line represents 1982-2011 data.

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Lobsters and Temperature

Lobster Landings Phenology vs. Temperature

Change in Start of Lobster Season (days)

April Temperature Anomaly (°C)

D = -9.4 T + 1.5
r² = 0.61, p < 0.01

Predicted

2012

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Lobsters and Temperature

- Predict uptick in lobster landings using April temperatures.
- Will begin issuing forecasts in March.
- Goal is January 22, 2015.

**Lobster Landings Phenology vs. Temperature**

Change in Start of Lobster Season (days)

- $D = -9.4T + 1.5$
- $r^2 = 0.61$, $p < 0.01$

April Temperature Anomaly (°C)
Conclusions

- World is changing, don’t look back
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• World is changing, don’t look back
• Gulf of Maine can and is changing quickly
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• Lobsters—>phenology (timing) is relatively easy
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Conclusions

• World is changing, don’t look back
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Start going boldly