RI Winter Flounder Studies

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SNE Stock Assessment – Model & Data Overview

Assessment Overview

- Most recent peer reviewed assessment for winter flounder occurred at the 52nd Stock Assessment Workshop at the NEFSC, Woods Hole, MA, June 6- 10, 2011

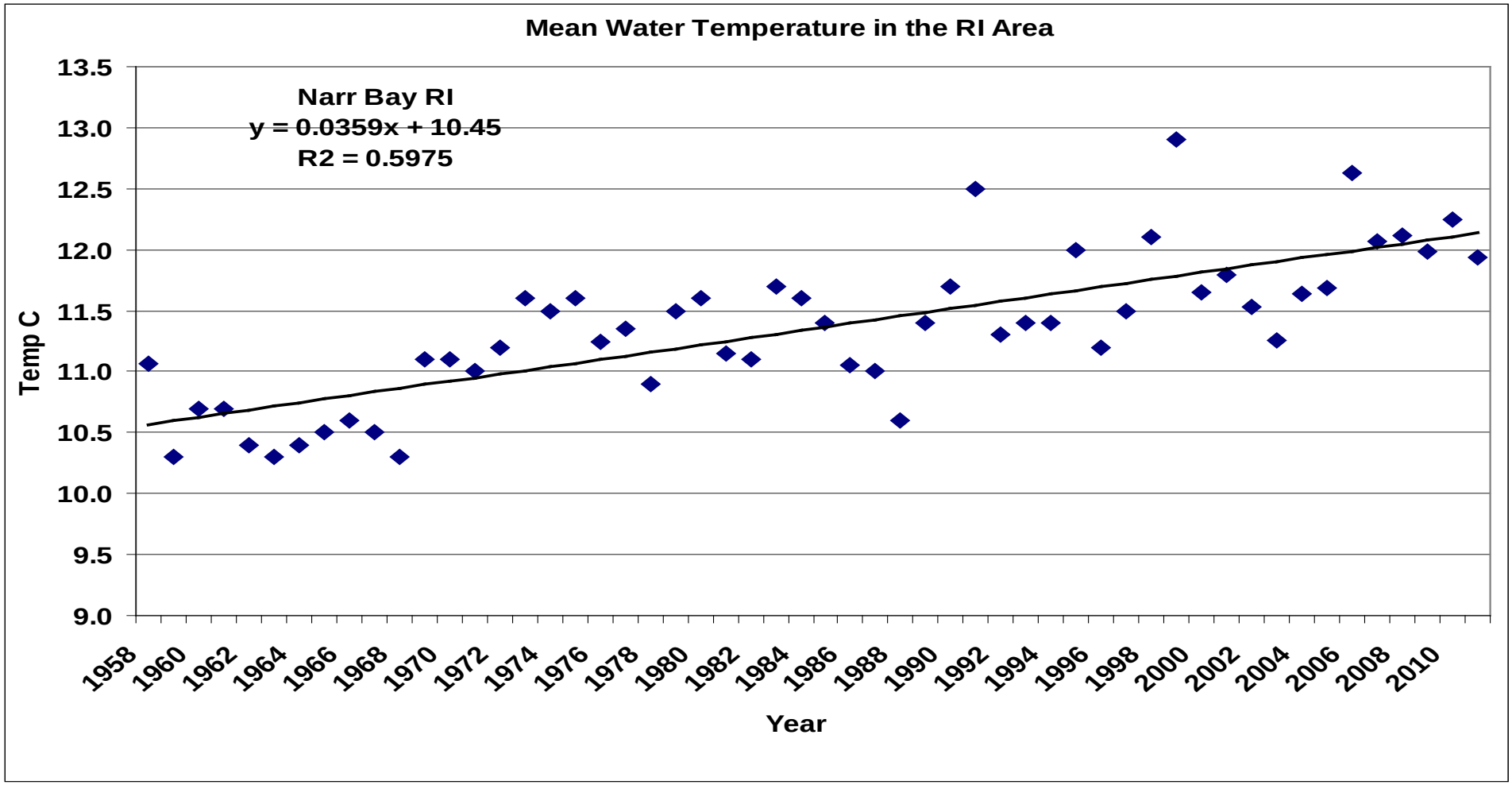
- Fishing mortality (F) & stock biomass B) estimates were generated using Statistical Catch at Age Model (ASAP), F_{MSY}, SSB_{MSY}, and MSY calculated with a stock recruitment model.

- Natural mortality (M) value was increased from 0.2 to 0.3 for all years and ages.

- Based on the stock recruitment model, warm winter temperatures are suggested to have a negative effect on recruitment of SNE/MA winter flounder.

Local RI Stock Assessment

- Analyze stock status on smaller spatial scale than SNE - MA
- Incorporate historical data to extend view back in time
- Incorporate climate change in the population dynamics
- Estimate biological reference points and evaluate rebuilding potential

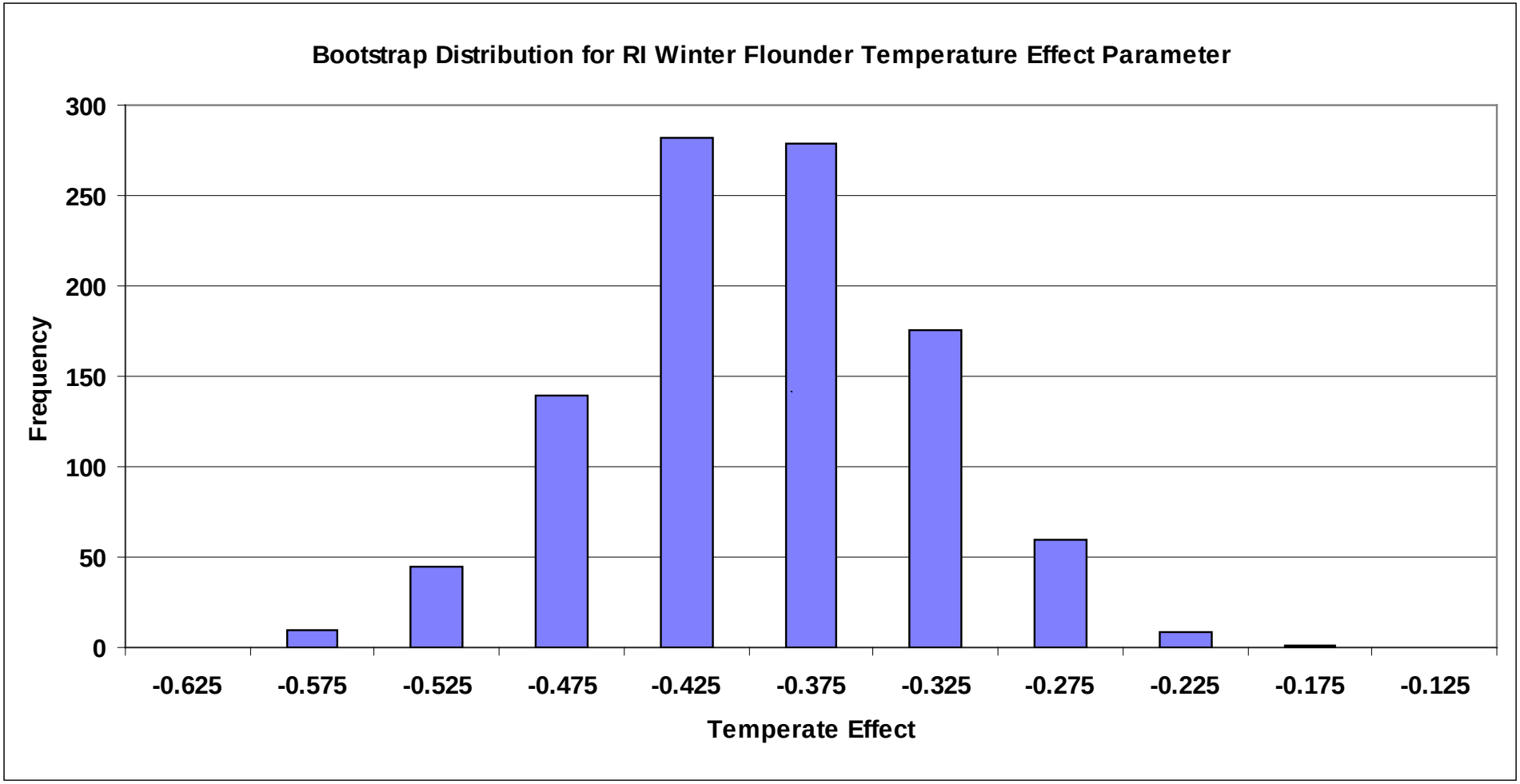

Mean Water Temperature in the RI Area
Narr Bay RI
y = 0.0359x + 10.45
R2 = 0.5975
Temp C
13.5
13.0
12.5
12.0
11.5
11.0
10.5
10.0
9.5
9.0
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
Year

Climate Dependent Biomass Dynamic Model

- Formulate intrinsic rate of increase (r) as a function of water temperature.

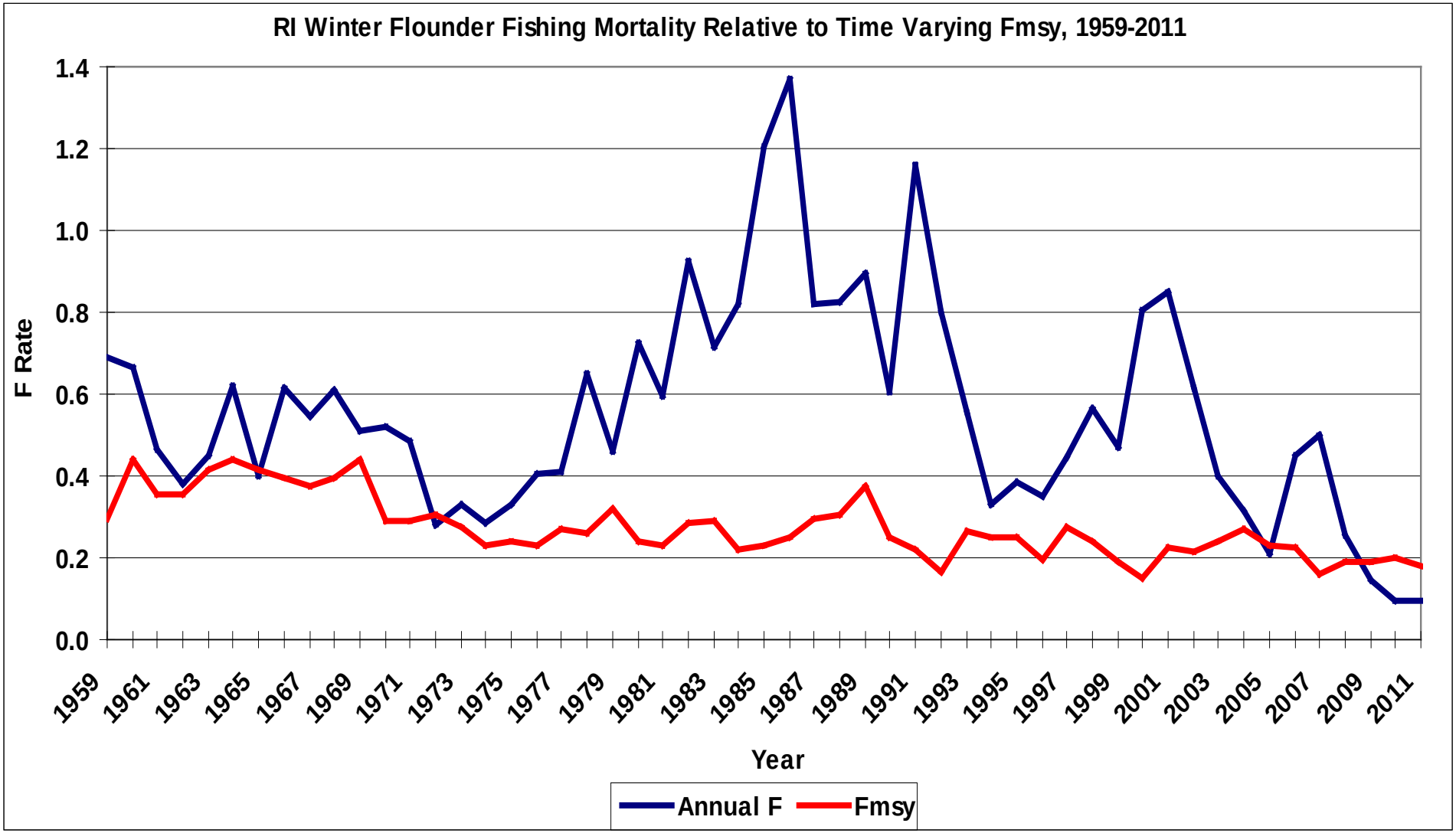
- $r_t = r_0 \exp(c*T_t)$

- r_0= base intrinsic rate
- T= temperature deviation from mean
- c= temperature parameter
- t= year.


Bootstrap Distribution for RI Winter Flounder Temperature Effect Parameter
Frequency
300
250
200
150
100
50
0
-0.625
-0.575
-0.525
-0.475
-0.425
-0.375
-0.325
-0.275
-0.225
-0.175
-0.125
Temperate Effect

Supporting Information for Temperature

- Jeffries and Terceiro (1985)- Recruitment inversely related to temperature.
- Buckley et al. (1990)- Eggs developing in females held in colder temperatures produced more robust larvae.
- Keller and Macphee (2000)- Larval survival higher in colder temperatures.
- DeLong et al. (2001) YOY mortality positively correlated with temperature.
- Taylor and Collie (2003)- Warmer temperatures enhances Crangon predation on settlers.
- Manderson et al. (2006)- Warmer temperatures and summer flounder predation on juveniles.
- Nye et al. (2009)- Northward distributional shift with warming temperatures.


RI Winter Flounder Fishing Mortality Relative to Time Varying Fmsy, 1959-2011
F Rate
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
Year
Annual F
Fmsy

Recommendations

- Standard TOR to evaluate candidate “change” models
- Assessment modeling approach capable of fitting suite of change models
- Formal model testing and evaluation (AIC)
- External supporting information for best model
- Model averaging if no clear winner or lack of external support.

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