Present and future dynamics of herring stocks in the Northwest Pacific in association with large-scale climate variability

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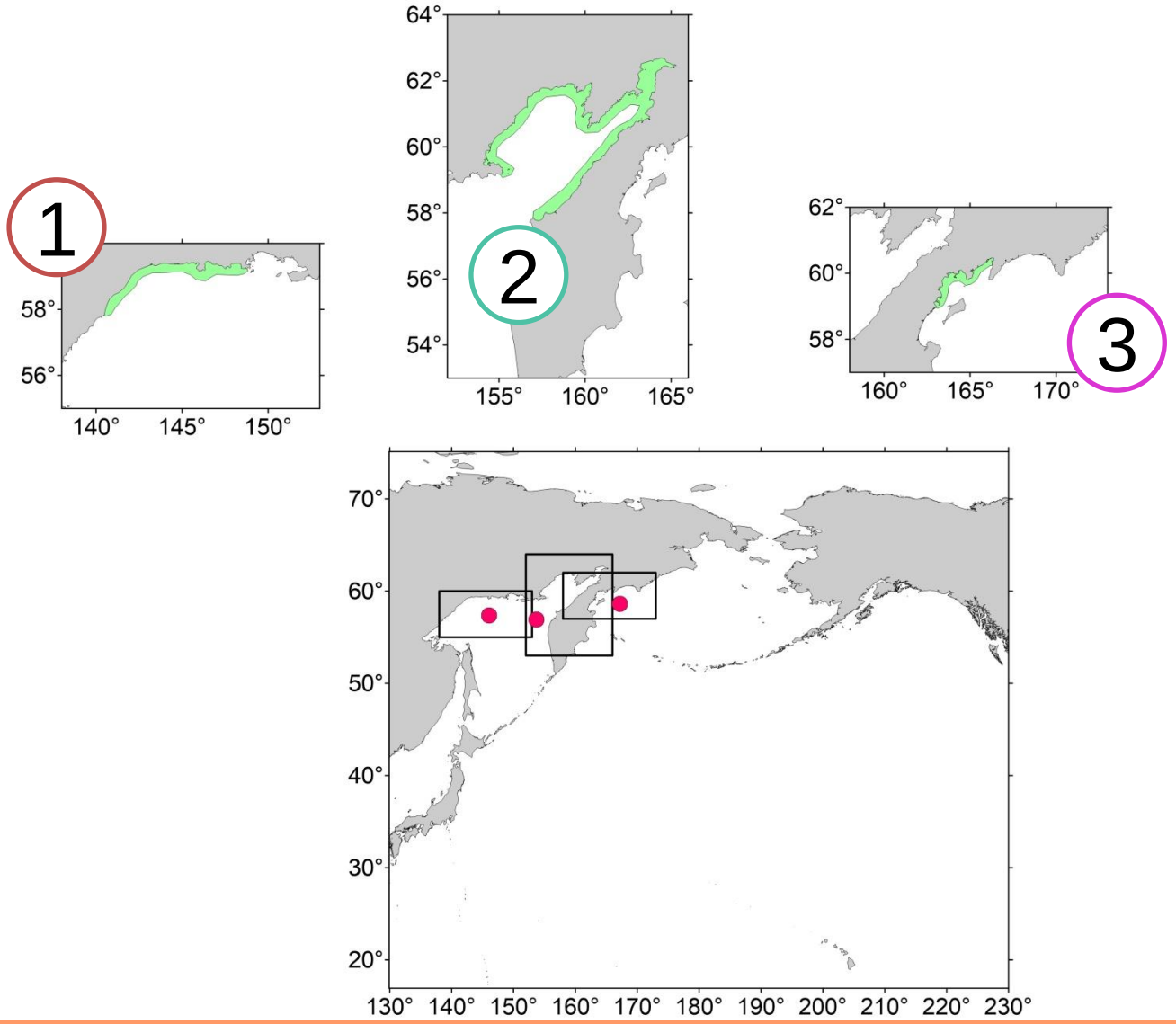
Outline

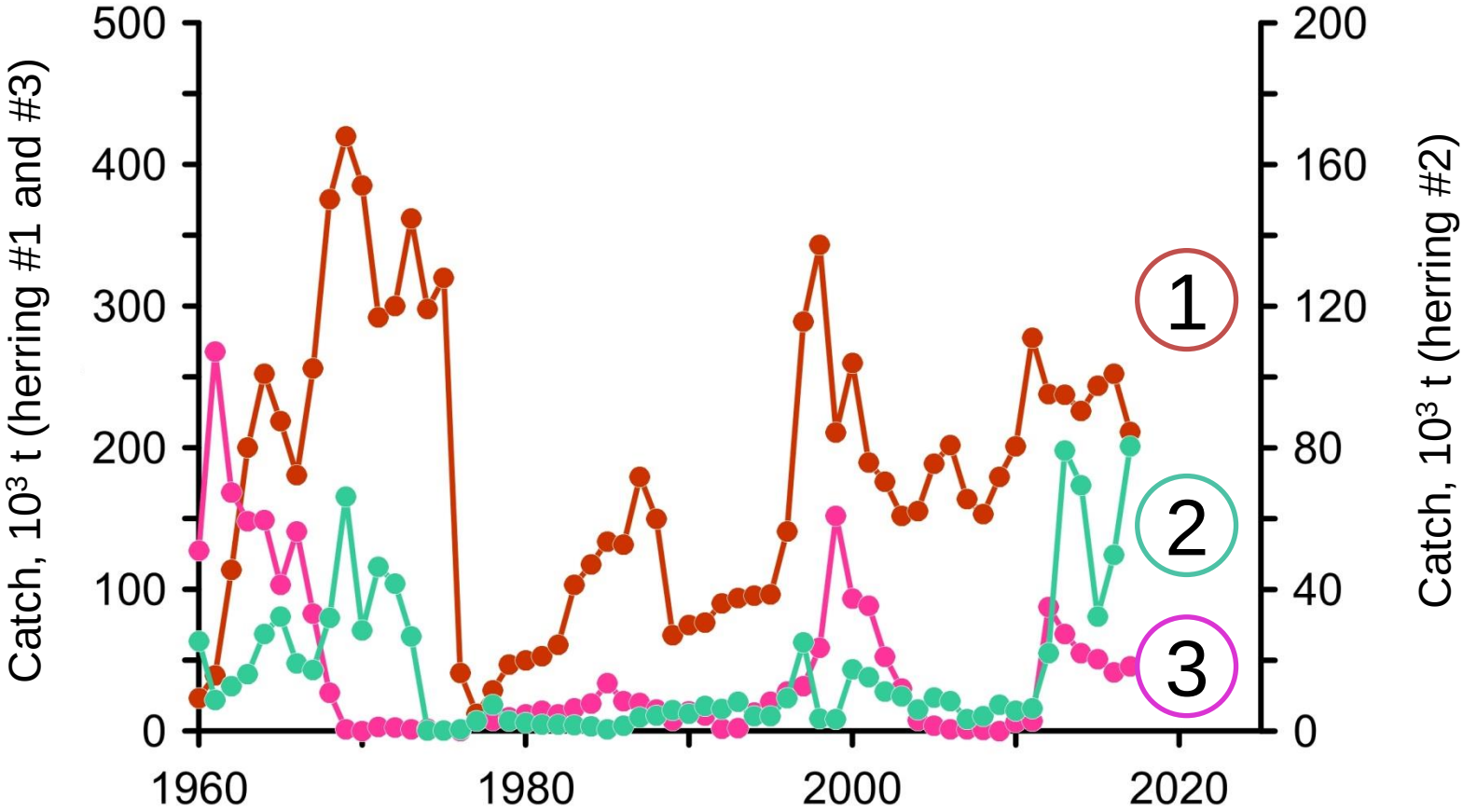
- Introduction and rational
- Data and methods
- Herring dynamics
- Connection to SST and atmospheric processes
- Conclusions

Introduction



Region of interest: spawning areas of three populations of herring

Introduction



Catch dynamics

Data and methods

- Herring catch for 1970-2017
- NOAA ERSST v 3b monthly data (1°×1°)

  hydrological Winter (JFMA) and spring (MJ)
- Geopotential height at 500 gPa (1°×1°)

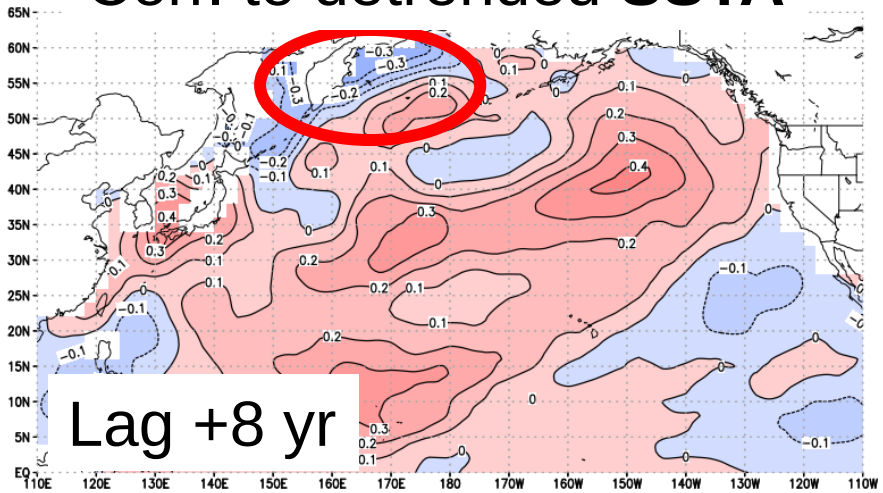
  Winter (DJF) and spring (MAM) data
- Correlation analysis
- EOF analysis of winter SST

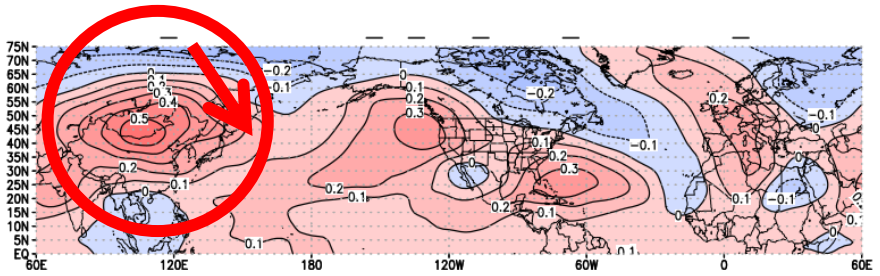
Results

Corr. to detrended **SSTA**

Corr. to H500-anomaly

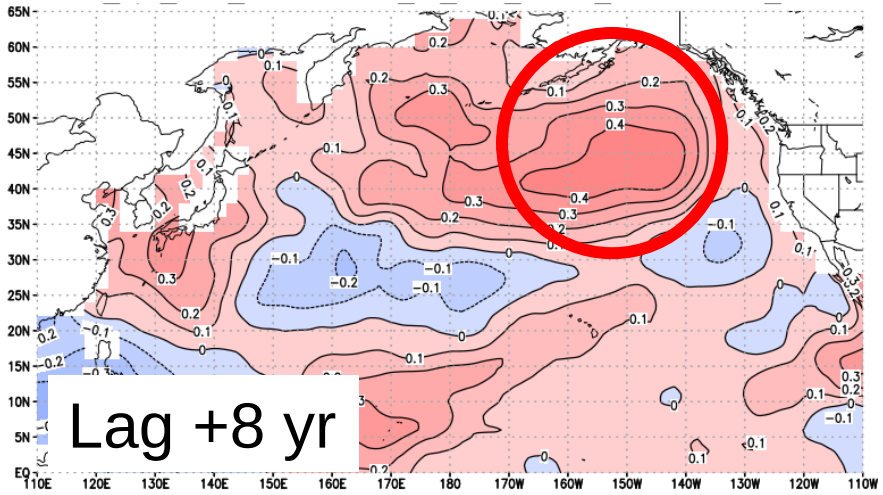
Winter

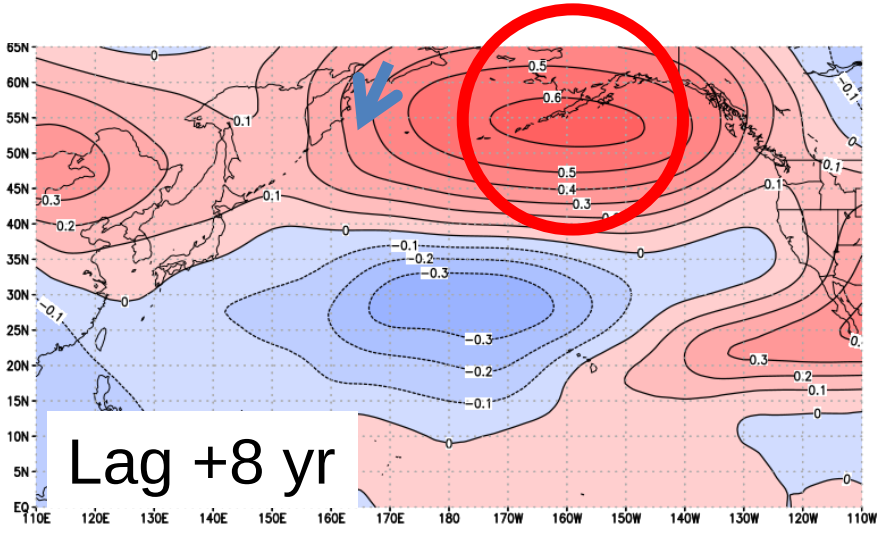




Lag +8 yr

Spring





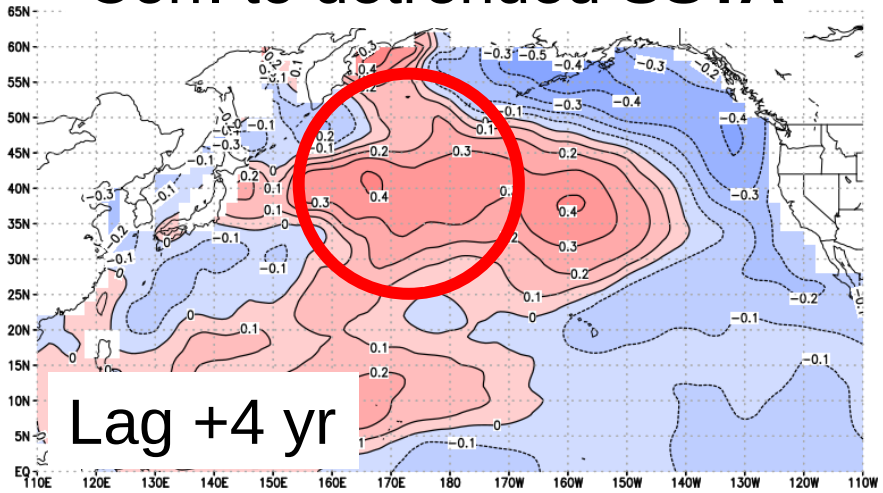
Okhotskaya (herring #1, N Sea of Okhotsk)

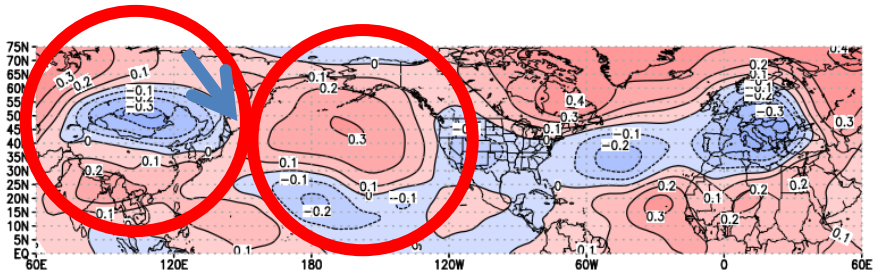
Results

Corr. to detrended **SSTA**

Corr. to **H500**-anomaly

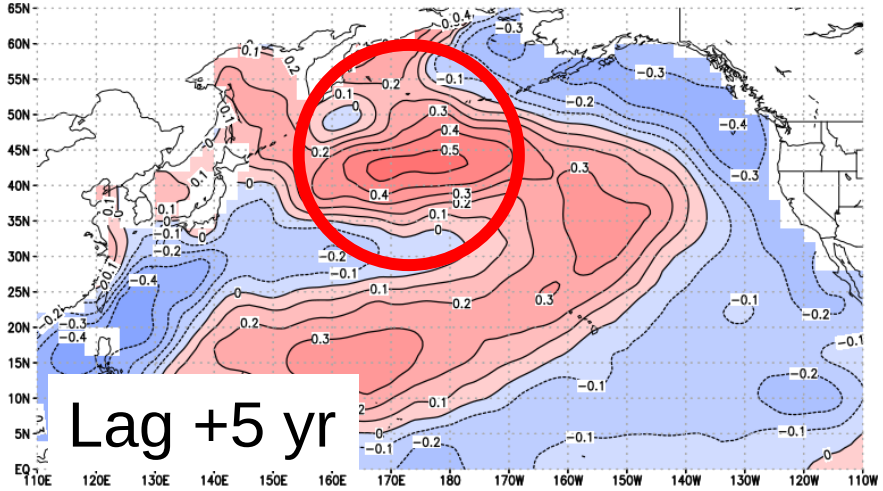
Winter

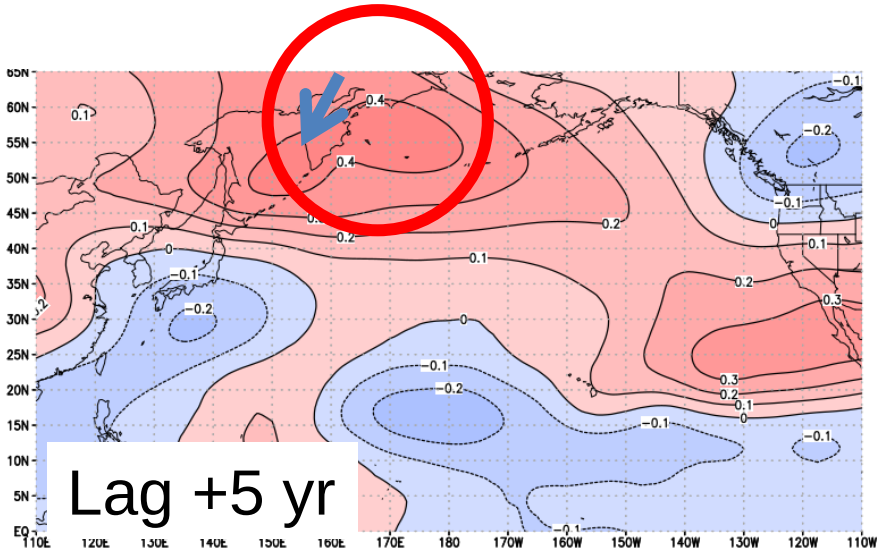




Lag +4 yr

Spring





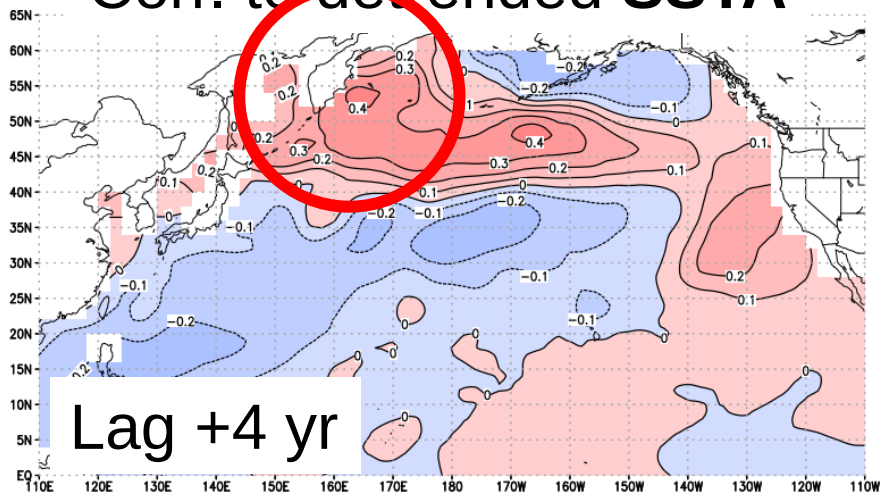
Gizhiginsko-Kamchatskaya (herring #2, NE Sea of Okhotsk)

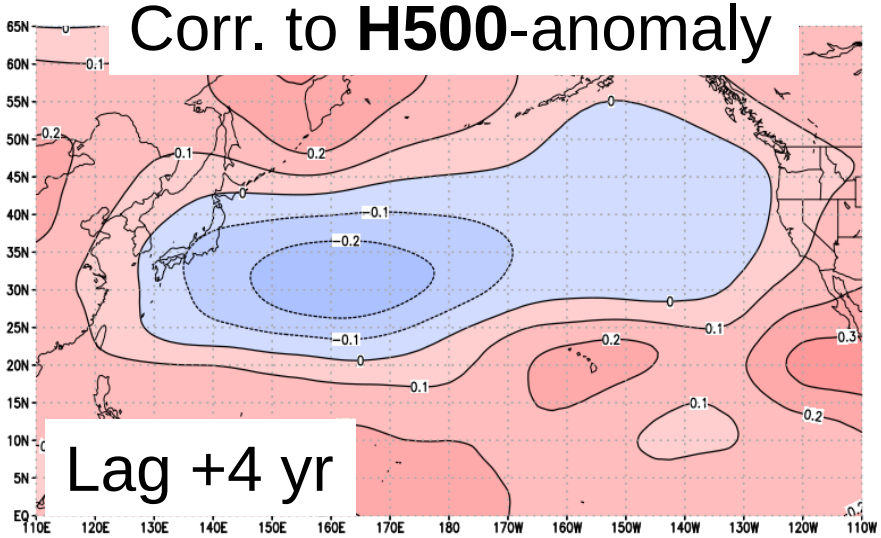
Results

Corr. to detrended **SSTA**

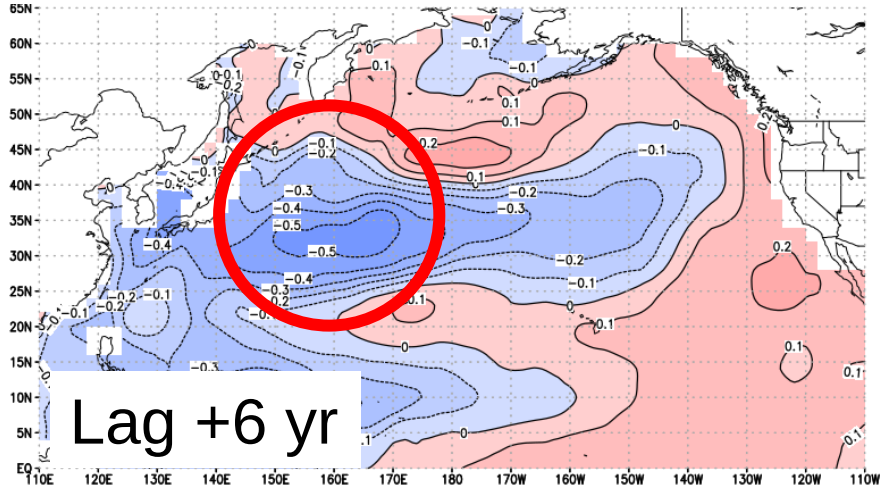
Corr. to **H500**-anomaly

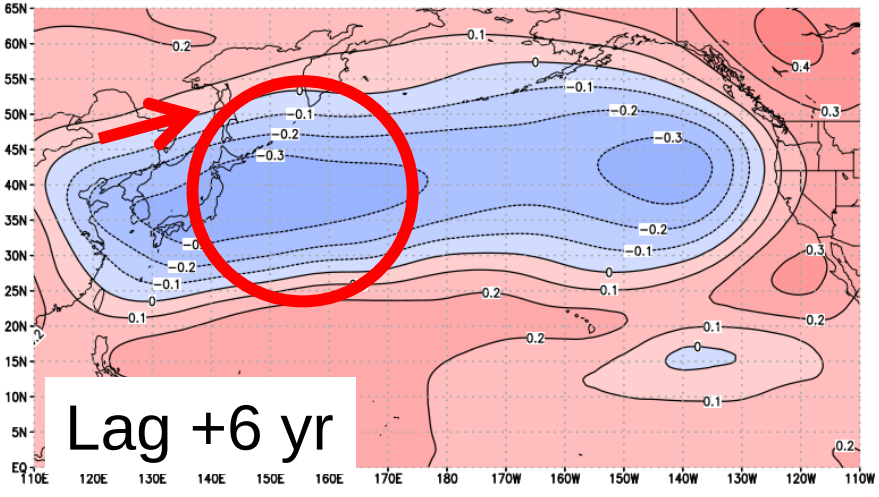
Winter





Spring

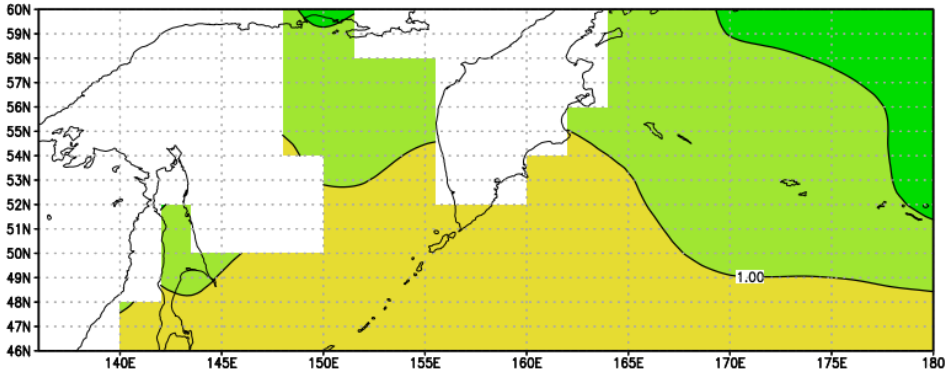




Korfo-Karaginskaya (herring #3, W Bering Sea)

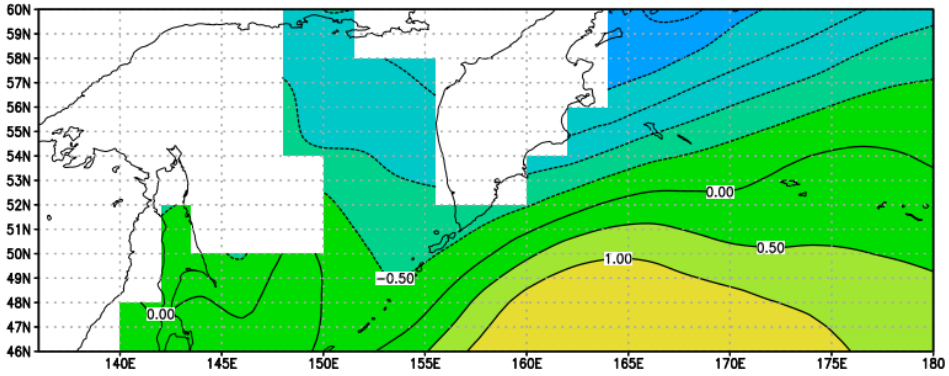
Results: EOF analysis of SSTA field

PC1



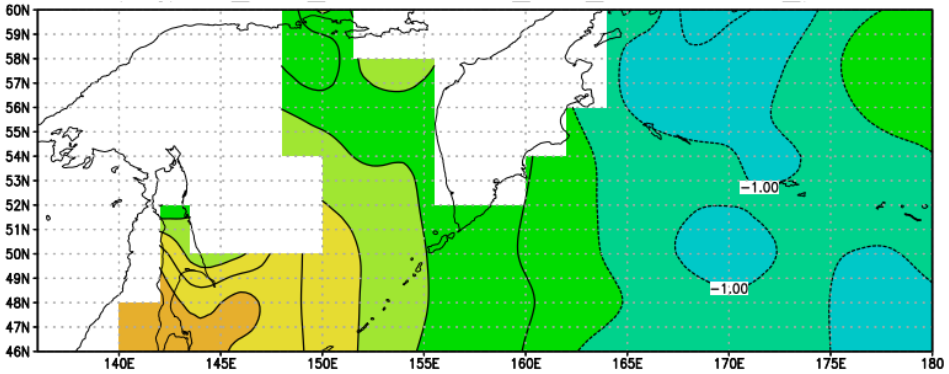
51 %

PC2



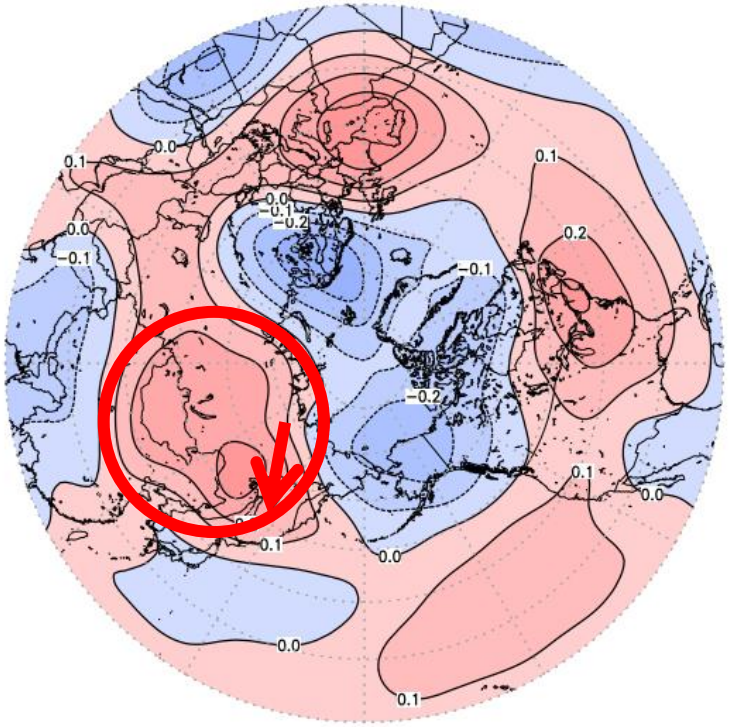
14 %

PC3

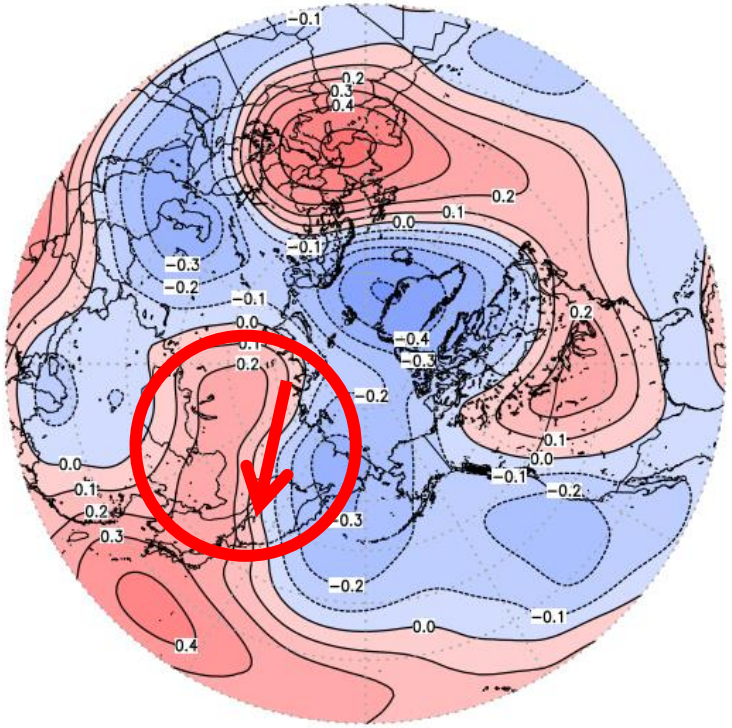


11 %

Results



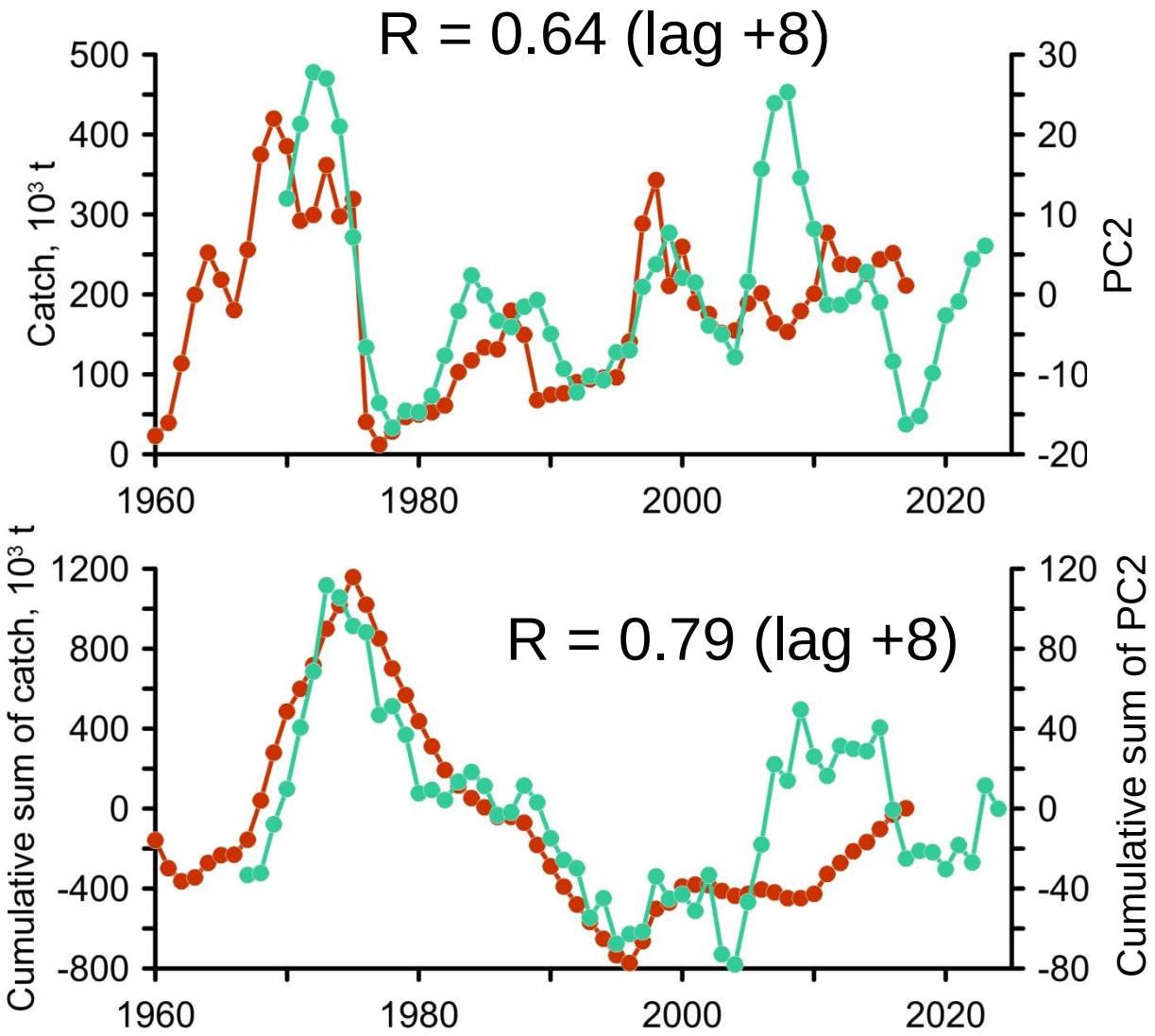
PC2



PC3

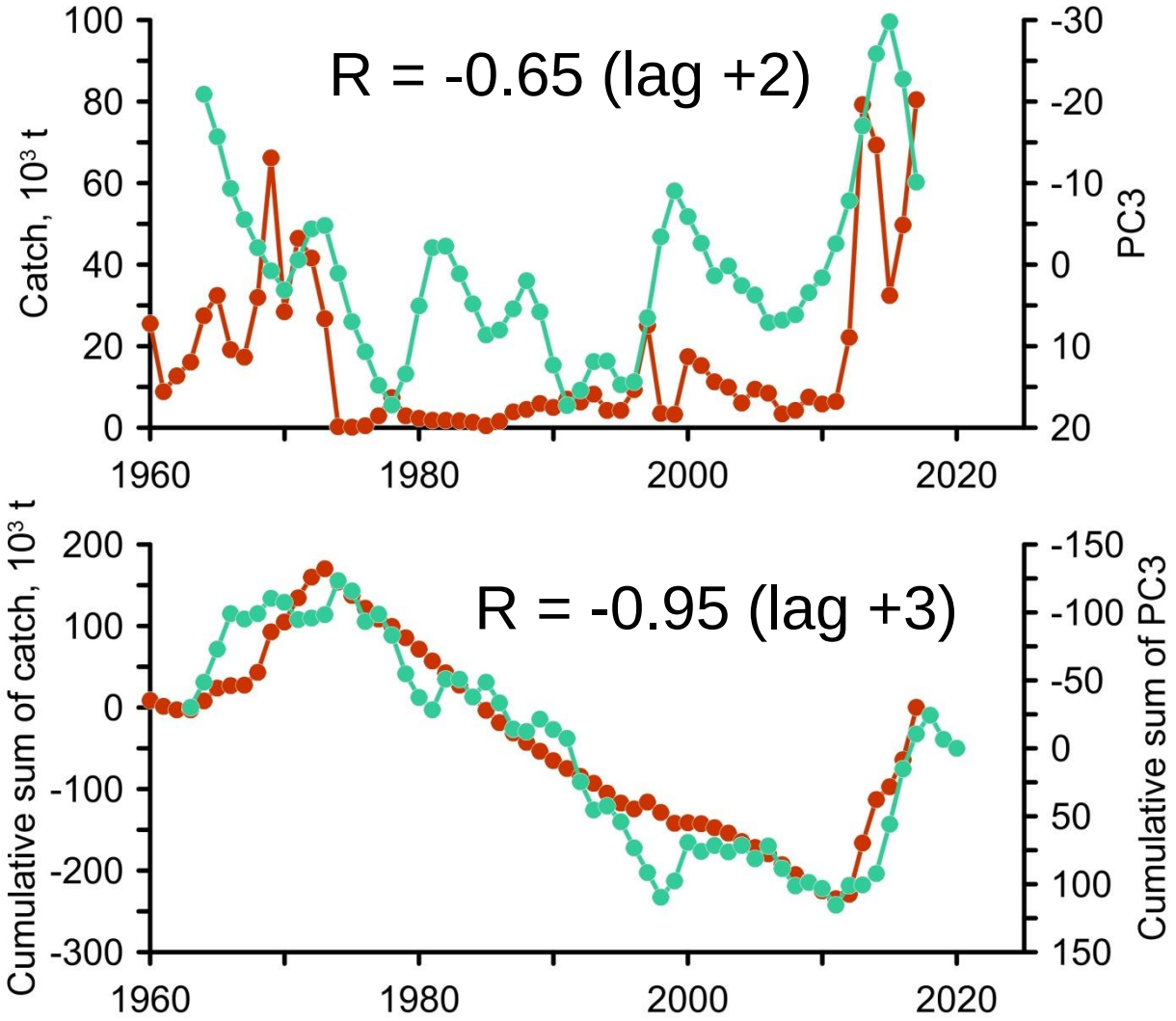
Correlation of PC2 and PC3 to H500-anomaly

Results



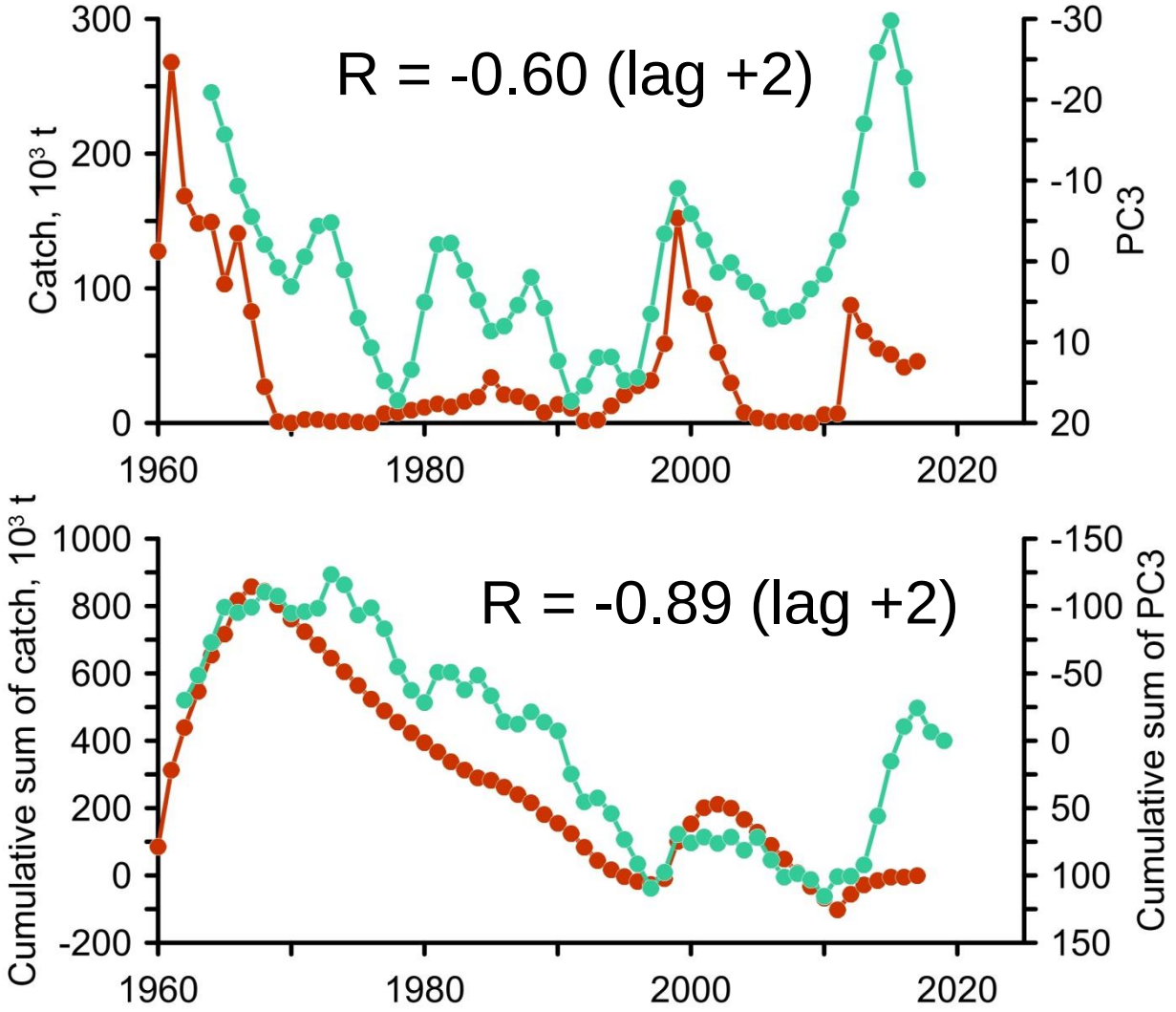
Okhotskaya (herring #1, N Sea of Okhotsk)

Results



Gizhiginsko-Kamchatskaya (herring #2, NE Sea of Okhotsk)

Results



Korfo-Karaginskaya (herring #3, W Bering Sea)

Conclusion

- Okhotsk herring survive better when the Siberian High is deep in winter and northerly winds are stronger in the northern Sea of Okhotsk
- This lead to colder SST in the northern Sea of Okhotsk in winter
- Reduced Aleutian Low in spring is favorable for this stock

Conclusion

- Gizhiginsko-Kamchatskaya herring (#2) survive better when the Siberian High is weak in winter and northerly winds are reduced in the northern Sea of Okhotsk
- Higher than usual pressure over Kamchatka Peninsula with stronger north-easterly winds over spawning grounds in spring is favorable for this stock

Conclusion

- Korfo-Karaginskaya herring (#3) survive better when SST is higher than usual in spawning area in winter and summer
- This seems to be somehow related to negative H500 anomaly over subarctic North Pacific