Warm and wanted: effects of climate change and fisheries on fish growth

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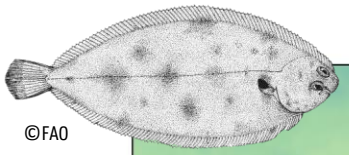


Sole - *Solea solea*

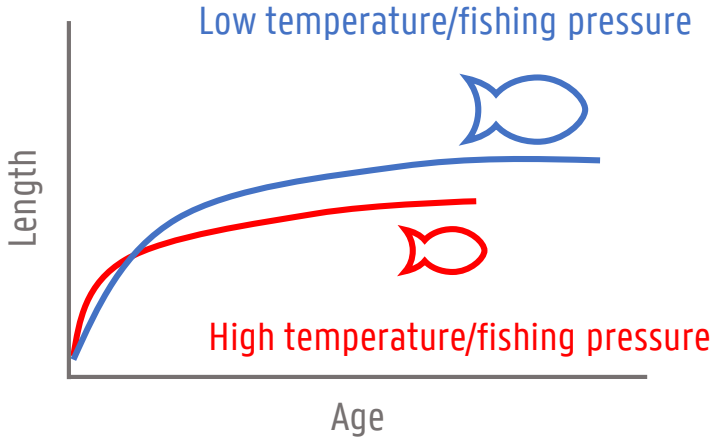
Temperature

(Temperature size rule)

X

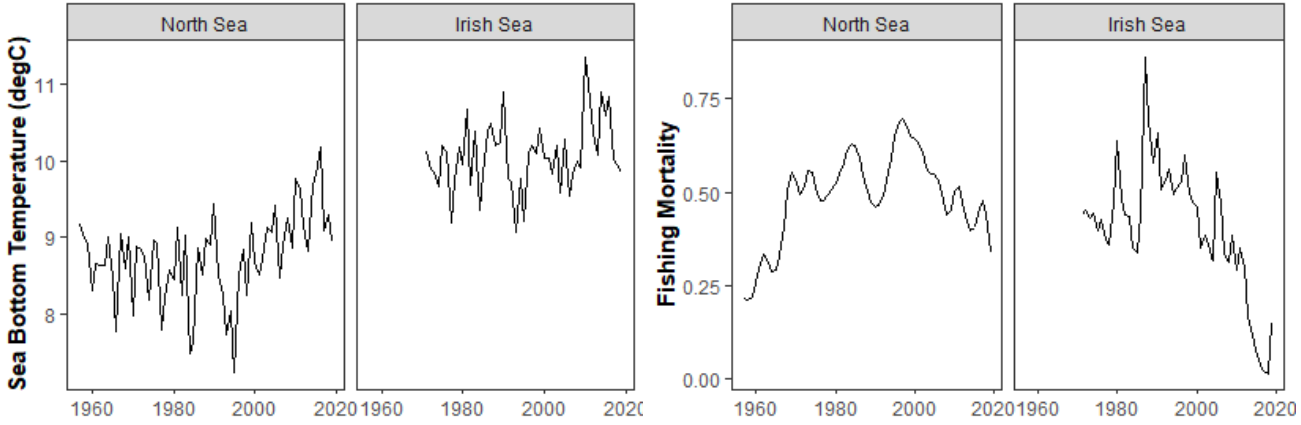
Fishing pressure

(Fisheries Induced Evolution)



Hypotheses

1. Sole growth is positively correlated to warming conditions
2. Sole growth is additively or synergistically affected by temperature and fishing variables
3. The effects of temperature and fishing variables on sole growth are region specific



Growth ~ Intrinsic Effects + Extrinsic Effects + Random Effects

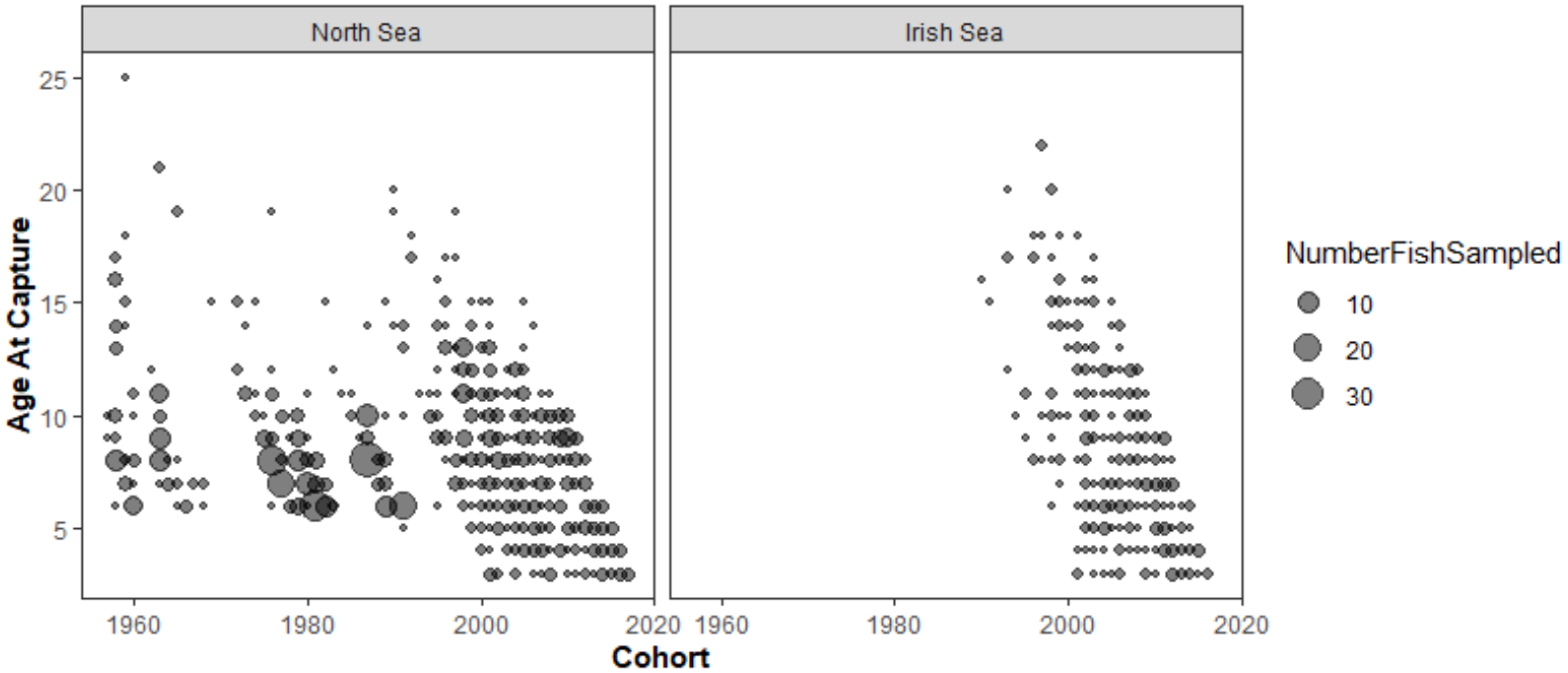
Age	Temperature	FishID
Age At Capture	Fishing Mortality	Year
	Stock Biomass	Cohort

North Sea

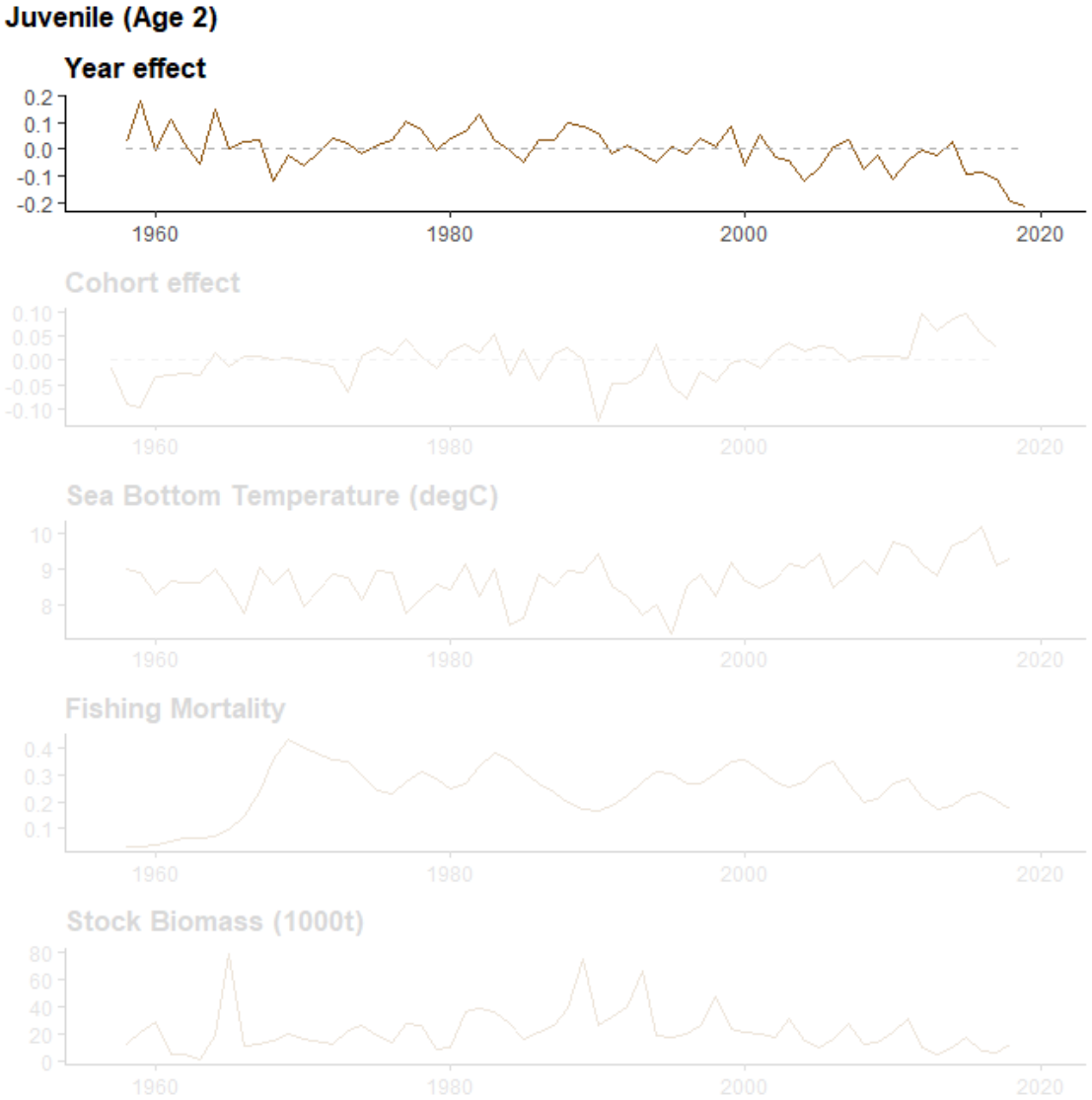
- Sampled fish: 852
- Age At Capture: 3-25
- Cohort: 1957-2017

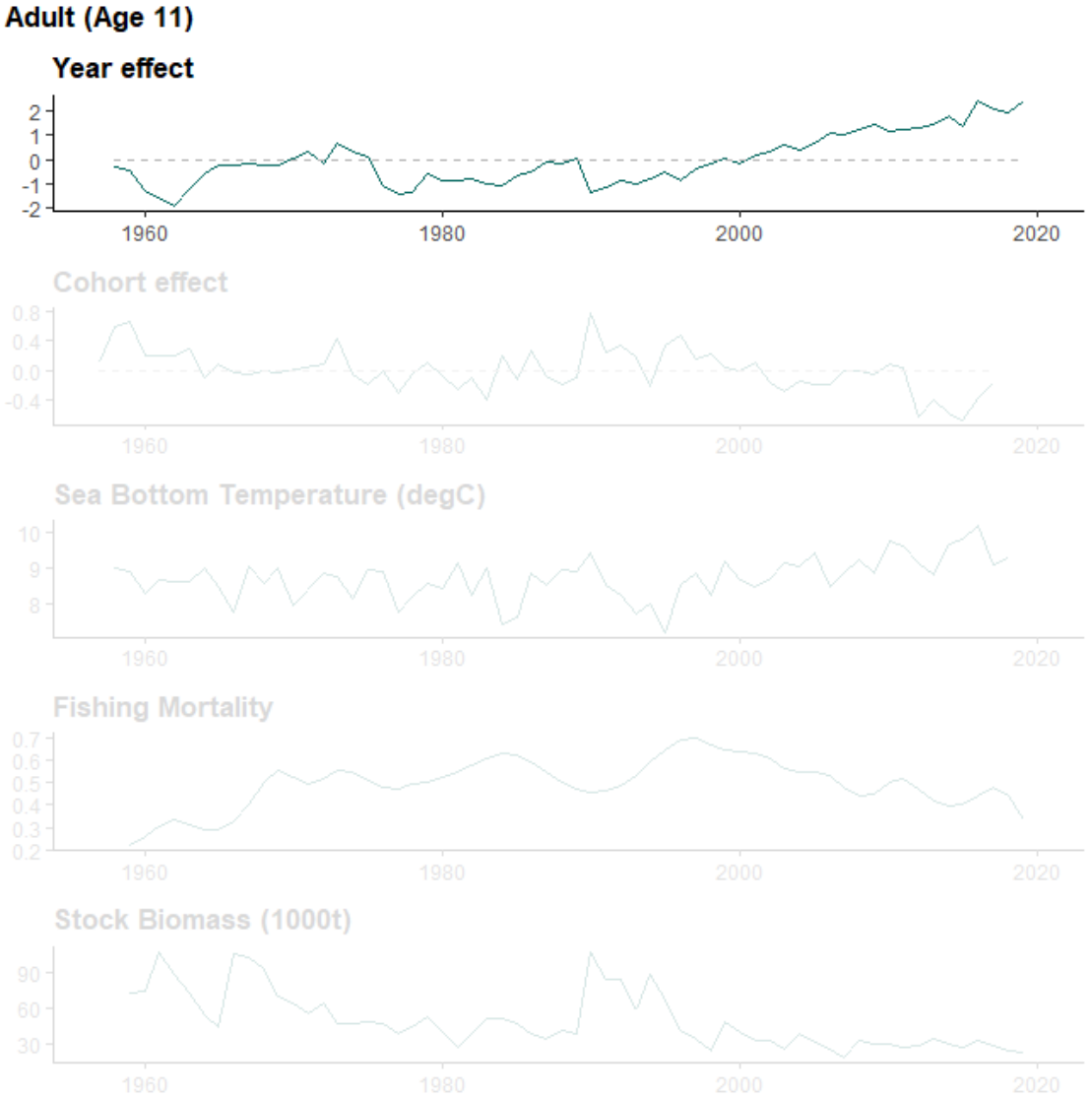
Irish Sea

- Sampled fish: 254
- Age At Capture: 3-22
- Cohort: 1990-2016 (future plan: Cohort 1970-1990)



North Sea





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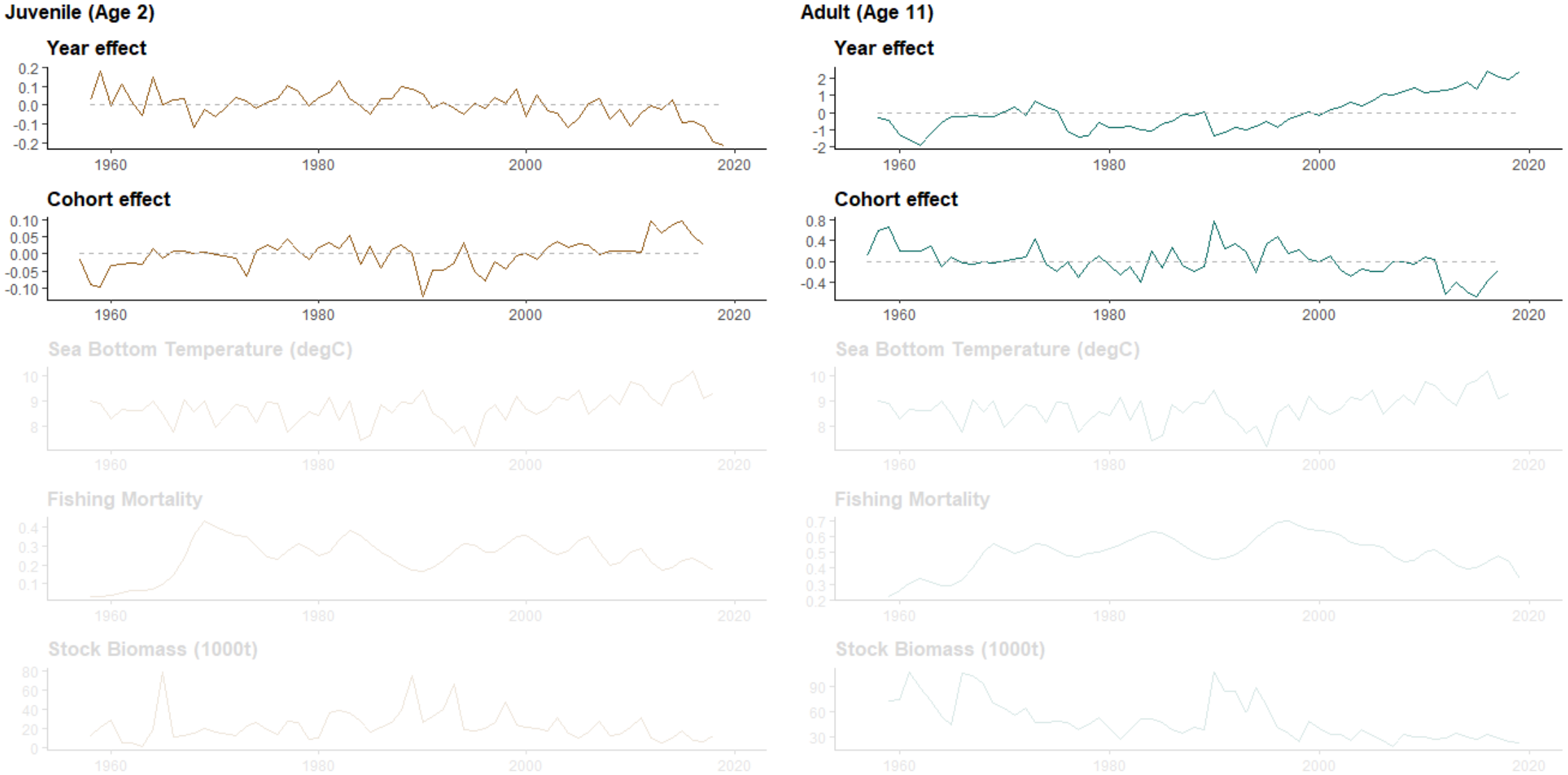
North Sea



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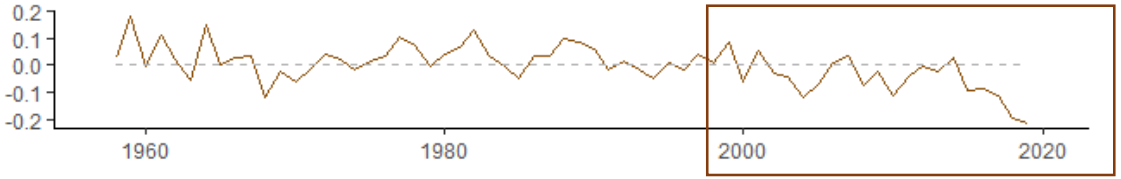
North Sea

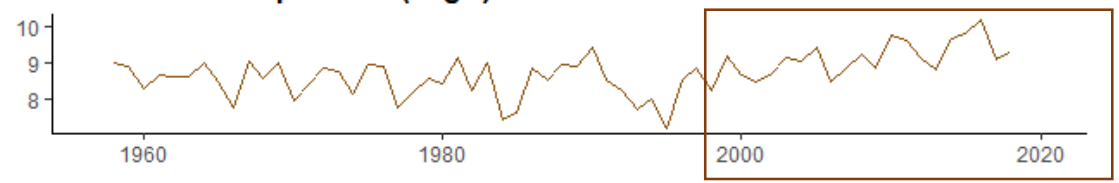
Juvenile (Age 2)

Year effect

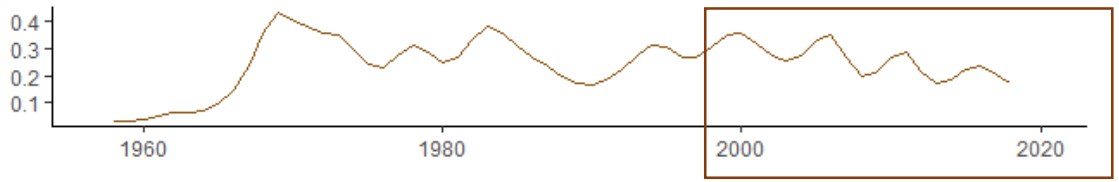


Cohort effect

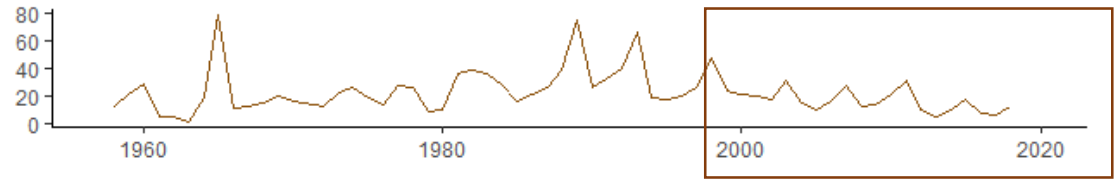
Sea Bottom Temperature (degC)



Fishing Mortality

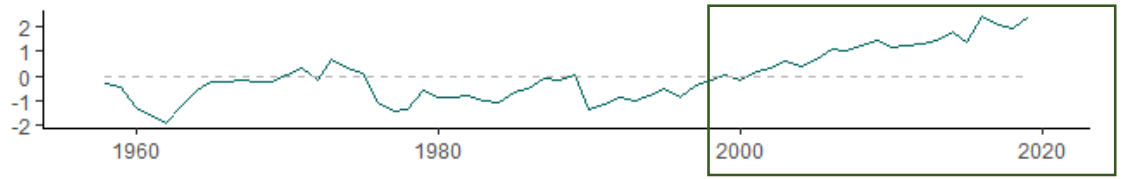


Stock Biomass (1000t)



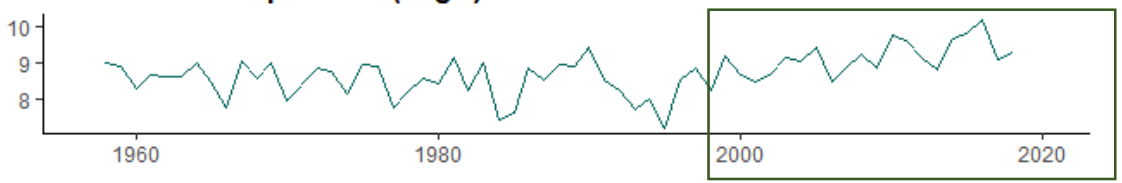
Adult (Age 11)

Year effect

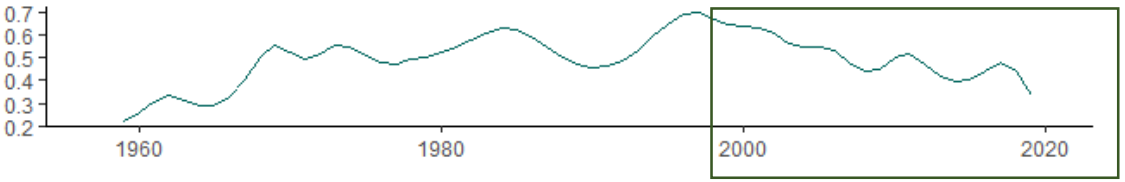


Cohort effect

Sea Bottom Temperature (degC)



Fishing Mortality



Stock Biomass (1000t)

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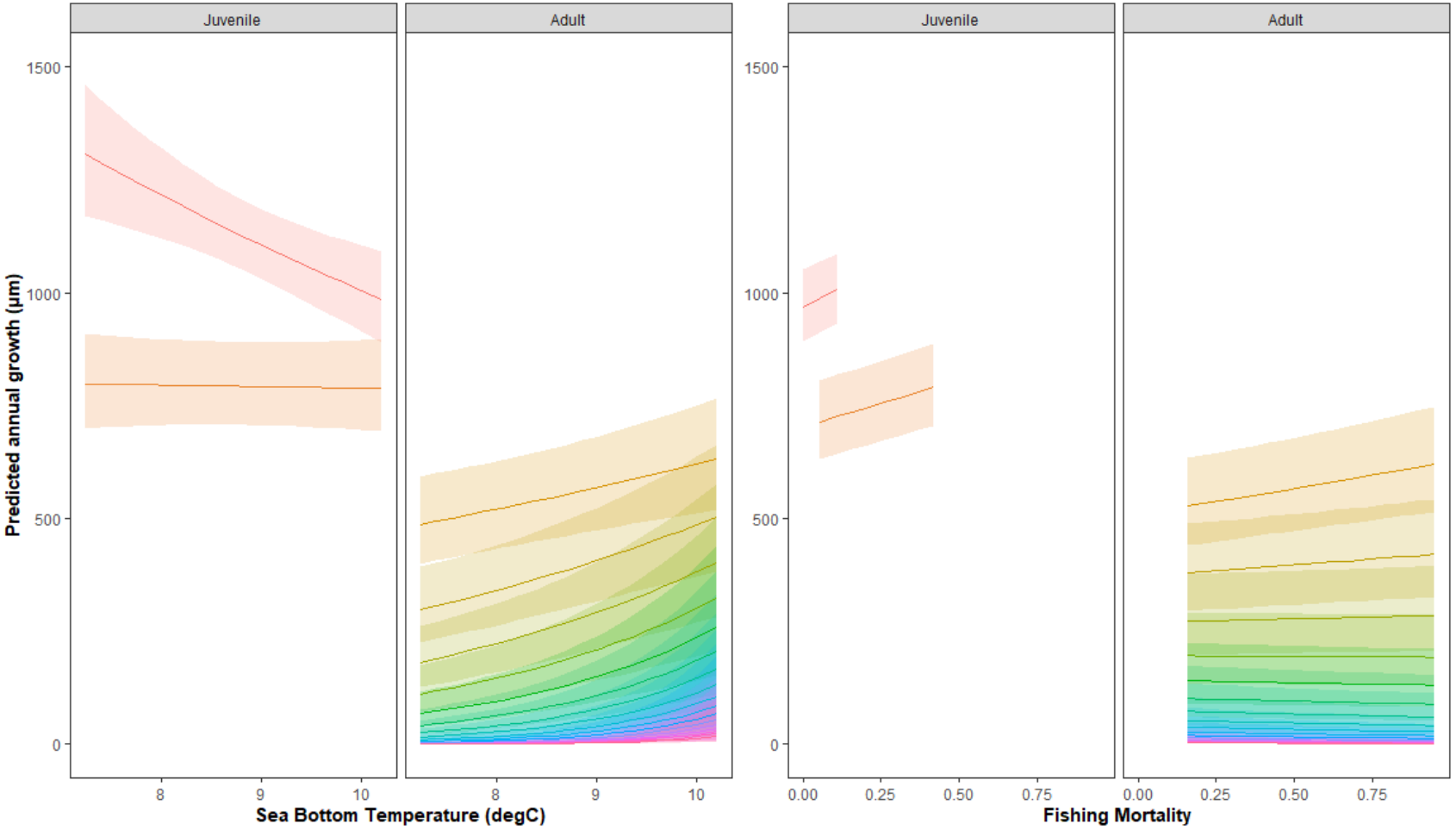
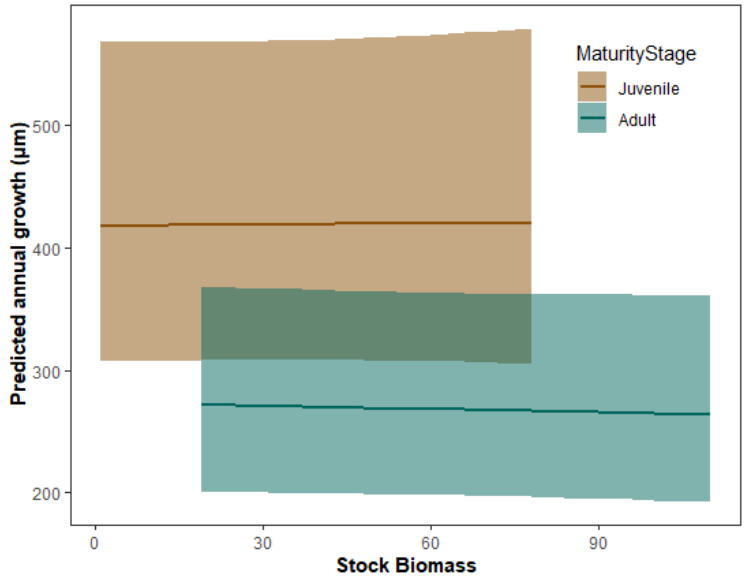
North Sea





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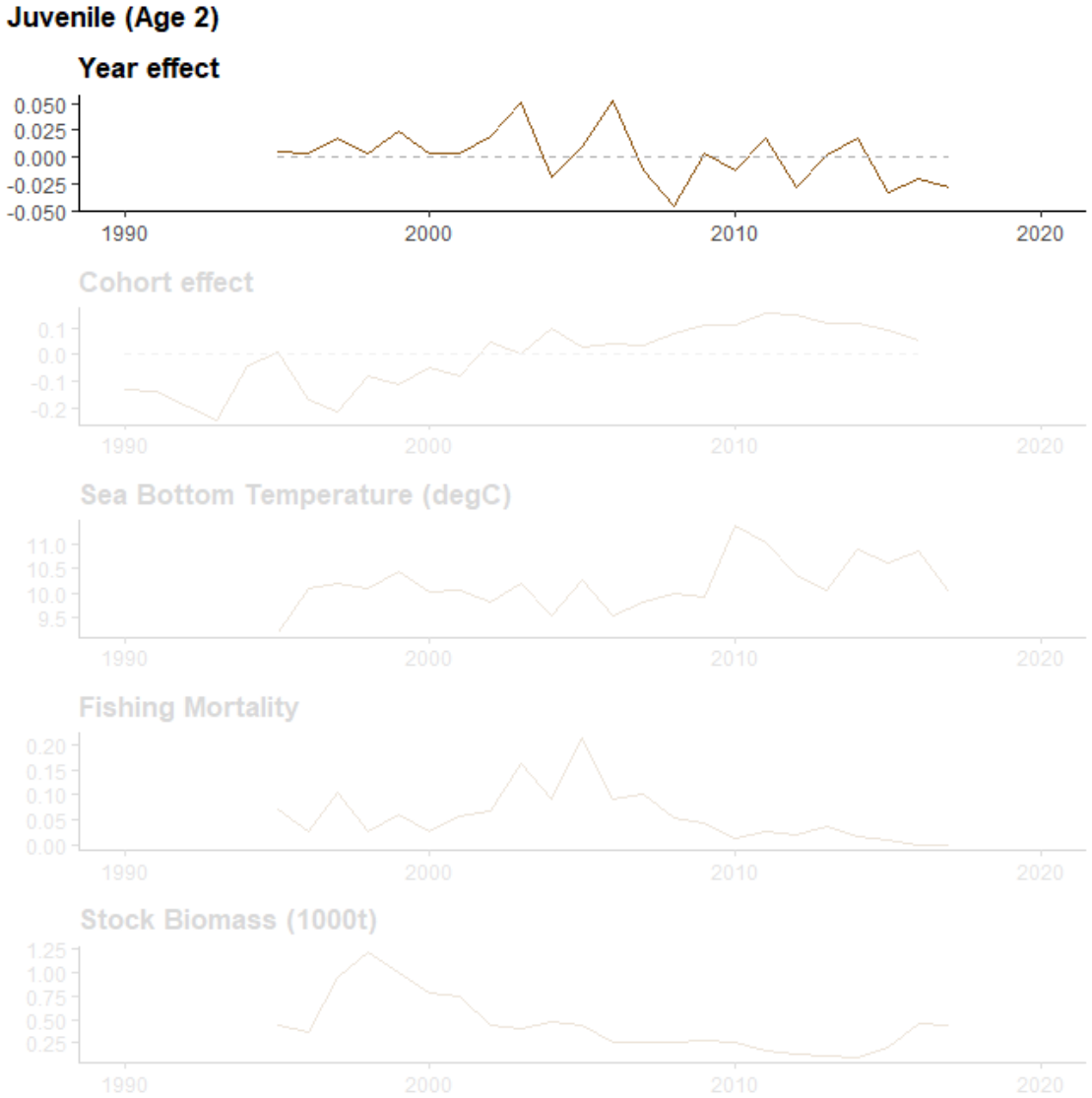
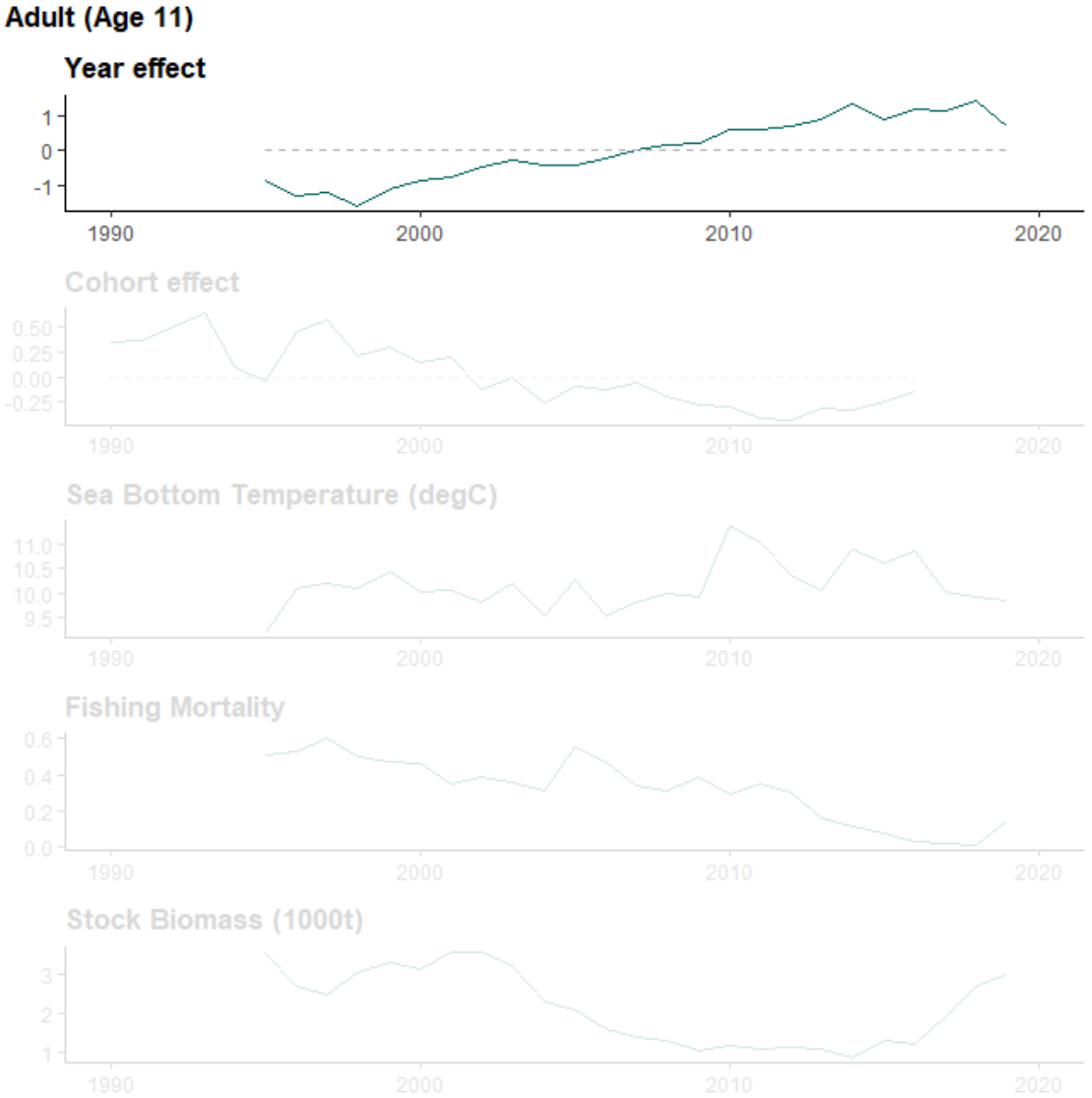
Irish Sea





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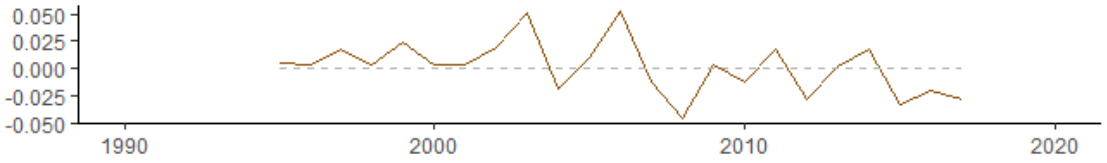
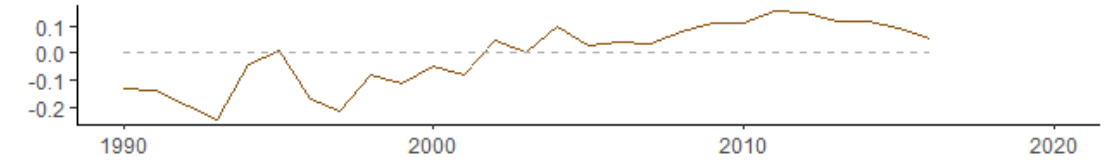
Irish Sea

Juvenile (Age 2)

Year effect



Cohort effect



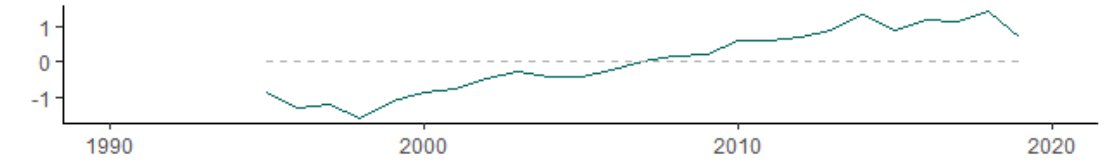
Sea Bottom Temperature (degC)

Fishing Mortality

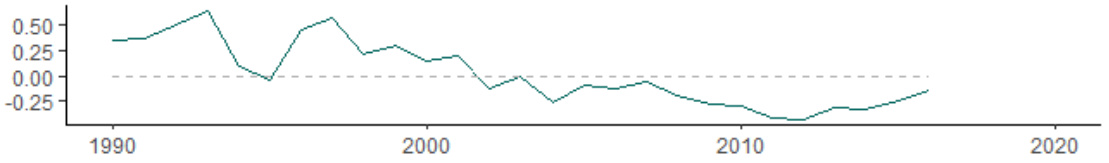
Stock Biomass (1000t)

Adult (Age 11)

Year effect



Cohort effect



Sea Bottom Temperature (degC)

Fishing Mortality

Stock Biomass (1000t)

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Irish Sea

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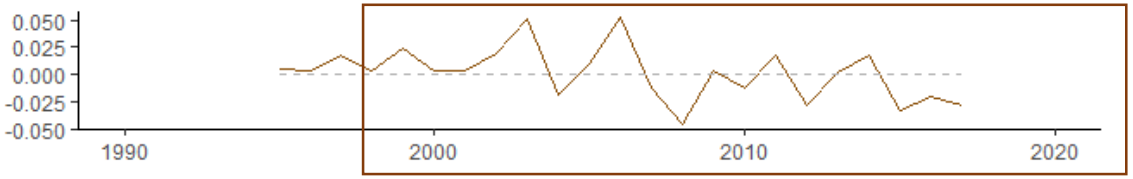
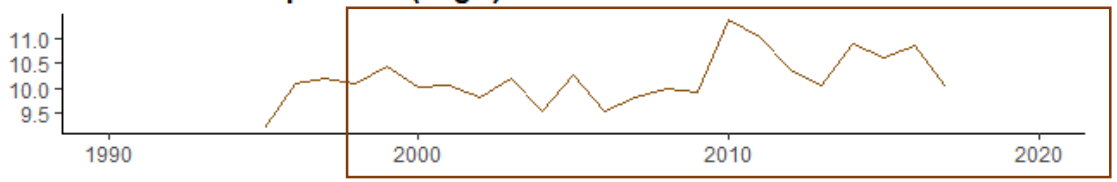
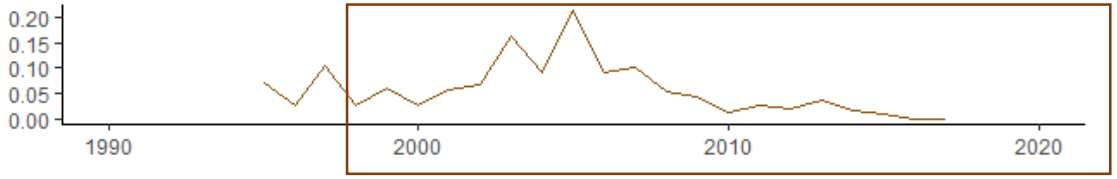


Cohort effect

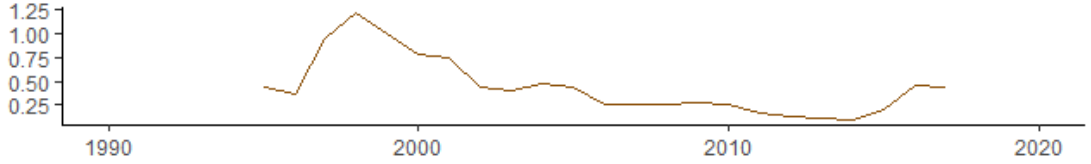
Sea Bottom Temperature (degC)



Fishing Mortality

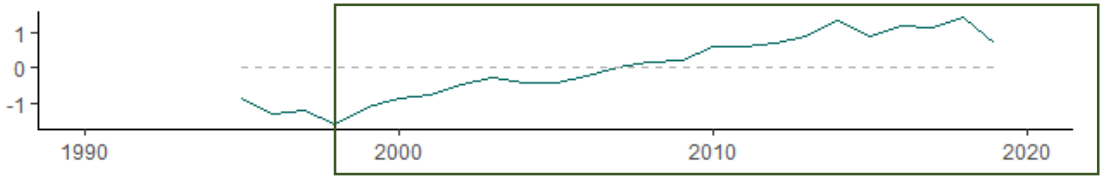


Stock Biomass (1000t)



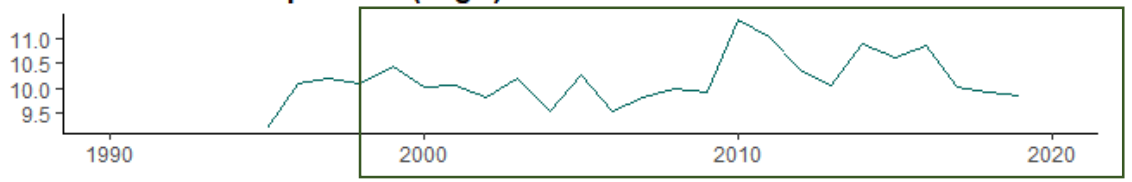
Adult (Age 11)

Year effect



Cohort effect

Sea Bottom Temperature (degC)



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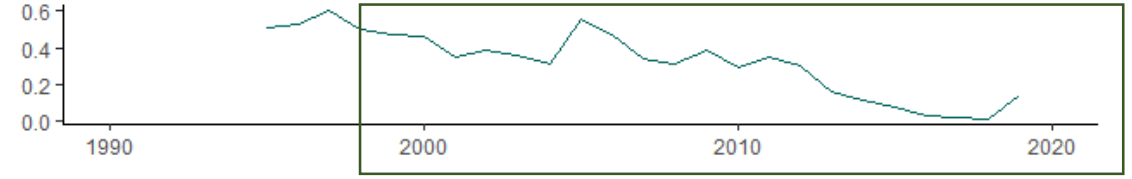
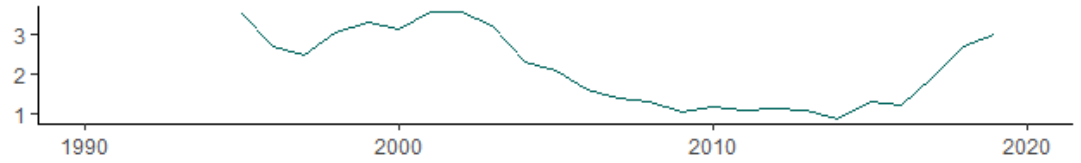


Stock Biomass (1000t)



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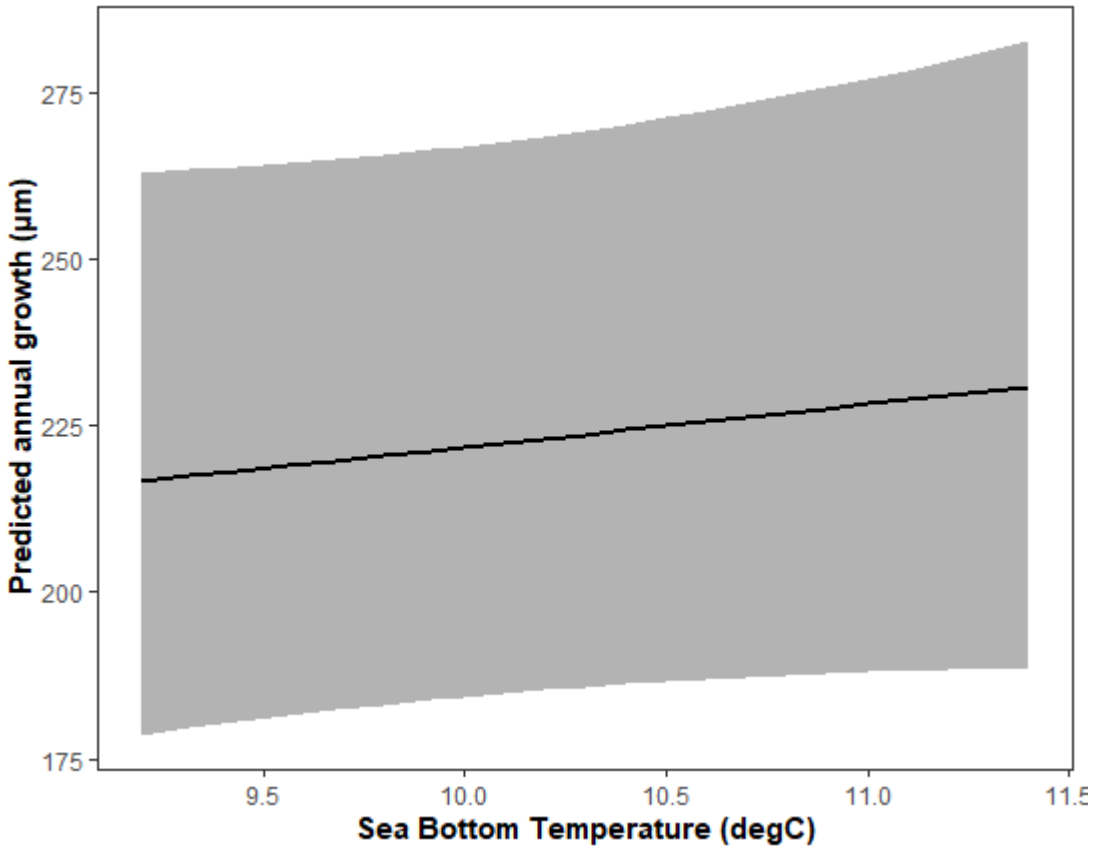

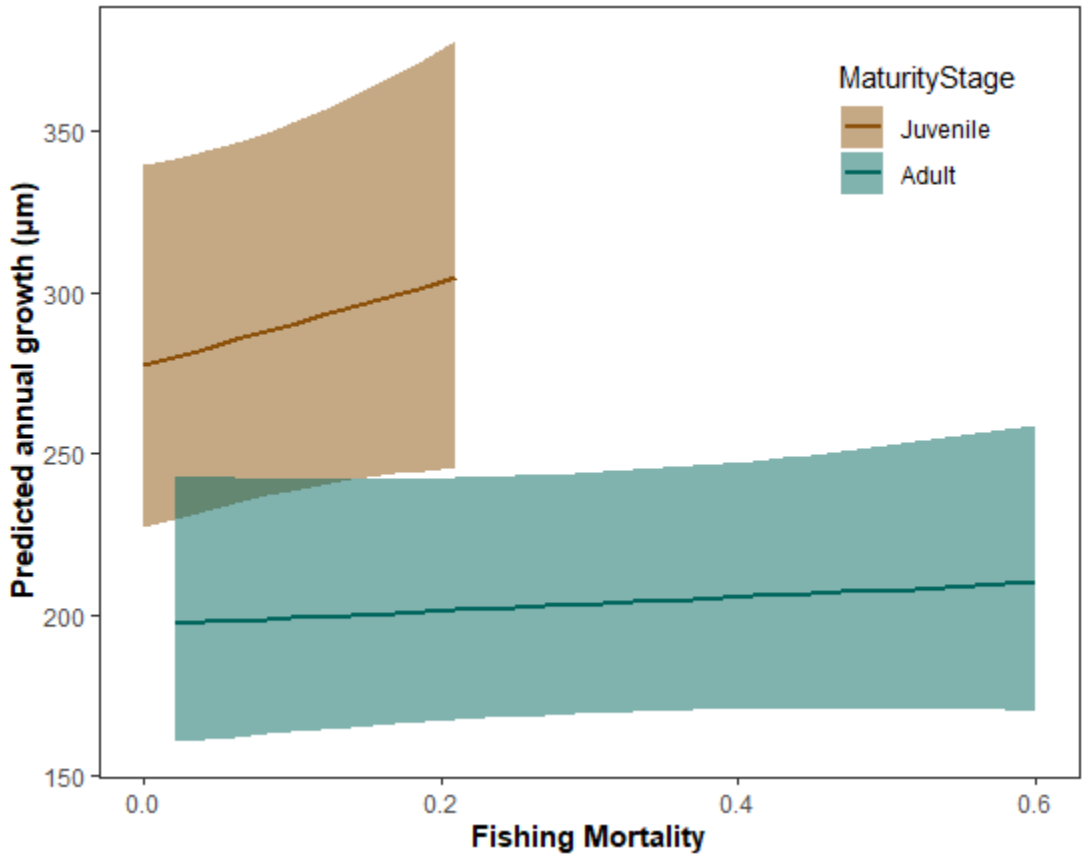

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Conclusion

1. Sole growth is **positively correlated to warming conditions**: **Irish Sea, North Sea (adult)**
2. Sole growth is **additively** affected by **temperature and fishing variables**: **Irish Sea, North Sea**
3. The **effects of temperature and fishing variables** on sole growth are **region specific**

Thank you for your attention

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