

Evaluation of potential trophic impacts from hake (*M. merluccius*) emergence in the North Sea.

3rd International Symposium
Effects of Climate Changes on World's Ocean

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21-27 March 2015, Santos, Brazil



Saithe and hake in the North Sea



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Saithe (*Pallachius virens*)

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European hake (*Merluccius merluccius*)

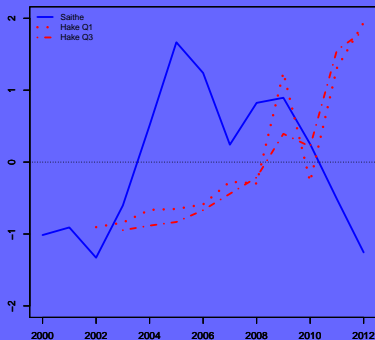
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Saithe (*Pollachius virens*)

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European hake (*Merluccius merluccius*)

Standardized spawning stock biomass trends (ICES, 2013; Baudron and Fernandes, 2014)

Saithe and hake in the North Sea



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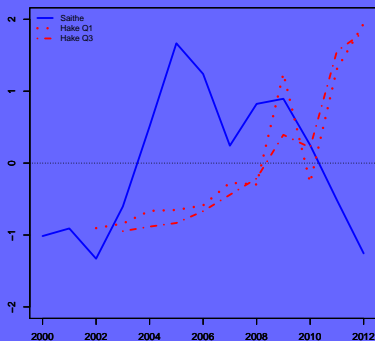
?

COMPETITION

?



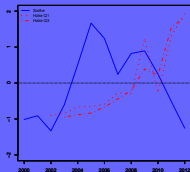
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European hake (*Merluccius merluccius*)

Standardized spawning stock biomass trends (ICES, 2013; Baudron and Fernandes, 2014)

Step by step towards competition theory (Link and Auster, 2013)

1. Opposite trends

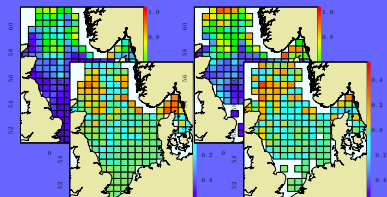


Since early 2000's in the North Sea:

- Opposite trends of population abundance.

Step by step towards competition theory (Link and Auster, 2013)

2. Spatial overlap, *Cormon et al., 2014*











Winter and Summer, (2007-2012) - (1991-1996)

Since early 2000's in the North Sea:

- Opposite trends of population abundance.
- Increase of hake probability of presence and of saithe-hake overlap.

Step by step towards competition theory (Link and Auster, 2013)

3. Drivers of probable habitats, Cormon *et al.*, 2014

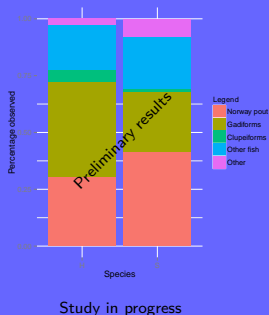
	Hake		Overlap	
	Winter	Summer	Winter	Summer
			NS	
		NS		

Since early 2000's in the North Sea:

- Opposite trends of population abundance.
- Increase of hake probability of presence and of saithe-hake overlap.
- Importance of temperature and Norway pout presence for probable habitats.

Step by step towards competition theory (Link and Auster, 2013)

4. Occurrences of prey in winter



Since early 2000's in the North Sea:

- Opposite trends of population abundance.
- Increase of hake probability of presence and of saithe-hake overlap.
- Importance of temperature and Norway pout presence for probable habitats.
- Potential diet overlap.

Step by step towards competition theory (Link and Auster, 2013)

5. Limiting resources?

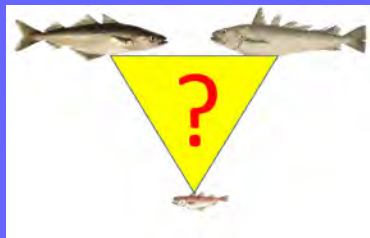
Last but not least condition to assume competition

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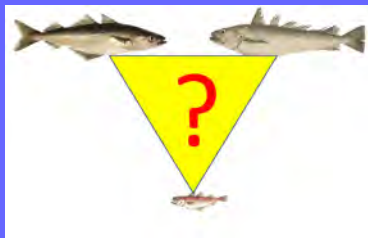
Limiting resources?

Saithe-Hake-Norway pout
threesome



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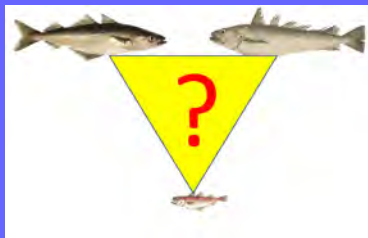


Pros

- Main shared prey

Limiting resources?

Saithe-Hake-Norway pout threesome

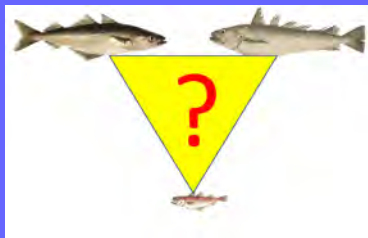


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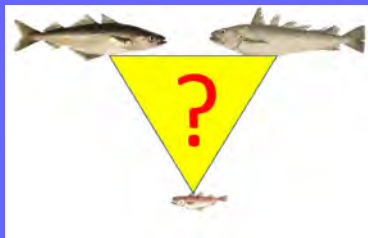


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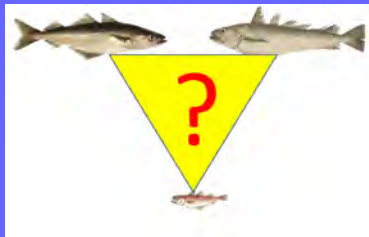


Pros

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- NS distribution overlapping
- Bottom-up processes only
- Assessed species

Limiting resources?

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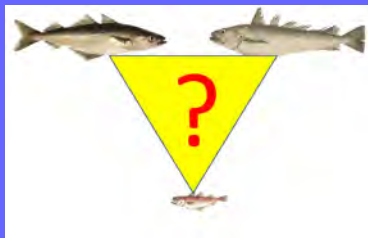
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Cons

- Simplistic

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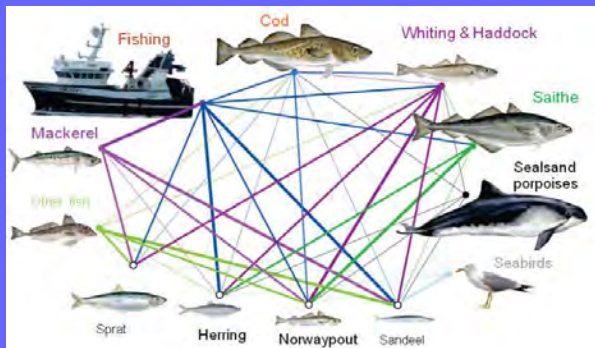
- Simplistic

Research question

What are the potential impacts of hake on saithe trough Norway pout availability in the North Sea?

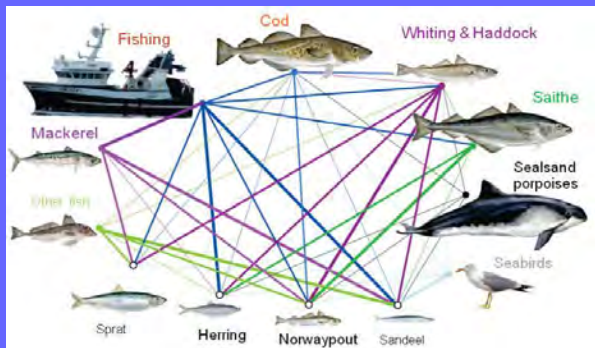
Materials and methods

SMS, Lewy and Vinther, (2004)



Materials and methods

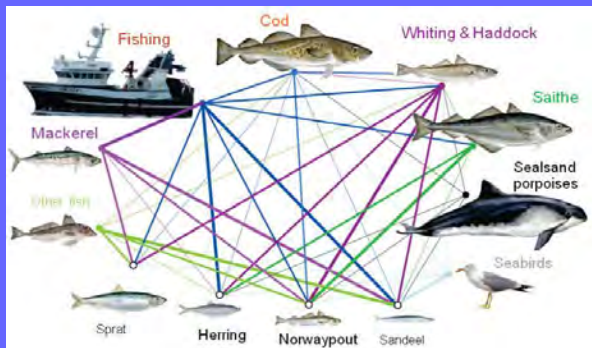
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Hake?

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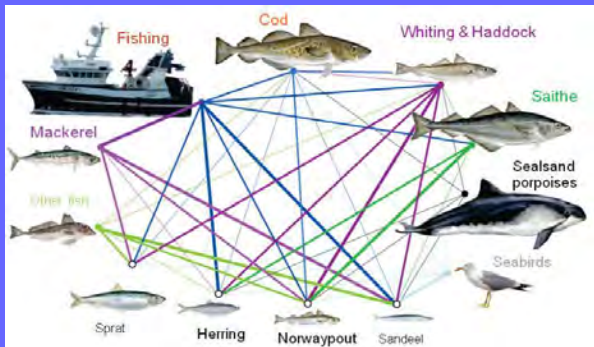


Hake?

WGSAM 2014 key-run

Materials and methods

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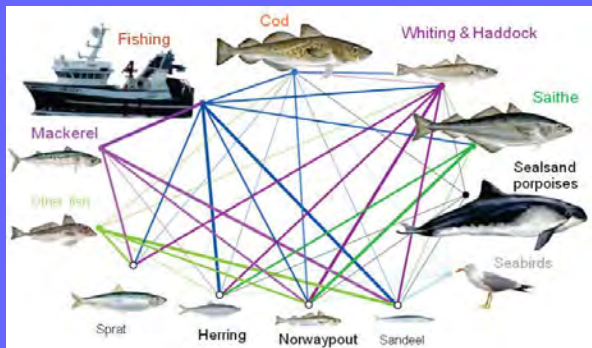
Hake?

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Bottom-up?

Cormon *et al.*, in prep

Parametrization and scenarios

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Parametrization and scenarios

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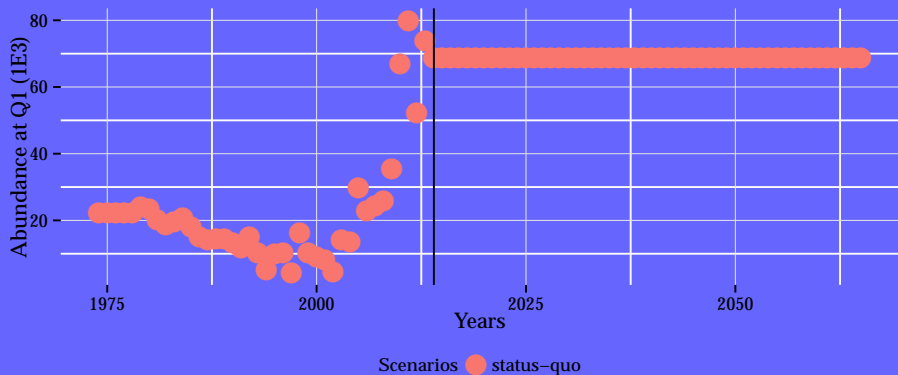
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Scenarios

	Status-quo	Growth	Extreme	Moderate
Growth	X	O	O	O
Hake change	1	1	1.10	1.05
Period	2011-2013	2011-2013	2014-2025	2014-2025

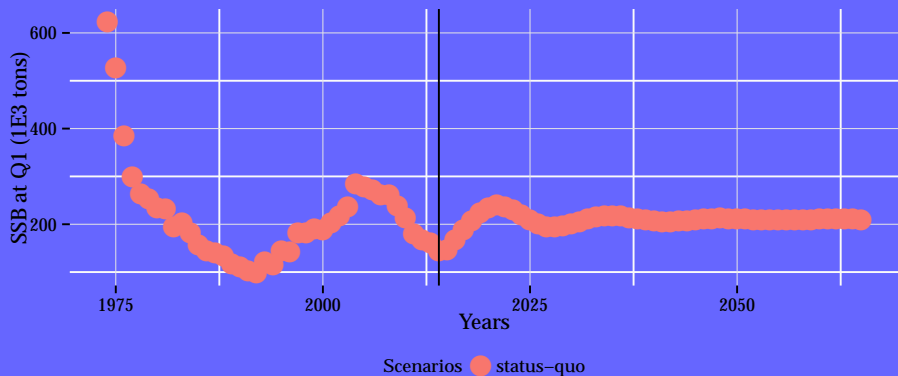
Status-quo results

Hake in number of individuals



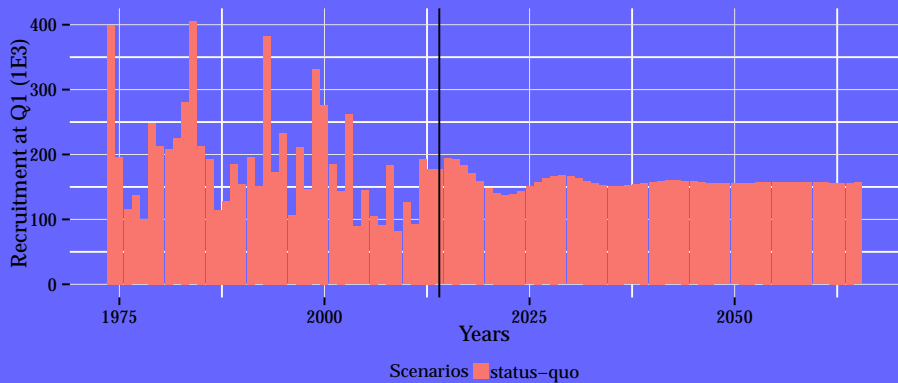
Status-quo results

Saithe spawning biomass



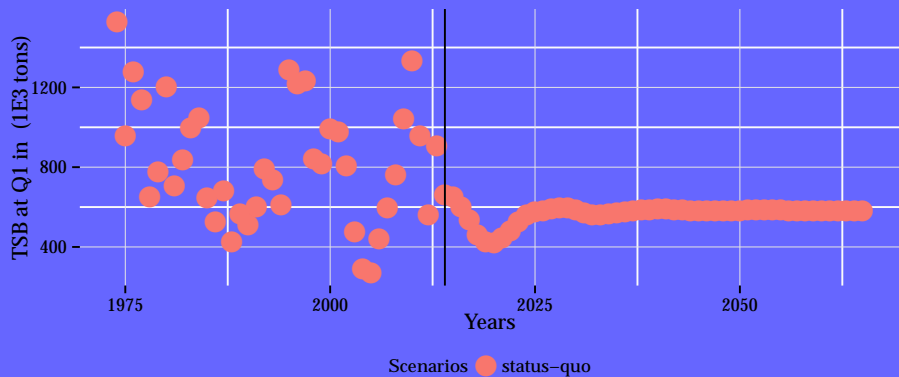
Status-quo results

Saithe recruitment



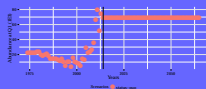
Status-quo results

Norway pout biomass

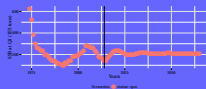


Status-quo results

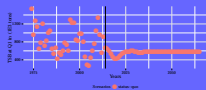
Hake in number of individuals



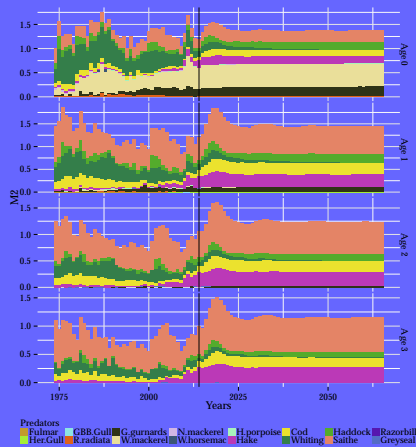
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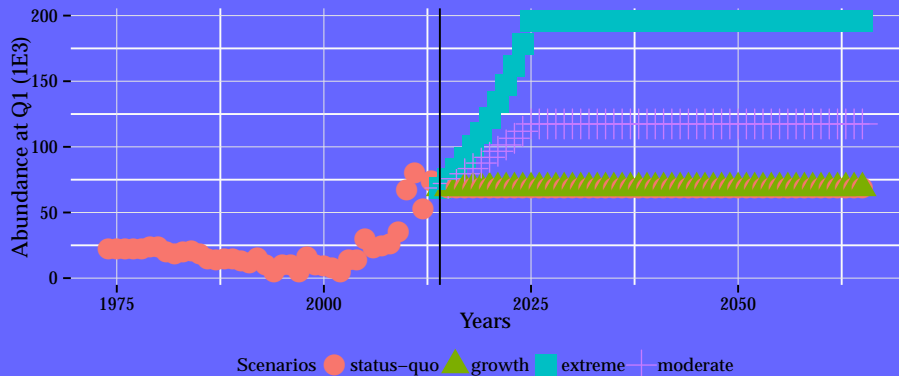


Norway pout predation mortality



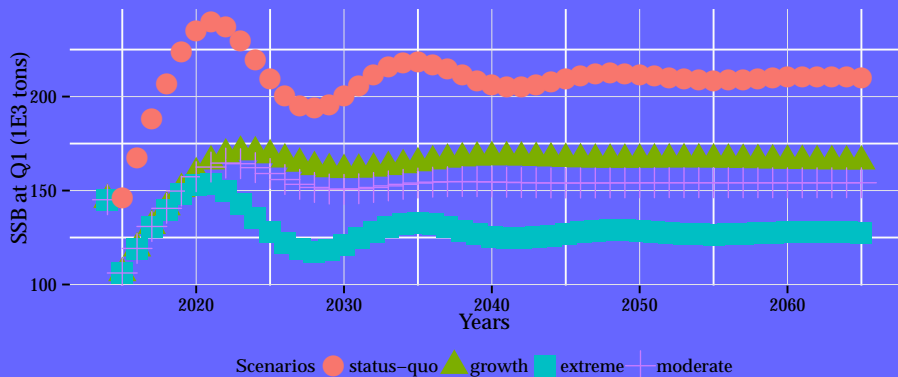
Scenarios comparison

Hake in number of individuals



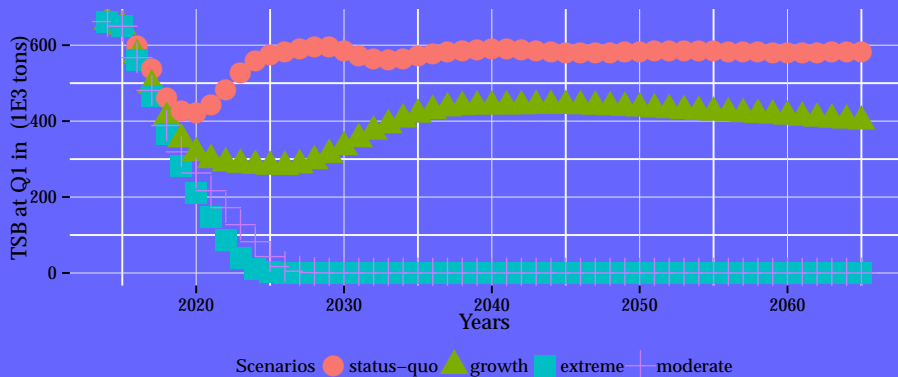
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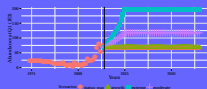
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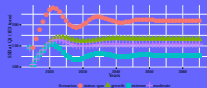


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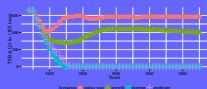
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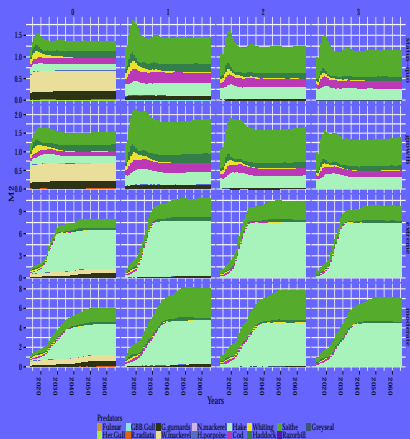
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Norway pout biomass



Norway pout predation mortality



What do we know and what's next?

Conclusions

- Lower saithe biomass estimates with growth.

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- Stochastic recruitment.

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The End...



(: Travel support :)



Baudron, A. and Fernandes, P. (2014). "Adverse consequences of stock recovery: European hake, a new "choke" species under a discard ban?" Fish and fisheries. doi: 10.1111/faf.12079.

Cormon, X., Loots, C., Vaz, S., Vermard, Y. and Marchal, P. (2014). "Spatial interactions between saithe (*Pollachius virens*) and hake (*Merluccius merluccius*) in the North Sea." ICES Journal of Marine Science. doi: 10.1093/icesjms/fsu120.

Cormon, X., Ernande B., Kempf, A., Vermard, Y., and Marchal, P. (in prep). "Bottom-up processes in the North Sea, an investigation of North Sea saithe growth characteristics in relation to environmental factors."

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Lewy P. and Vinther M. (2004) "SMS, A stochastic age-length-structured multispecies model applied to North Sea and Baltic Sea stocks."

Link J. and Auster P. (2013) "The challenges of evaluating competition among marine fishes: who cares, when does it matter, and what can we do about it?" Bulletin of Marine Science: 89(1):213-247.