



Methods used in establishing control of bycatch in landings in Denmark

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Why did we change the approach?

Denmark received in January 2019 from the EU commission

SUPPLEMENTARY OPENING MEMORANDUM

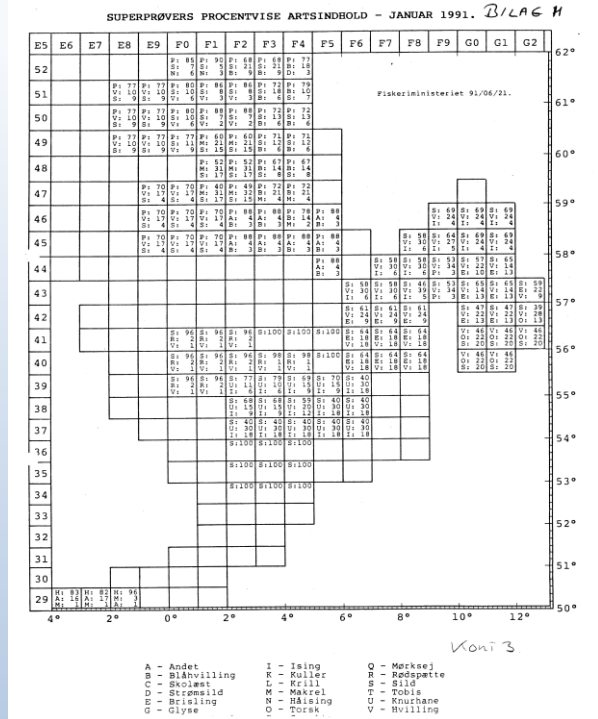
nr. 2014/2137

On the obligation concerning Council regulation (EF) nr. 1224/2009 and the Commissions implementing regulation (EU) nr. 404/2011 about a precise registration and reporting of all amount of fish, caught or obtained on board in the Danish industrial fishery.

9 square method

In Denmark we have used the 9 square method to ensure the correct quota deduction by species

- month
- ICES square
- Fishery



New system

The aim was to evaluate how many samples (10 kg buckets) are needed from every single industrial landing in order to determine the relative species composition with a given uncertainty.



Background

- Since 1976 we have control samples
- Samples have been taken throughout the loading process, however number of samples depends on the results of the 1. sample.
- This gives numbers of samples per landing between 1-35 samples
- Last 10 years samples have been used
- For a given fishery analysis only includes species accounting for more than 0.5% of total catch weight

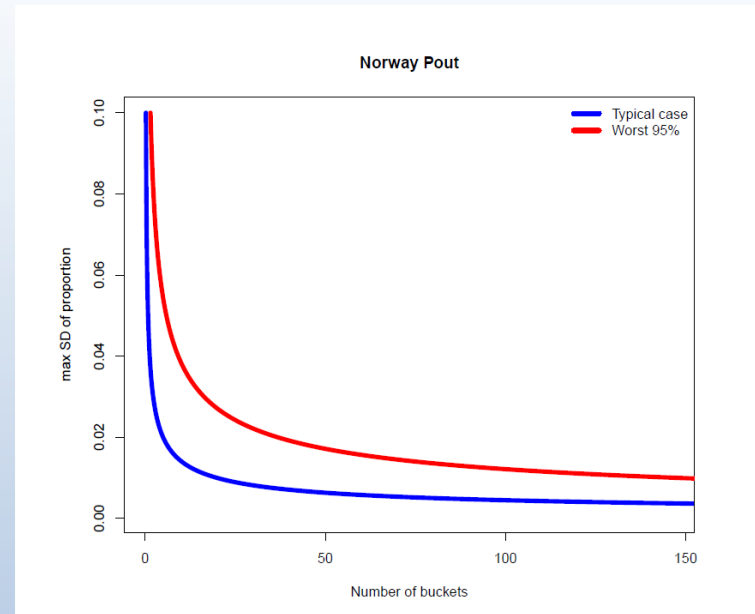
The data available

Fishery	Percent of catch in weight (rounded)					Samples
Sand eel North Sea	Sprat	Herring	Sand eel			2471
	1	1	99			
Sprat 3A	Anchovy	Sprat	Whiting	Herring		2471
	2	47	3	49		
Sprat North Sea	Sprat	Whiting	Herring			2091
	78	1	20			
Sprat Baltic	Sprat	Herring				3178
	85	15				
Norway Pout	Blue whiting	Whiting	Saithe	Herring	Norway Pout	1123
	3	2	1	11	83	
Blue whiting	Blue whiting	Mackerel				199
	93	7				
Boar fish	Boar fish	Horse mackerel				142
	99	1				



How many samples to collect ?

Fishery	Quantile	SD=1%	SD=2.5%	SD=5%
Sand eel North Sea	Median (typical case)	1	1	1
	75% (get lower SD)	1	1	1
	95% (get lower SD)	7	2	1
Sprat 3A	Median (typical case)	90	15	4
	75% (get lower SD)	89	15	4
	95% (get lower SD)	127	21	6
Sprat North Sea	Median (typical case)	18	3	1
	75% (get lower SD)	61	10	3
	95% (get lower SD)	147	24	6
Sprat Baltic	Median (typical case)	17	3	1
	75% (get lower SD)	45	8	2
	95% (get lower SD)	94	15	4
Norway Pout	Median (typical case)	20	4	1
	75% (get lower SD)	65	11	3
	95% (get lower SD)	147	24	6
Blue whiting	Median (typical case)	1	1	1
	75% (get lower SD)	1	1	1
	95% (get lower SD)	23	4	1
Boar fish	Median (typical case)	1	1	1
	75% (get lower SD)	1	1	1
	95% (get lower SD)	12	2	1



Species ID course



DTU

Har den 27/9 2022 deltaget i kurset:

Grundkursus "artsbestemmelse af marine fisk i det pelagiske fiskeri"

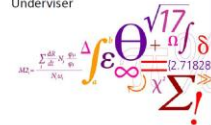
Følgende emner indgår i kurset:

- Bestandsudvikling af de vigtigste industri fiskerier
Tobis, brising, sperling, blåhvilling, havgalt
- Teoretisk gennemgang af de vigtigste bifangst arter
- Teoretisk gennemgang af hvordan man benytter en nøgle
- Praktisk gennemgang af bestandsbestemmelse i laboratoriet
- Test af kursisternes viden

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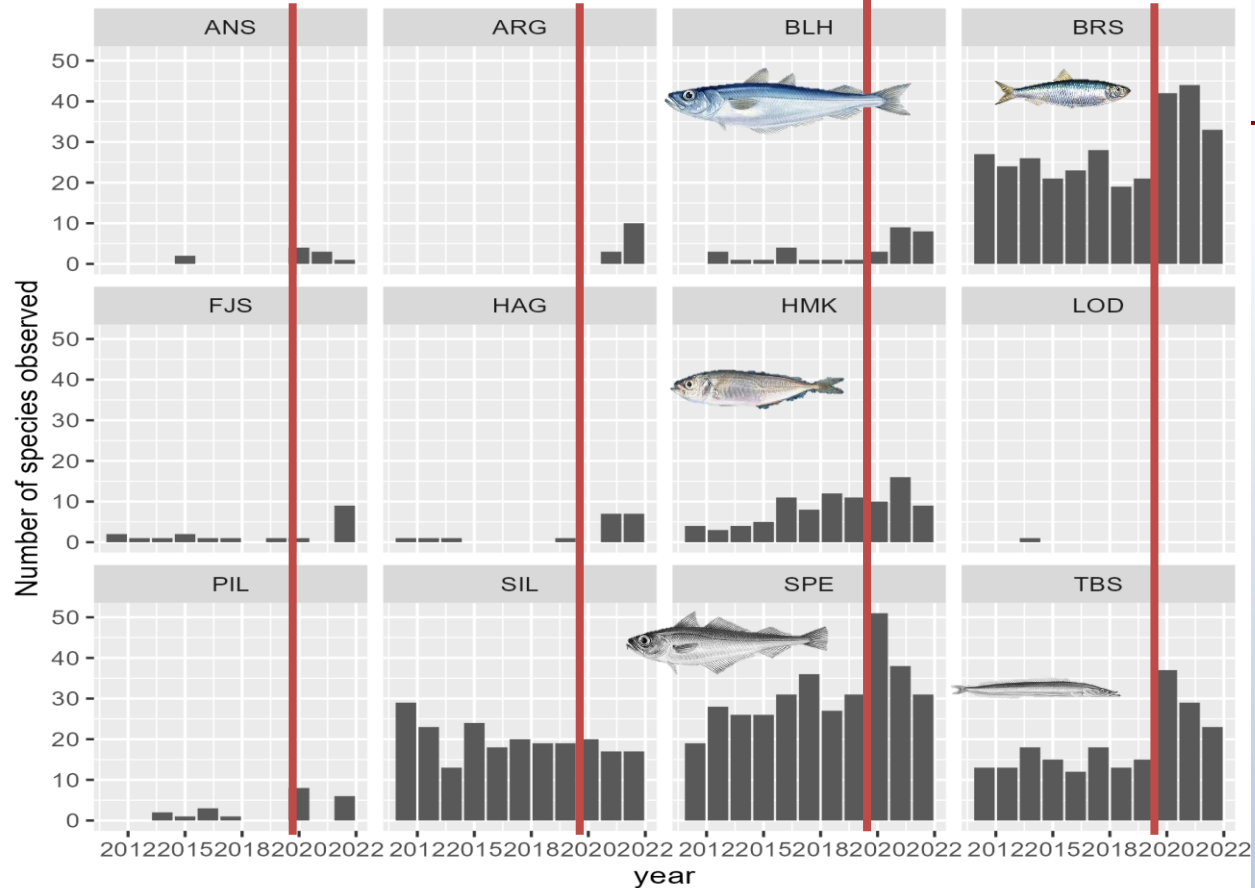


In the regulation

Speices	Area	Sample numbers <25 tons	Sample numbers between 25 and 200 tons	Sample numbers > 200 tons
Sand ell (SAN)	Nor Sea	3	3 + 1 pr. 50 tons	6 + 1 pr. 250 tons
Sprat (SPR)	3A	5	10	21
Sprat (SPR)	North Sea	5	10	24
Sprat (SPR)	Baltic	5	10	15
N. Pout (NOP)	Alle	5	10	24
Blue W. (BLH)	All	3	4	4 + 1 pr. 250 tons
Boar Fish (BOR)	All	3	3 + 1 pr. 50 tons	6 + 1 pr. 250 tons

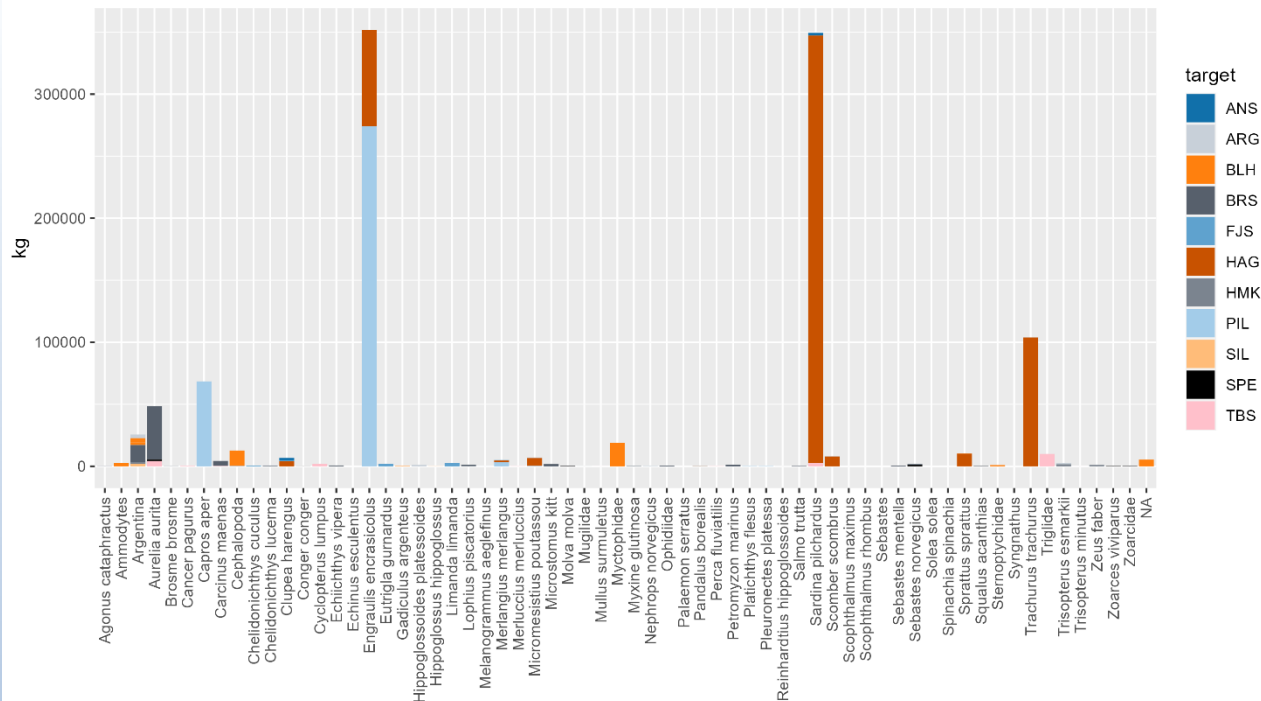
Number of species observed per year and target species

Only industrial landings with selected target



“New” species in the landings

Arter ikke set i 2020-2022, men ikke i 2012-2019



Alternative methods?

Can DNA testing be used for mixed catches?

- **Challenges:**

- How to sample large inhomogenous mixtures?
- Do some species give more DNA \neq weight?
- Is the precision high enough?

- **Potential solutions:**

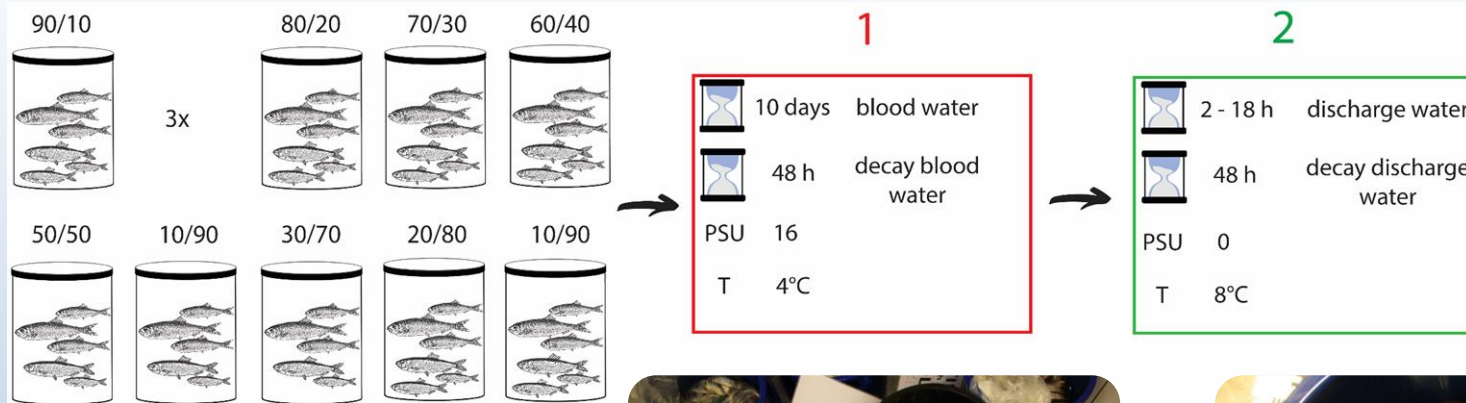
- Sample production water on vessel or in factory = more homogenous DNA composition than the fish
- Calibrate for DNA/weight, with respect to different species
- Test the robustness of inferences with "mock" mixture samples (species proportions and size etc.)



Sprat and herring mixed catches



Experiment:

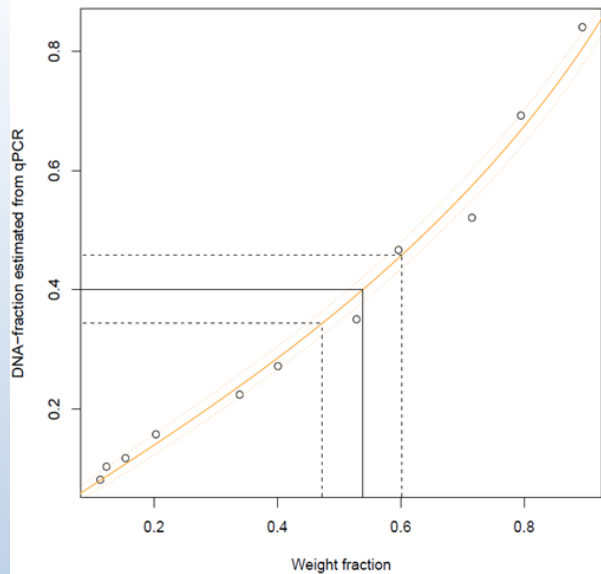


5 kilos in each bucket

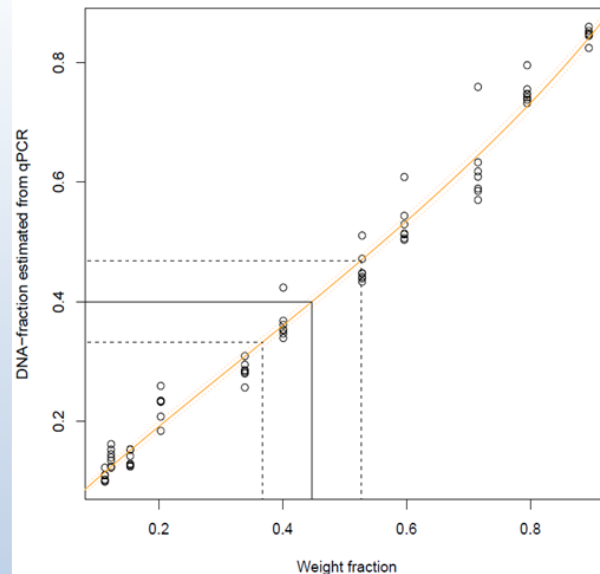


Relationship between weight and DNA fractions (herring)

qPCR-measurements of blood water



qPCR-measurements of discharge water



DNA-fraction measured (μ_i) = 0.4 (95% CI)

Weight fraction estimated = 0.53 ± 0.07



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This article is more than 1 month old

'Phenomenal loophole' in quotas could lead to massive overfishing



„Sprat, for example, is a species protected by a quota, but in samples from one EU state, sprat was underreported by 78%, while hauls of non-quota species were overreported by 81%, according to the audit, which is mentioned in the EU papers. The average underreporting of herring and sprat in another state were 36% and 63% respectively.”

Thanks

