

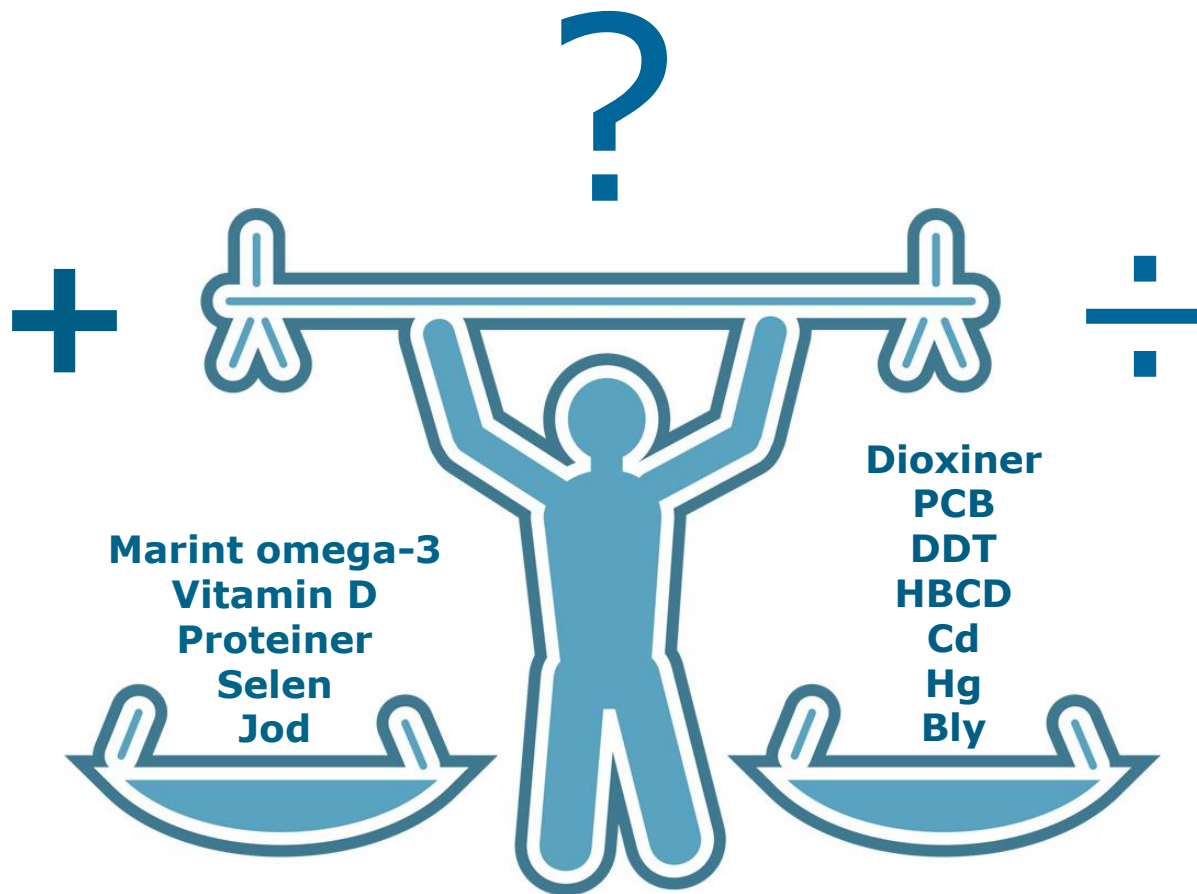
Sild eller makrell -er det ett fett?



Ingvild Eide Graff
Forskningsjef
NIFES

Pelagisk samling, Ålesund 4. desember 2012

www.nifes.no



**Hva vet vi om innhold i
NVG sild og makrell?**

Ingen overskridelser av EUs øvre grenseverdi

- innholdet av miljøgifter varierer med sildens livssyklus

Totalt 800 prøver av filet

Lavest innhold av PBDE, PCB₇, dioksiner og dioksinlignende PCB

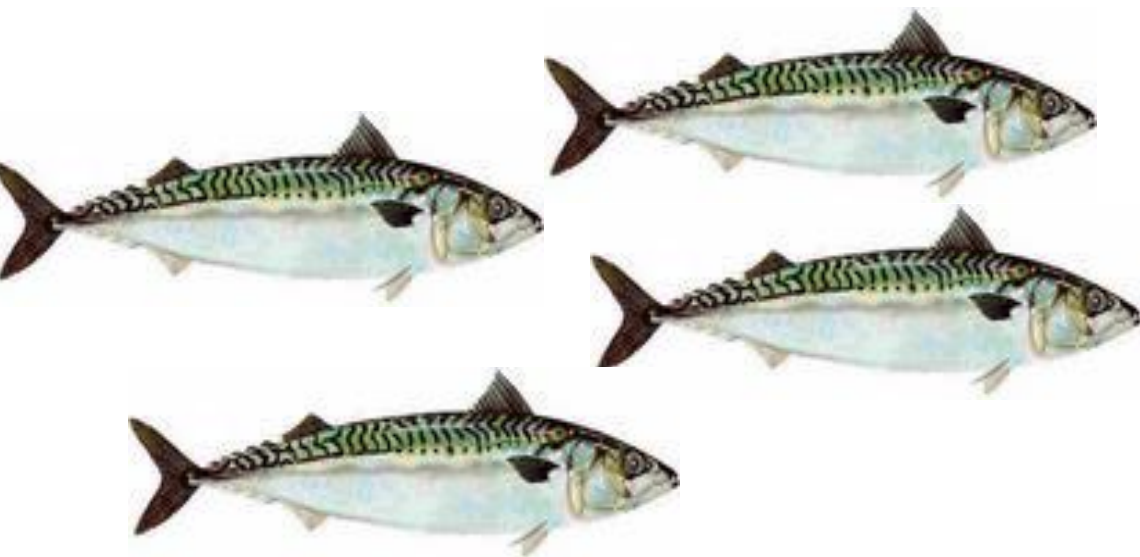
Høyest innhold av PBDE, PCB₇, dioksiner og dioxinlignende PCB

Overvåkning i fremtiden

- Prøver av gyteklare sild fra blå region i januar /februar
- 25 fisk fra 2-3 posisjoner, fordelt fra sør til nord
- Prøvetaking hvert 3.-5. år

Makrell: Generelt lave nivåer av dioksiner, furaner og dioksinliknende PCB

Fremmedstoff	Status 2009
Sum dioksiner	Generelt lave nivåer, høyere i Skagerrak
Sum dioksiner og dioksinliknende PCB	Generelt lave nivåer, Høyere i Skagerrak: 1 fisk overskred EUs øvre grenseverdi



- 850 prøver
- hovedsakelig sentralt i Nordsjøen om høsten (viktigste område og sesong)

38 millioner måltider norsk sjømat hver dag

Fremmedstoffer i sjømat
Kostholdsråd



Hvorfor skal vi da
spise sjømat?

Det er sjømat vi spiser!



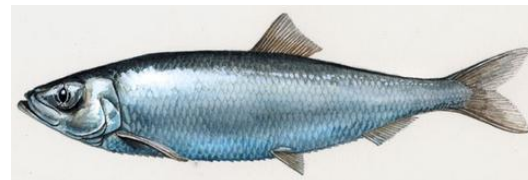
Hva med næringsstoffene?

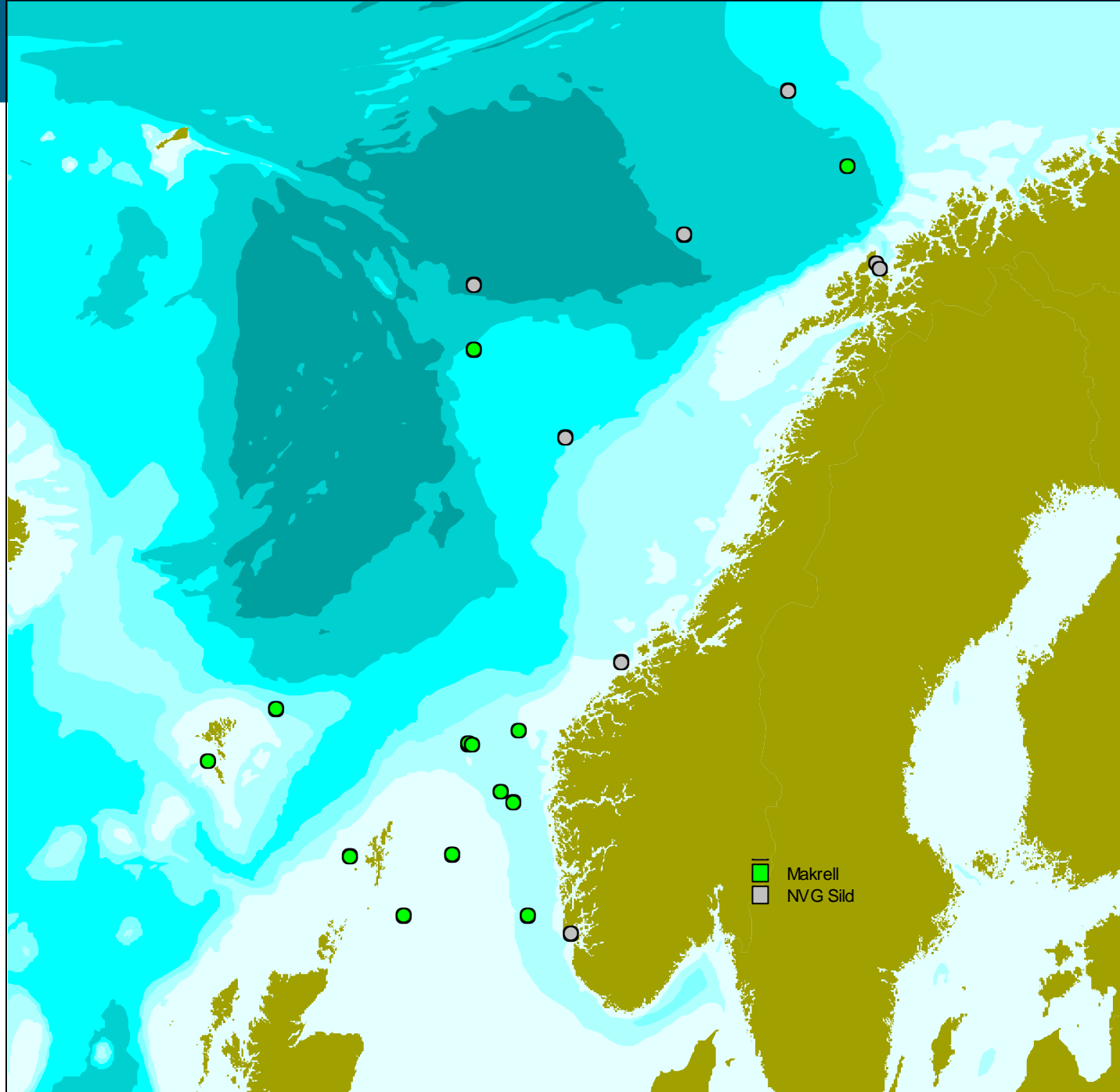
Har noe data på næringsstoffer i sjømat, men få og gamle tall.

FHF-prosjekt #900663: Næringsstoff sild og makrell

- 200 NVG sild
- 200 Stillehavssild

- 350 Nord-østatlantisk makrell
- 200 Japansk makrell





Status norske farvann

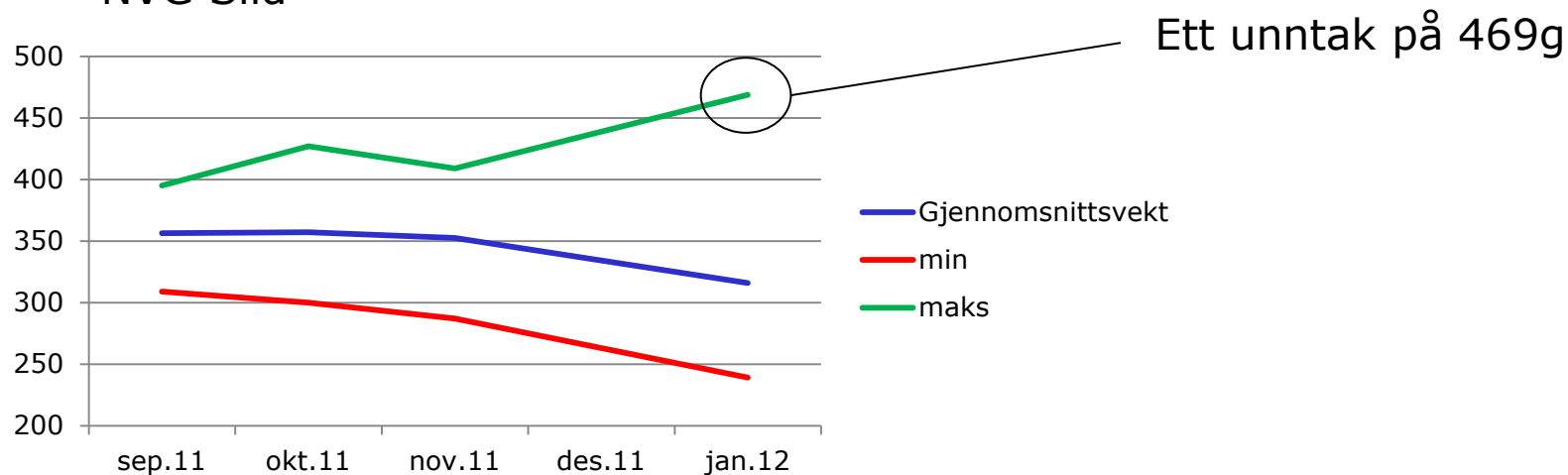
Art	Tidspunkt	Antall	Har mottatt	Har analysert	Gjenstår
NVG sild	Sept 2011	1 (25 fisk)	OK	X	
	Okt-Des 2011	3 (75 fisk)	OK	X	
	Jan-Feb 2012	3 (75 fisk)	OK	X	
	Mars 2012	1 (25 fisk)	OK		X
Makrell	Juli-Aug 2011	2 (50 fisk)	OK	X	
	Sept-Nov 2011	10 (250 fisk)	OK	X	
	Mai-Juni 2012	2 (50 fisk)	OK		X (synergi med nytt prosjekt)

Stillehavsartene: prøveinnsamling pågår.

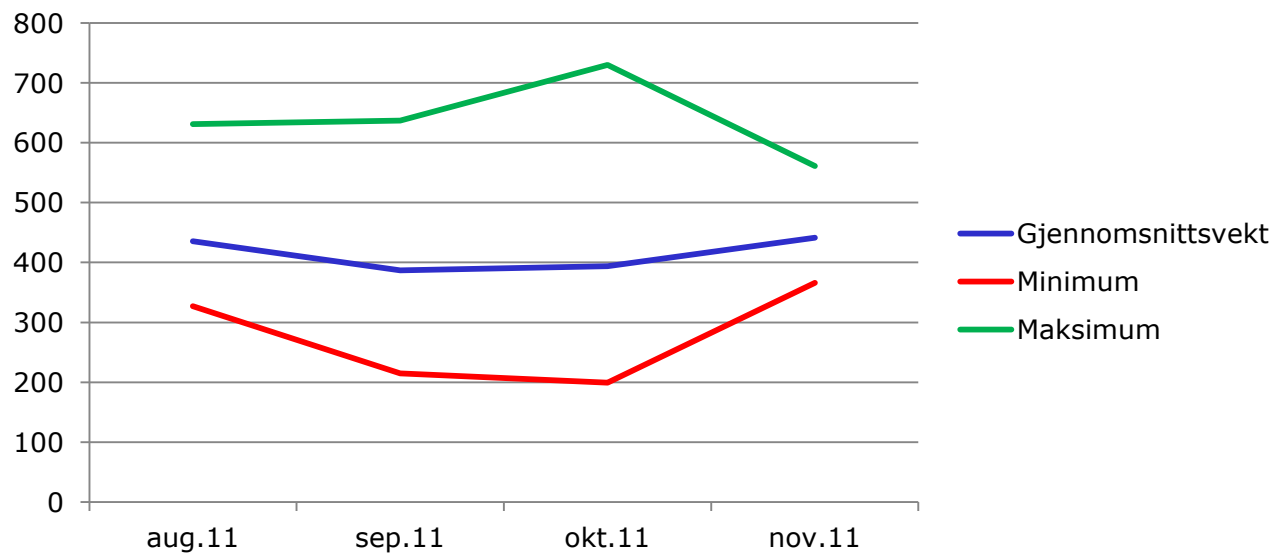
Fett (totalt fettinnhold)
Fettklasser (fosfolipider)
Fettsyrer (for eksempel EPA og DHA)
Vitamin D



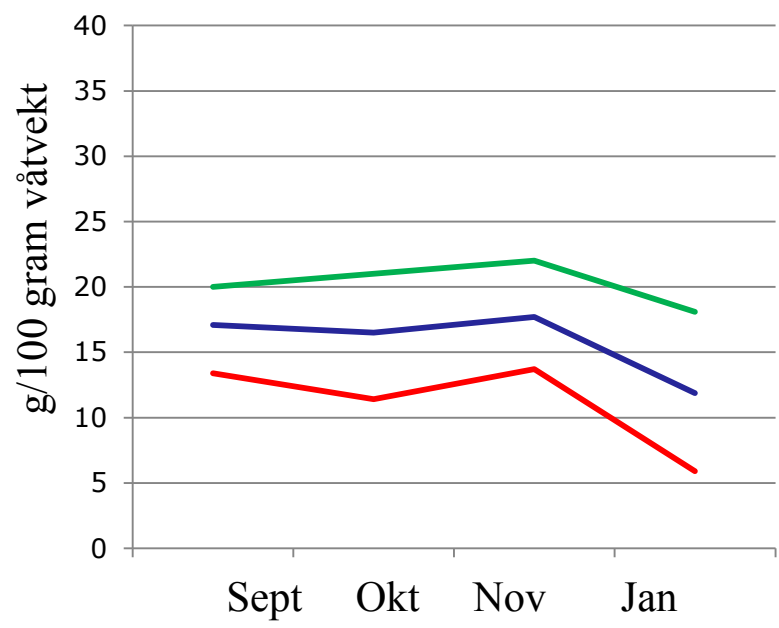
NVG Sild



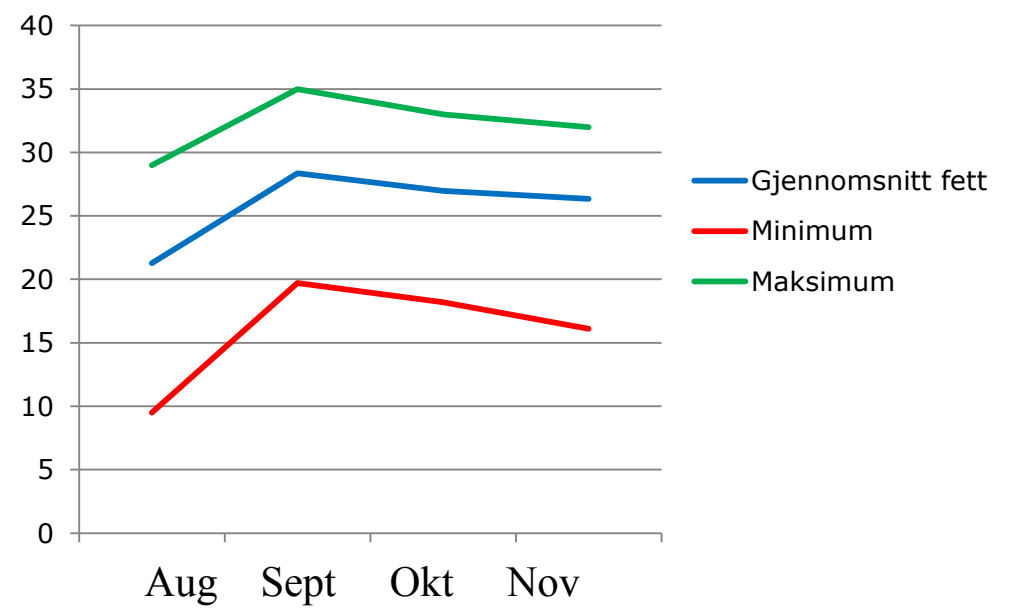
Makrell



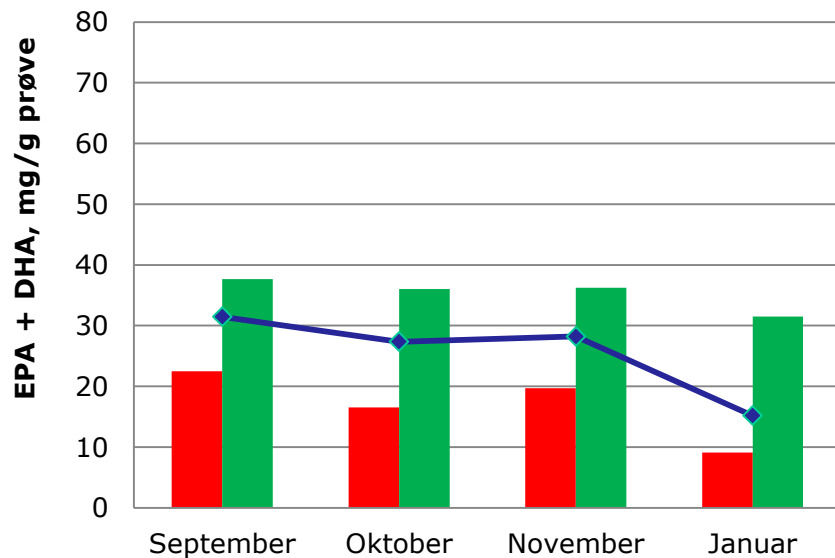
SILD



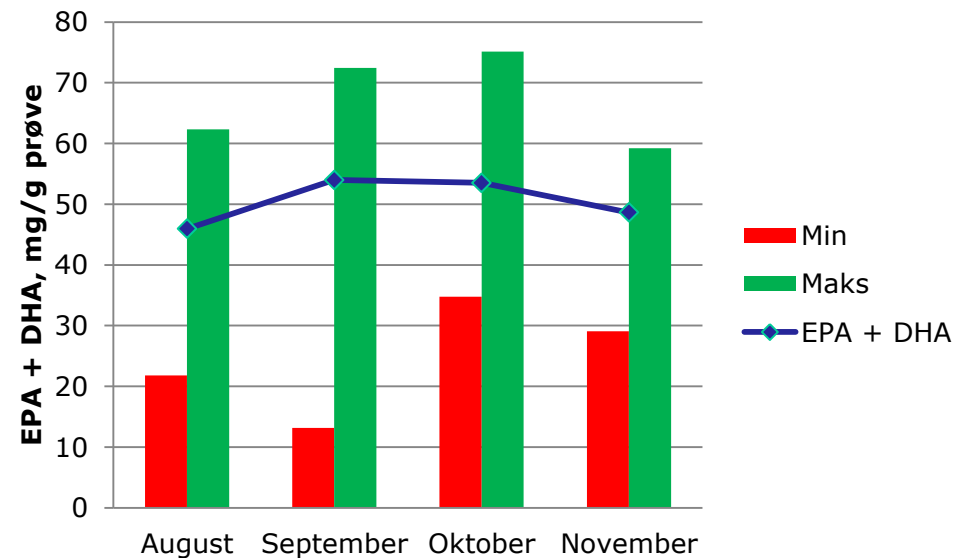
MAKRELL



NVG Sild

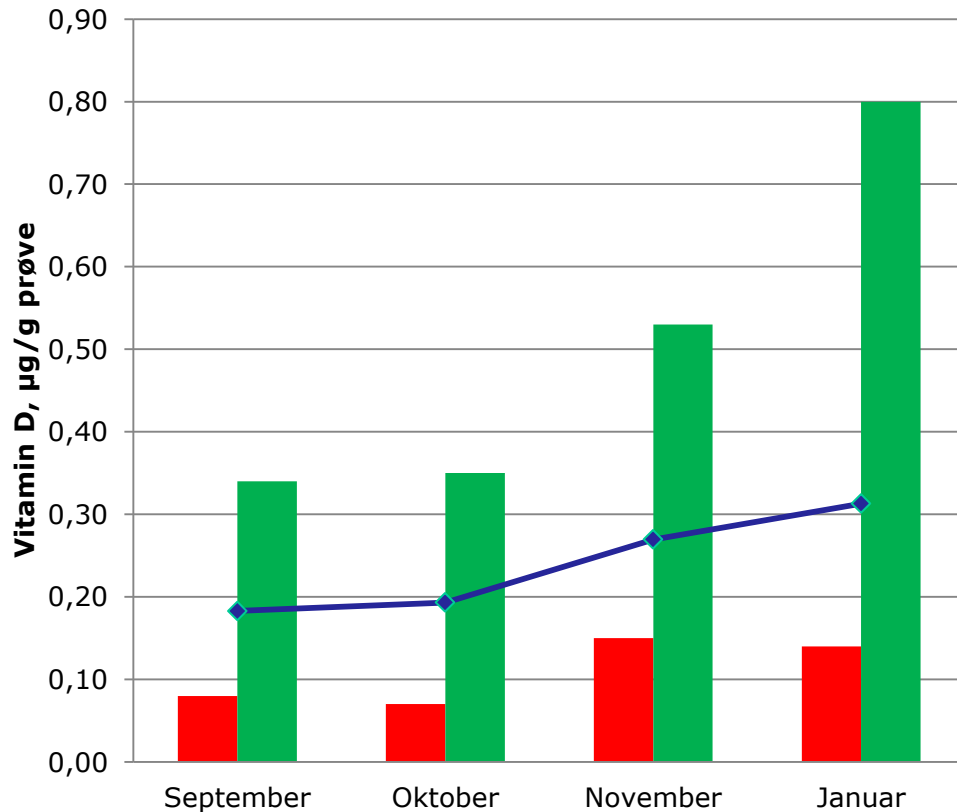


Makrell

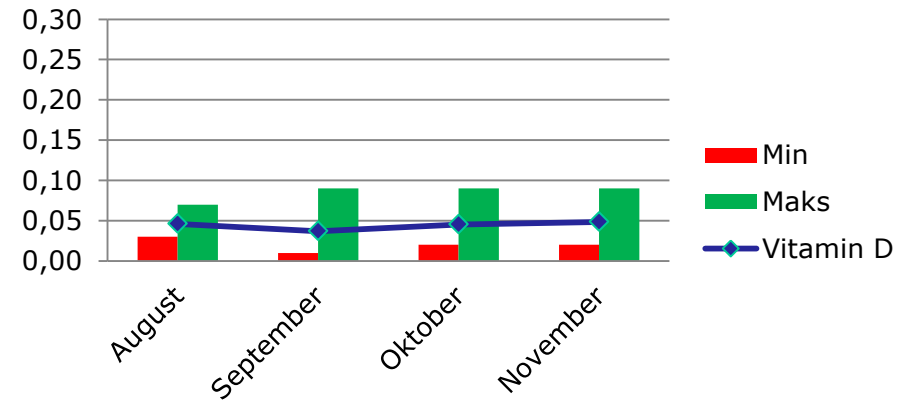


- Sild og makrell er svært gode kilder til marint omega-3
- Innholdet er høyest i makrell
- Laks: ca 21 mg EPA + DHA pr gram

NVG Sild



Makrell

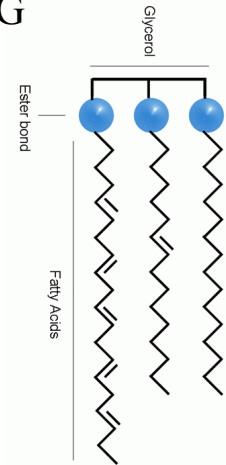


- Sild og makrell inneholder vitamin D gjennom fangstsesongen
- Innholdet er mye høyere i sild enn i makrell

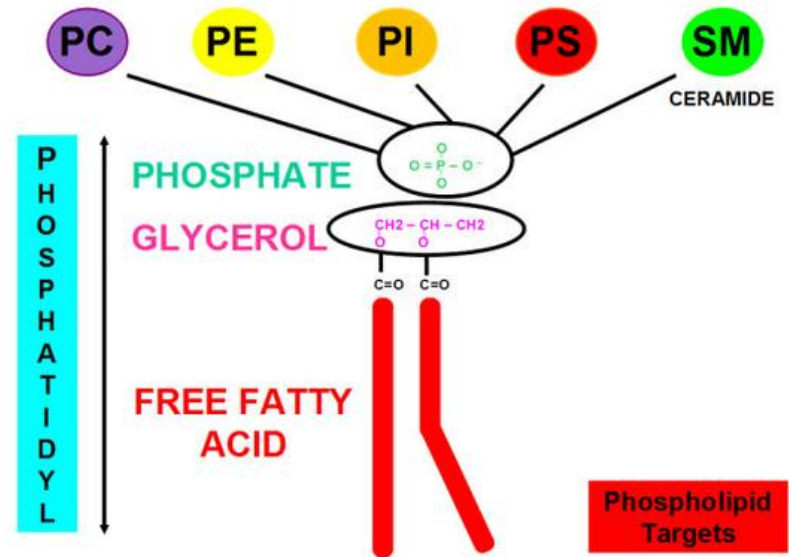
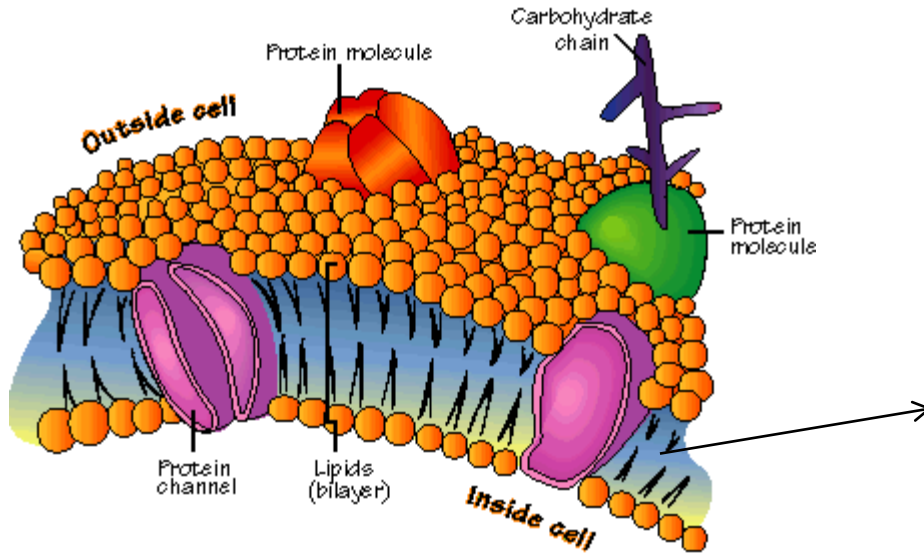
Fosfolipider



Lagringsfett TAG

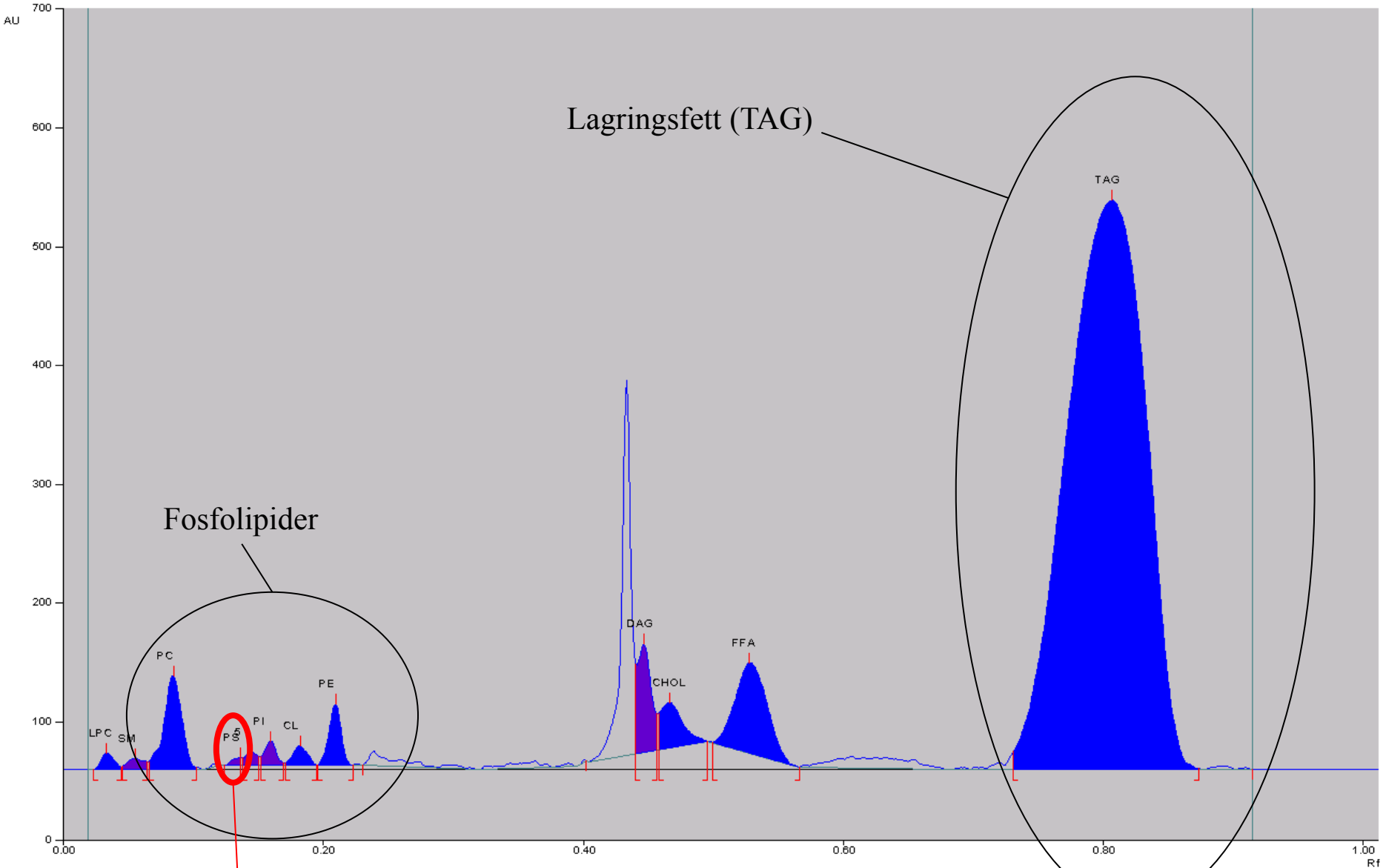


Cellemembran



Fosfolipider makrell (sild veldig likt)

Track 19 , ID: 19



Lagringsfett (TAG)

Fosfolipider

Fosfatidylserin (PS, den minste av de minste)

SILD –alle prøver
analysert
(mg lipid/g prøve)

	LPC	SM	PC	PS	PI	CL	PE	DAG	CHOL	FFA	TAG
Gjennomsnitt	639	51	648	< 15	180	42	165	147	66	388	11 757
Minimum	497	36	490		141	13	76	54	54	205	3 472
Maksimum	806	72	877		206	77	260	216	83	458	15 804

MAKRELL –analysert
fem fisk pr lokalitet
(mg lipid/g prøve)

	LPC	SM	PC	PS	PI	CL	PE	DAG	CHOL	FFA	TAG
Gjennomsnitt	354	27	541	<15	38	0	107	242	156	619	23 327
Minimum	213	13	446		9	0	59	202	95	437	17 910
Maksimum	637	48	691		121	4	211	303	244	825	28 063

Here is what the German lab is saying in terms of Phospholipids:

PHOSPHOLIPIDS: **Herring**

TOTAL PHOSPHOLIPIDS mg 2580 mg/MJ

PHOSPHATIDYLCHOLINE mg 1380 mg/MJ

PHOSPHATIDYLETHANOLAMINE mg 686 mg/MJ

PHOSPHATIDYLSERINE mg 360 mg/MJ

SPHINGOMYELIN mg 115 mg/MJ

??

PHOSPHOLIPIDS: **Mackerel**

TOTAL PHOSPHOLIPIDS mg 2870 mg/MJ

PHOSPHATIDYLCHOLINE mg 443 mg/MJ

PHOSPHATIDYLETHANOLAMINE mg 1380 mg/MJ

PHOSPHATIDYLSERINE mg 480 mg/MJ

SPHINGOMYELIN mg 572 mg/MJ

??

Rådata?
Fosfatidylinositol?

Dear Mrs. Graff,

thanks for your mail concerning phospholipids in fish. First of all I have to correct a **misunderstanding**. The dimension unit used to cite the data from our nutrition tables is wrong. The data refer to **mg/100g edible portion** **not** to mg/MJ!!!

Furthermore you should know that the Deutsche Forschungsanstalt für Lebensmittelchemie (DFA) in Freising is indeed the editor of the Souci Fachmann Kraut Nutrition Tables but **we don't analyse the data by ourselves**.

Staatl. geprüfte Lebensmittelchemikerin
Deutsche Forschungsanstalt für Lebensmittelchemie
Lise-Meitner-Str. 34
85354 Freising

Average data given per 100g edible portion:

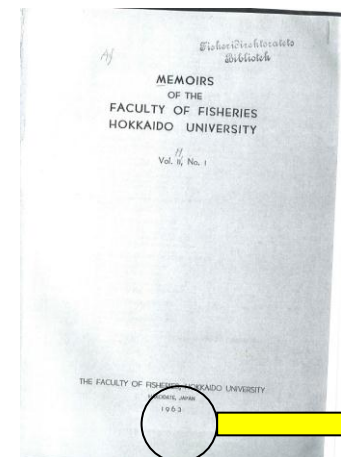
	Herring	Mackerel	Cod	Trout
Total fat (g)	17,8	11,9	0,69	2,73
Total Phospholipids (mg)	2580	2870	564	330
Phosphatidylcholine (mg)	1380	443	389	220
Phosphatitdylethanolamine (mg)	686	1380	107	70
Phosphatidylserine (mg)	360	480	28	14
Sphingomyelin (mg)	115	572		6
Phosphatidylinositol (mg)				6

Kjente ikke til fosfatidylinositol (vanligvis større enn fosfatidylserine)

Dear Ingvild,

Thanks for your mail giving more information to me what you are searching for. It's not possible to list all the papers we have used to collect our datas. But at least one of it is free available in the net. The link is:

[Technical &The Phospholipid Content of Foods 1 - SpringerLink](http://www.springerlink.com/index/PPKN825255085440.pdf)
www.springerlink.com/index/PPKN825255085440.pdf
by JL Weihrauch - 1983



Tabeller fra boken, makrell

Table 43. Lipid Content of the Body Tissues of Mackerel (11)
(Indicated by Values in mg per 100g of Fresh Tissue)

Japansk makrell!

Tissue		Ordinary muscle		Dark-colored muscle		Liver	
		♂	♀	♂	♀	♂	♀
Total Lipid	g	1.996	1.814	10.138	10.543	5.781	4.967
Lecithin	mg	151.7	239.6	110.5	774.1	414.7	371.9
Phosphatidylethanolamine	mg	257.8	183.1	1441.7	1308.5	1413.0	643.3
Phosphatidylserine	mg	96.0	75.4	624.5	334.5	368.8	176.0
Sphingomyelin	mg	289.8	158.6	150.9	994.3	296.3	889.7
Cerebroside	mg	24.4	58.5	274.5	614.6	426.3	1241.5
Total Phospholipids	mg	795.1	656.7	2327.6	2410.4	2491.8	2080.9
Total Conjugated Lipids	mg	819.7	715.2	2602.1	4026.6	2918.1	3322.4
Neutral Fat	mg	1176.3	1098.8	7535.9	6516.4	2862.9	1644.6

Rød muskel
480 mg/100g

Hvit muskel:
85.7 mg/100g

Table 39. Lipid Content of the Body Tissues of Herring (II)

Tissue	Ordinary muscle		Dark-colored	
	♂	♀	♂	
Lecithin	mg	511.2	486.3	1384.2
Phosphatidylethanolamine	mg	229.0	208.9	686.4
Phosphatidylserine	mg	147.1	132.6	359.7
Acetal Lipid	mg	14.0	12.6	39.1
Sphingomyelin	mg	68.5	62.7	114.6
Cerebroside	mg	187.6	160.8	408.6
Cholesterol	mg	83.5	80.4	265.6
Total Phospholipids	mg	969.8	903.1	2584.0
Total Conjugated Lipids	mg	1157.4	1063.9	2992.6
Neutral Fat	mg	2663.5	2592.7	16347.0
Phospholipid/Cholesterol		11.6	11.2	9.7

Rød muskel: 360 mg/100g

Hvit muskel: 140 mg/100g (gjennomsnitt hun og han)

Wikipedia

Food	PS Content in mg/100 g
Bovine brain	713
Atlantic mackerel	480
Chicken heart	414
Atlantic herring	360
Eel	335
Offal (average value)	305
Pig's spleen	239
Pig's kidney	218
Tuna	194
Chicken leg, with skin, without bone	134
Chicken liver	123
White beans	107
Soft-shell clam	87
Chicken breast, with skin	85
Mullet	76
Veal	72
Beef	69

kilde: Souci SW, Fachmann E, Kraut H (2008). *Food Composition and Nutrition Tables*. Medpharm Scientific Publishers Stuttgart

Studier gjort på fosfolipider måler ofte effekt av EPA + DHA, ikke av fosfolipidene i seg selv.

Dement Geriatr Cogn Disord. 2010;28(5):467-74. Epub 2010 Jun 3.

Phosphatidylserine containing omega-3 fatty acids may improve memory abilities in non-demented elderly with memory complaints: a

Abstract:
The aim of this study was to evaluate the effect of phosphatidylserine (PS) on mental stress. A randomized, double-blind, placebo-controlled trial was conducted. The study design (T1 and T2) after 42 days of treatment. Tasks using electroencephalogram (FFT) determined the effect of PS (group 1 trial 2). Results for Beta-amyloid protein (Aβ) and results for Beta-amyloid protein (Aβ) are shown.

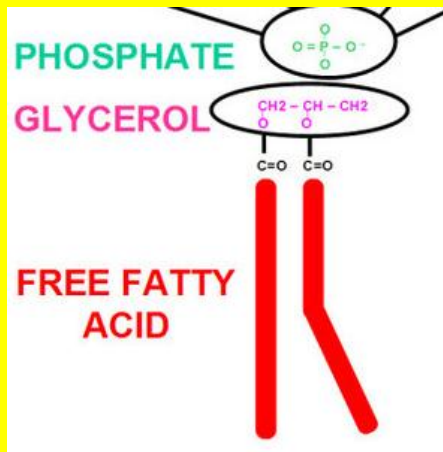
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Keywords:
Aging
Choline
Dementia
Learning and memory
Phosphatidylserine
Kritik



EPA + DHA

Fosfolipid
inkl
EPA + DHA

the hippocampus. These findings demonstrate that KR-PS the neuronal and cognitive impairments that occur with SOY-PS. These data indicate that oral ad substitute for bovine cerebral cortex PS (BC-PS) as the function in elderly people.

Keywords:
Erythrocyte
Membrane fluidity

supplement group.

Although this study is a preliminary investigation, we believe these findings to be of great speculative and interpretative interest to better understand the complex and multi-factorial mechanisms behind the possible links between diets, their functional components and possible molecular processes that contribute to increasing the risk of developing MCI and Alzheimer's.

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Oppsummering

- Sild og makrell er begge svært gode kilder til marint omega-3
- Makrell har høyere innhold av marint omega-3 enn sild
- Sild inneholder betydelig mer vitamin D enn makrell
- Tynt belegg for at makrell og sild er gode kilder til fosfatidylserin
- Spennende å følge analysene av stillehavsartene

