

# METABOLISM AND TURNOVER OF LIPIDS OF ZOOPLANKTON KEY SPECIES IN KONGSFJORDEN

Martin Graeve

Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany

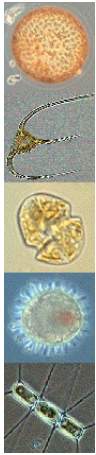
**2008 AWIPEV Workshop**  
8-10 October 2008, Bremen, Germany







# Food chain 1



Phytoplankton FA



*Limacina helicina*

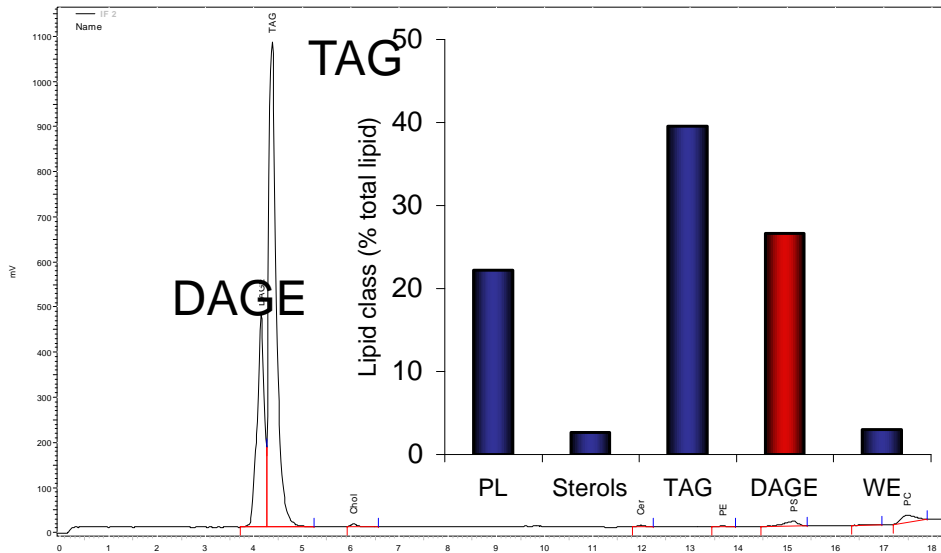
(Size 1 - 4 mm)

Monophage nutrition



(Size 4 - 15 mm)

*Clione limacina*

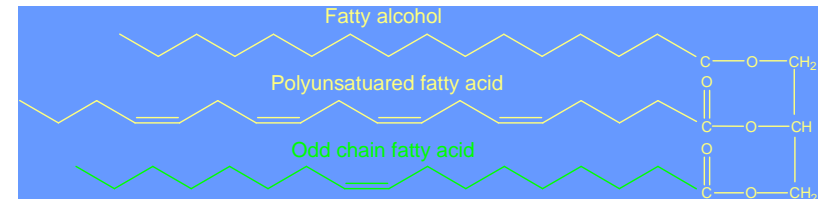


HPLC-ELSD

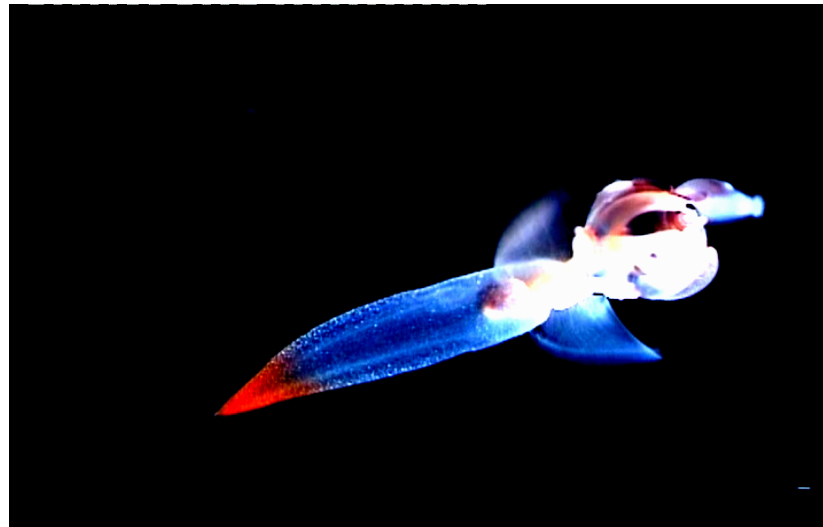
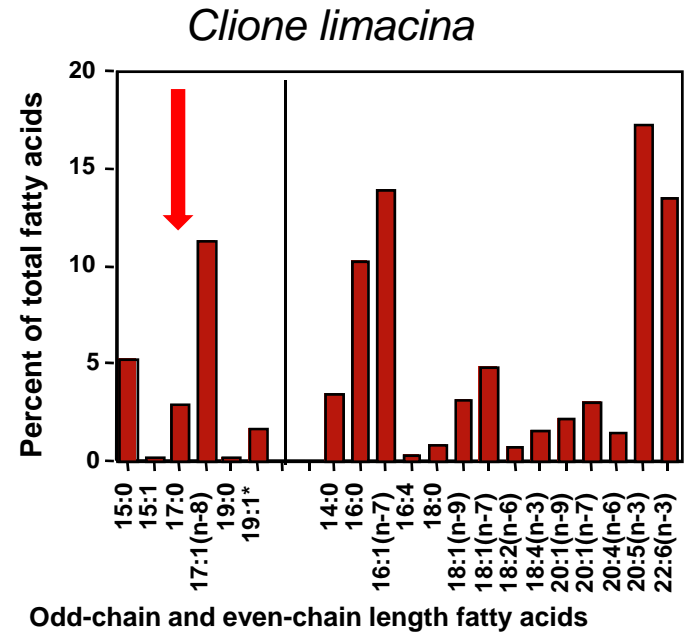
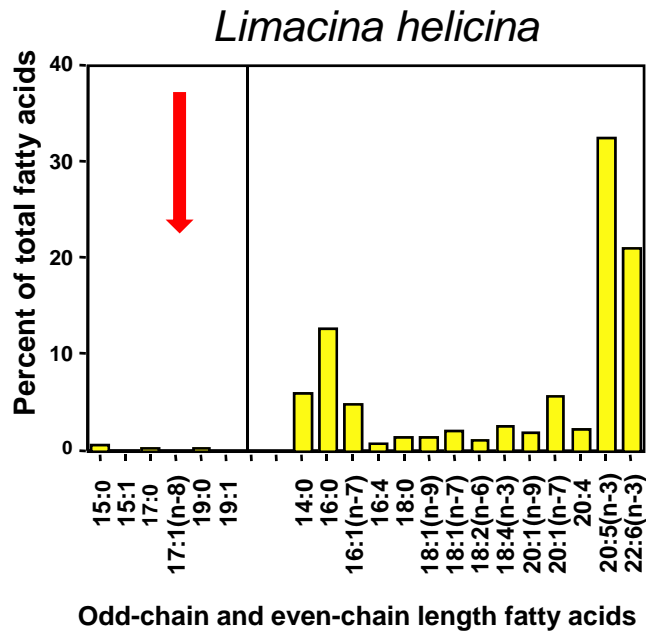
Graeve & Janssen in prep.

- Phospholipids (PL)
- Triacylglycerols (TAG)
- Diacylglycerol ethers (DAGE)
- Wax esters (WE)

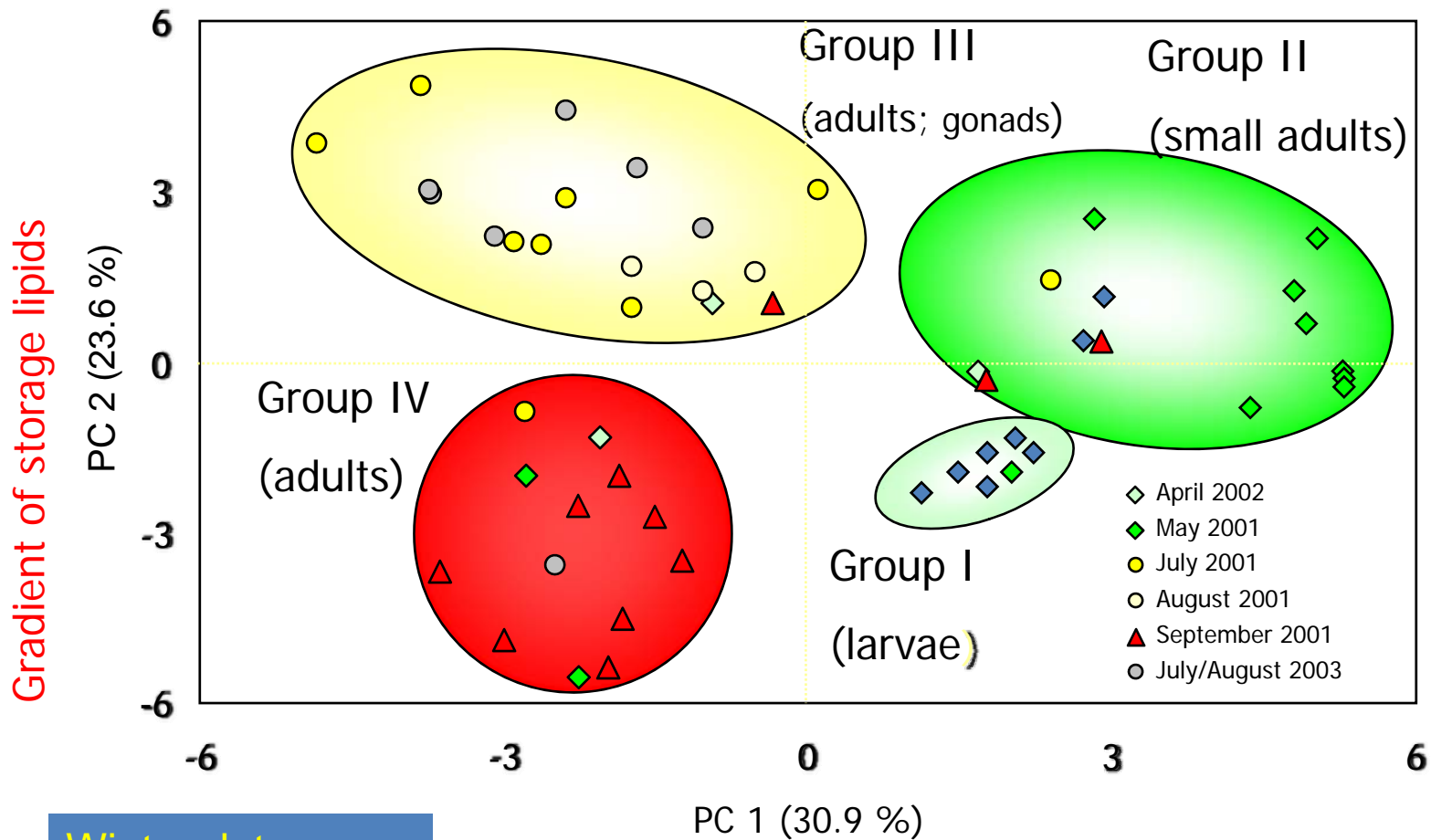
Storage of TAG und DAGE



# Food chain 1



# Lipid dynamic of *C. limacina* from the Arctic



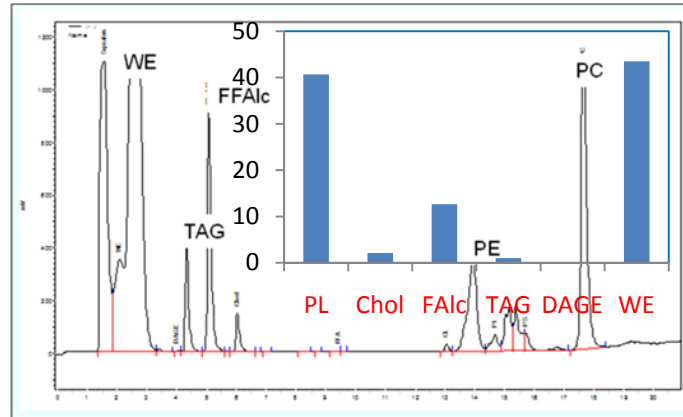
Winter data are still missing

Gradient of development

# Food chain 2



*Calanus glacialis*



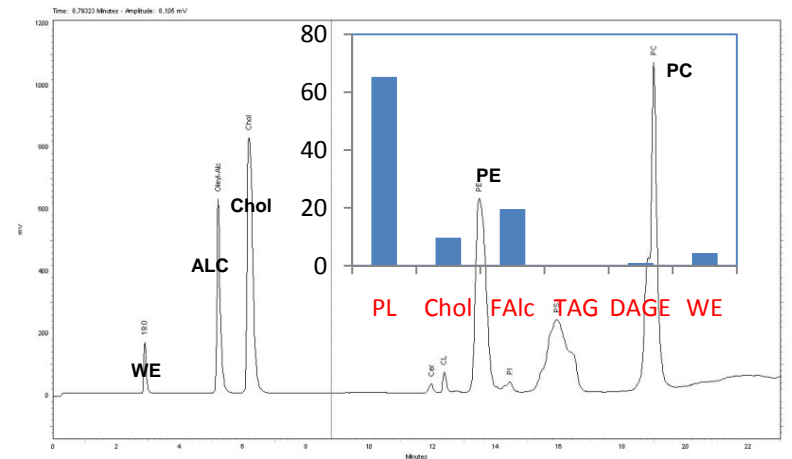
*Mertensia ovum*



*Berøe cucumis*



*Thysanoessa inermis*



# Food chain 2 - *Mertensia ovum*

## *Mertensia ovum*: fatty acids and alcohols of total lipids

Fatty acids	A	B
	%	
14:0	4.9	11.4
16:0	13.2	12.2
16:1(n-7)	2.2	7.7
16:2(n-4)	0.2	0.7
16:3(n-4)	0.3	1.0
16:4(n-1)	0.0	1.4
17:0	0.5	0.0
18:0	3.3	3.0
18:1(n-9)	3.7	4.2
18:1(n-7)	1.2	1.2
18:2(n-6)	0.8	1.0
18:3(n-3)	0.5	0.7
18:4(n-3)	1.9	5.0
20:1(n-9)	0.9	0.6
20:1(n-7)	2.9	0.3
20:4(n-6)	0.4	0.5
20:4(n-3)	0.7	1.0
20:5(n-3)	24.7	12.4
22:1(n-11)	0.7	6.1
22:1(n-9)	2.2	3.5
22:6(n-3)	32.7	23.4

Alcohols	A	B
	%	
14:0	1.4	2.3
16:0	1.8	6.5
16:1(n-7)	0.0	5.0
18:1(n-9)	5.1	2.1
18:1(n-7)	0.0	1.5
20:1(n-9)	3.4	30.5
<b>22:1(n-11)</b>	<b>88.3</b>	<b>52.1</b>
WE%	34.8	71.2

## *Mertensia ovum*: free fatty alcohol composition (mass%)

Month	May	July	Sept.	All samples	
	Mean (2)		Mean (2)	Mean	±SD (8)
14:0	0.6	13.0	0.8	2.0	±4.5
16:0	2.3	14.4	1.2	2.8	±4.9
16:1(n-7)	1.7	0.0	0.4	0.5	±1.2
18:1(n-9)	0.5	0.0	0.2	0.3	±0.4
18:1(n-7)	0.5	0.0	0.0	0.1	±0.3
20:1(n-9)	19.4	29.7	3.9	15.3	±16.0
<b>22:1(n-11)</b>	<b>75.1</b>	<b>42.8</b>	<b>93.6</b>	<b>79.0</b>	<b>±21.0</b>

# Food chain 2 - *Beröe cucumis*

## *Beröe cucumis*: fatty acids and alcohols of total lipids

Fatty acids	%	SD
14:0	5.9 ± 2.4	
16:0	10.8 ± 3.0	
16:1(n-7)	3.1 ± 1.8	
16:2(n-4)	0.3 ± 0.2	
16:3(n-4)	0.2 ± 0.1	
16:4(n-1)	0.0 ± 0.0	
17:0	0.4 ± 0.3	
18:0	4.2 ± 1.6	
18:1(n-9)	6.0 ± 1.9	
18:1(n-7)	1.0 ± 0.4	
18:2(n-6)	1.4 ± 0.5	
18:3(n-3)	1.4 ± 0.8	
18:4(n-3)	2.1 ± 0.9	
20:1(n-9)	6.6 ± 3.2	
20:1(n-7)	1.3 ± 0.5	
20:4(n-6)	0.9 ± 0.3	
20:4(n-3)	0.8 ± 0.3	
20:5(n-3)	15.5 ± 5.0	
22:1(n-11)	4.6 ± 2.5	
22:1(n-9)	3.1 ± 0.8	
22:6(n-3)	20.9 ± 6.8	

Alcohols	%	SD
14:0	2.0 ± 2.2	
16:0	2.9 ± 2.3	
16:1(n-7)	0.1 ± 0.2	
18:1(n-9)	1.3 ± 0.6	
18:1(n-7)	2.2 ± 1.6	
20:1(n-9)	21.6 ± 11.1	
22:1(n-11)	64.9 ± 21.7	
WE%	51.1 ± 21.4	



# Conclusion

## Food chain 1 *Clione limacina*

Monophage nutrition (*Limacina helicina*)

Storage of TAG and DAGE

De novo biosynthesis of odd chain fatty acids

## Food chain 2 *Mertensia ovum*

Feeding on copepods (*C. glacialis*, *C. finmarchicus*) and krill

Digestion and absorption of WE and TAG

Storage of free alcohols (especially 22:1 alcohol)???

## Food chain 2 *Beroë cucumis*

Preys on other ctenophores

Contains wax ester (dietary ?)

Ingestion/storage of free alcohols

# Thank you, for your kind attention!



This work was done in co-operation with:

Haakon Hop, Stig Falk-Petersen, Charlotte Gannefors,  
Marte Lundberg, Eva Leu, **(NPI)**  
Jørgen Berge, Janne Søreide, **(UNIS)**  
Patrick Mayzaud **(LOV)**

Many thanks to **AWIPEV** Koldewey Station  
for logistic support

and to my workgroup Marine Chemistry (AWI)

