

INTENSIVE PRODUCTION OF LOBSTER (*HOMARUS GAMMARUS*)

By Jan Ove Evjemo, K. Gruven, E. Sigstadstø, K. Johnsen, M. Andersen
and Y. Olsen

NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (NTNU)
SINTEF FISHERIES AND AQUACULTURE

E-mail:

Jan.ove.evjemo@bio.ntnu.no

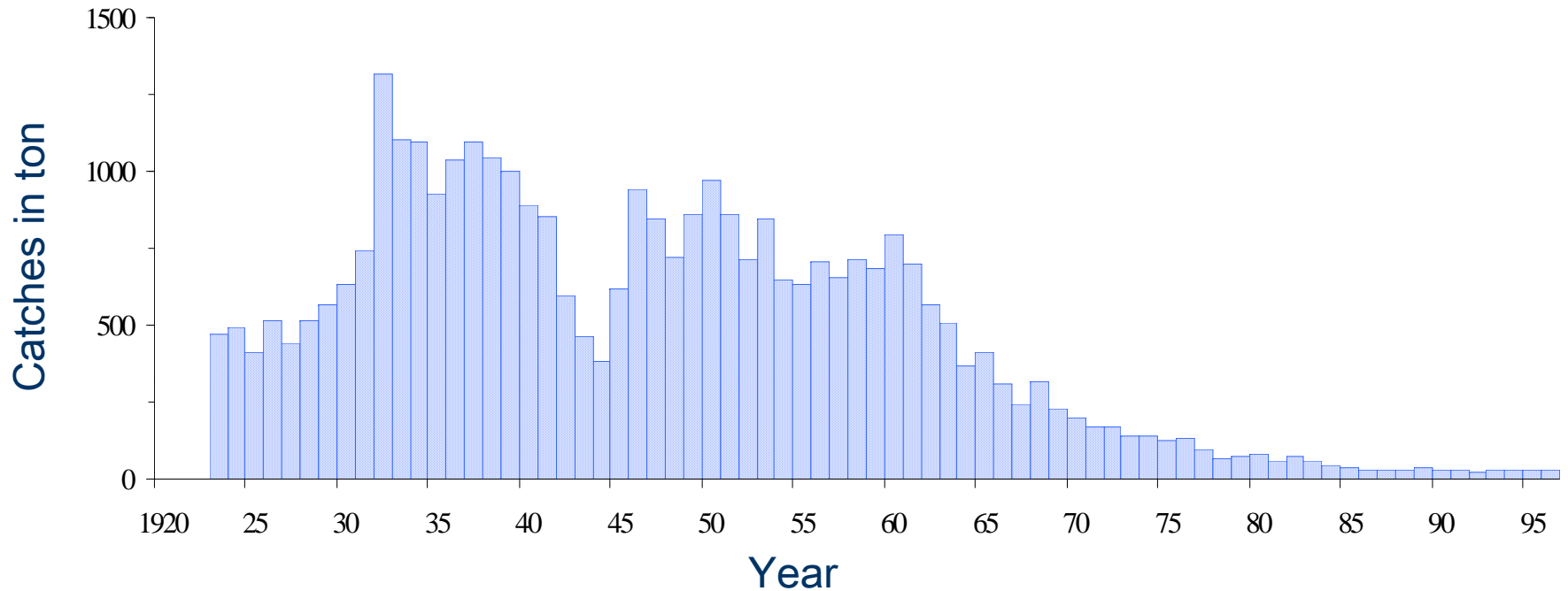
Jan.o.evjemo@sintef.no



LOBSTER IS A NEW SPECIES IN MARINE AQUACULTURE

- In Norway there are two hatcheries
 - Production of lobster juveniles for sea ranching
 - Intensive 2 - 2½ year production to plate size lobster (market size (300 – 400 g))
- Several small companies have license for sea ranching
 - At present there is a lack of lobster juveniles
- The hatcheries are still in an early phase of their building/up scaling process

CATCHES OF LOBSTER IN NORWEGIAN WATERS



Total catches (in ton) of European lobster (*Homarus gammarus* L.) in Norway from 1923 until 1996 (data from Fiskeridirektoratets fiskeristatistikk)

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Ton	30	35	45	59	52	40	40	52	50	58	62	57	54
Value in 1000 NOK	3887	4639	6400	9490	9287	7900	8100	9932	8992	10755	11780	11919	13392
NOK/kg	130	133	142	161	179	198	203	191	203	185	190	209	290

FIRST FEEDING – PELAGIC STAGES



NEWLY HATCHED LARVAE

STAGE IV (18 – 25 days)



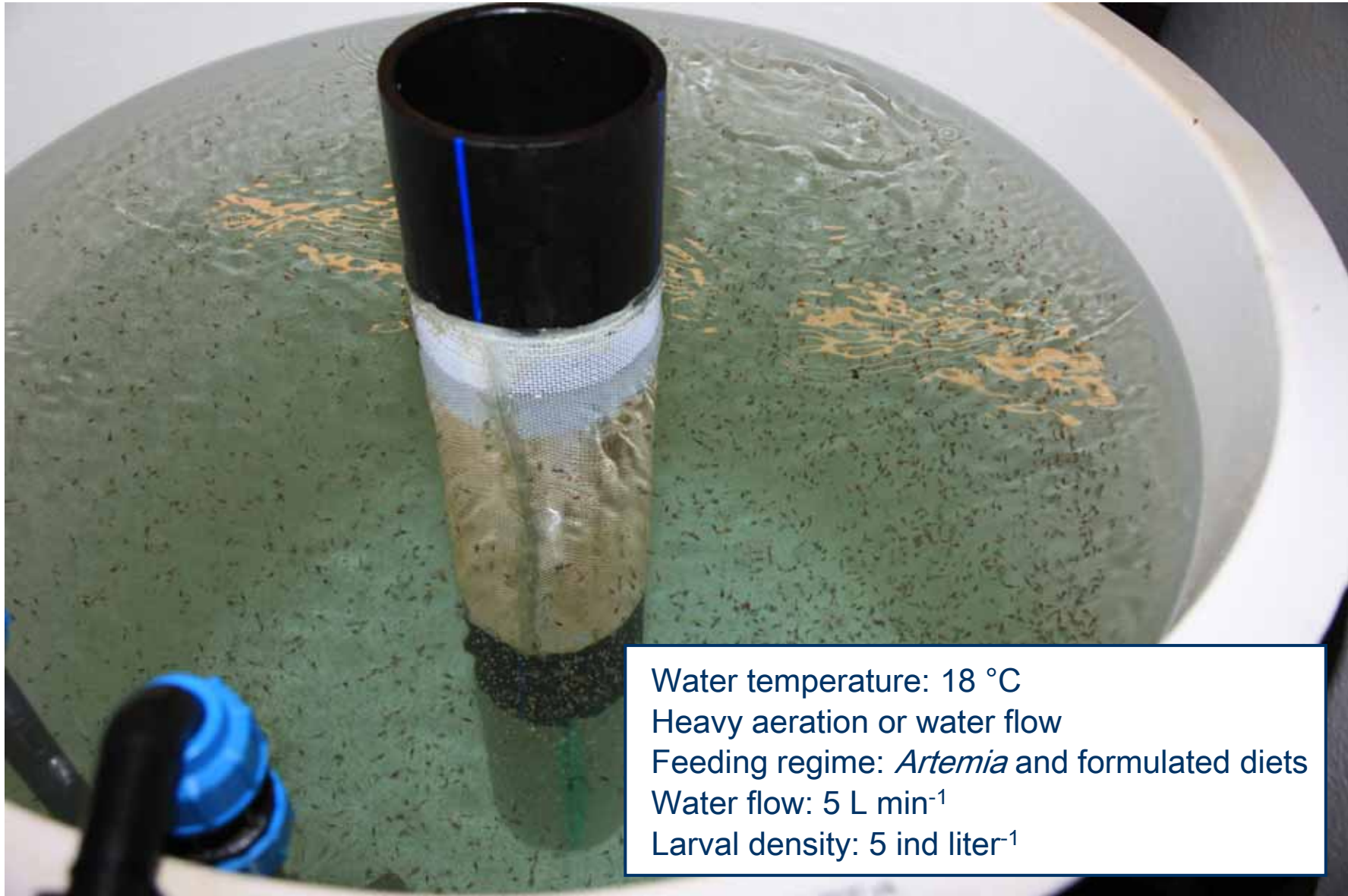
NEWLY HATCHED LOBSTER LARVAE

CANNIBALISM IS THE MAJOR CHALLENGE
RELATED TO INTENSIVE PRODUCTION OF
LOBSTER

FIRST FEEDING IN A CLOSED SYSTEM

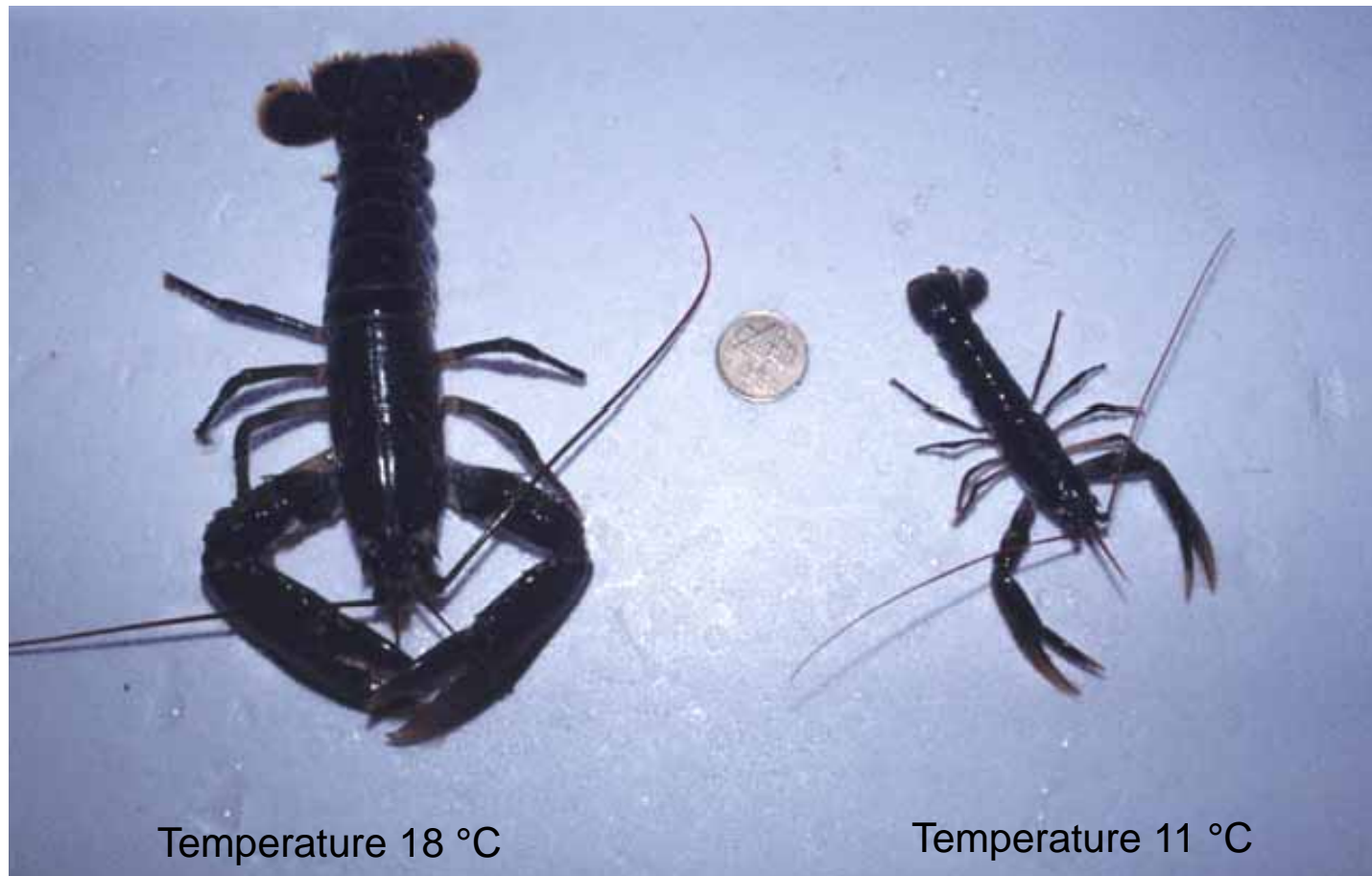


FIRST FEEDING AN OPEN SYSTEM (Volume 1000 L)



TEMPERATURE IS VERY IMPORTANT FOR THE GROWTH RATE

Effect of two different temperatures after 15 months growth



INDUSTRIAL SYMBIOSIS AT STATOIL - HYDRO MONGSTAD AND TJELDBERGODDEN

Possible to integrate different aquaculture species to the activity at the industry plants of Mongstad and Tjelbergodden

Waste water from the industry: temperature $> 20\text{ }^{\circ}\text{C}$



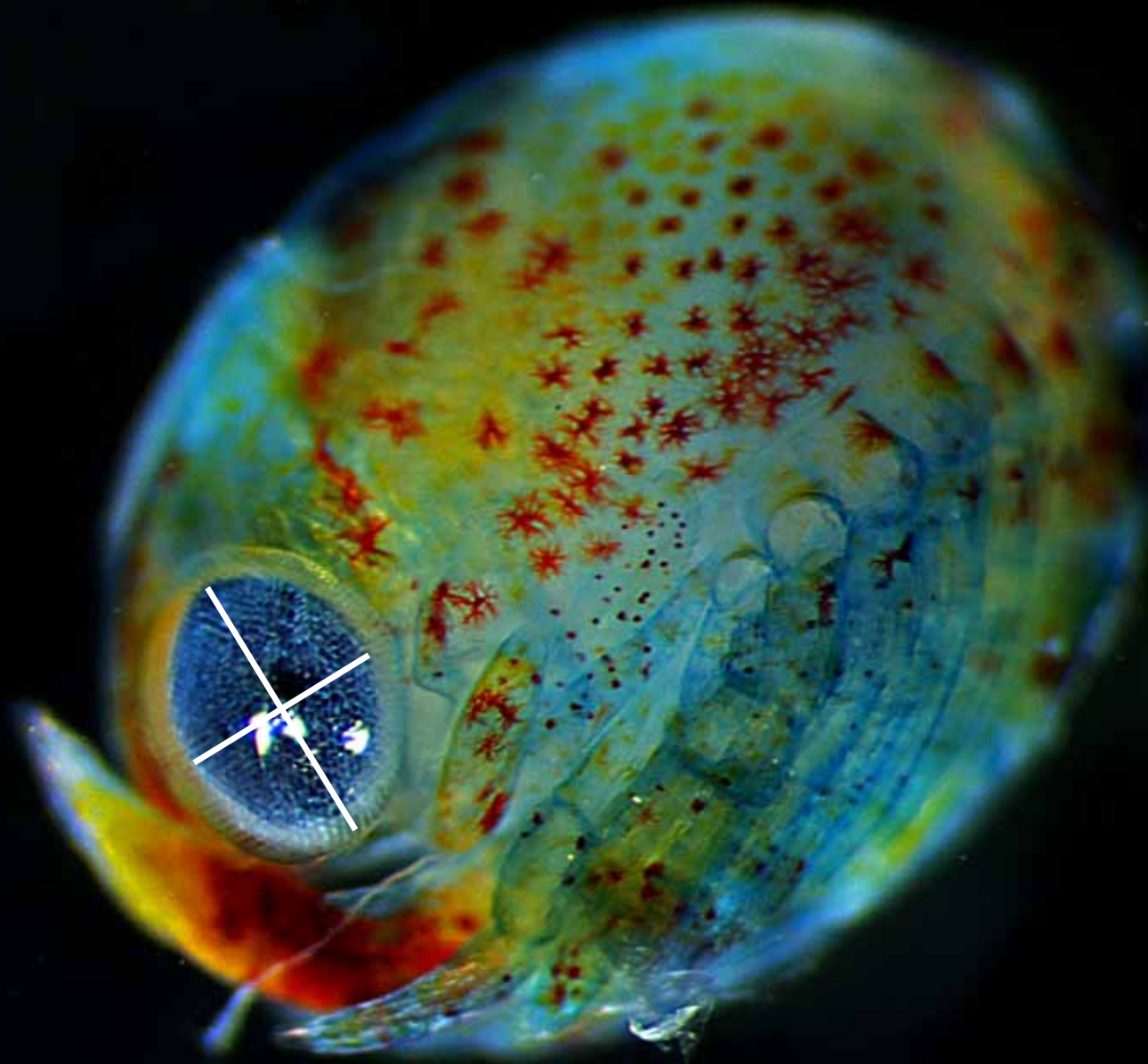
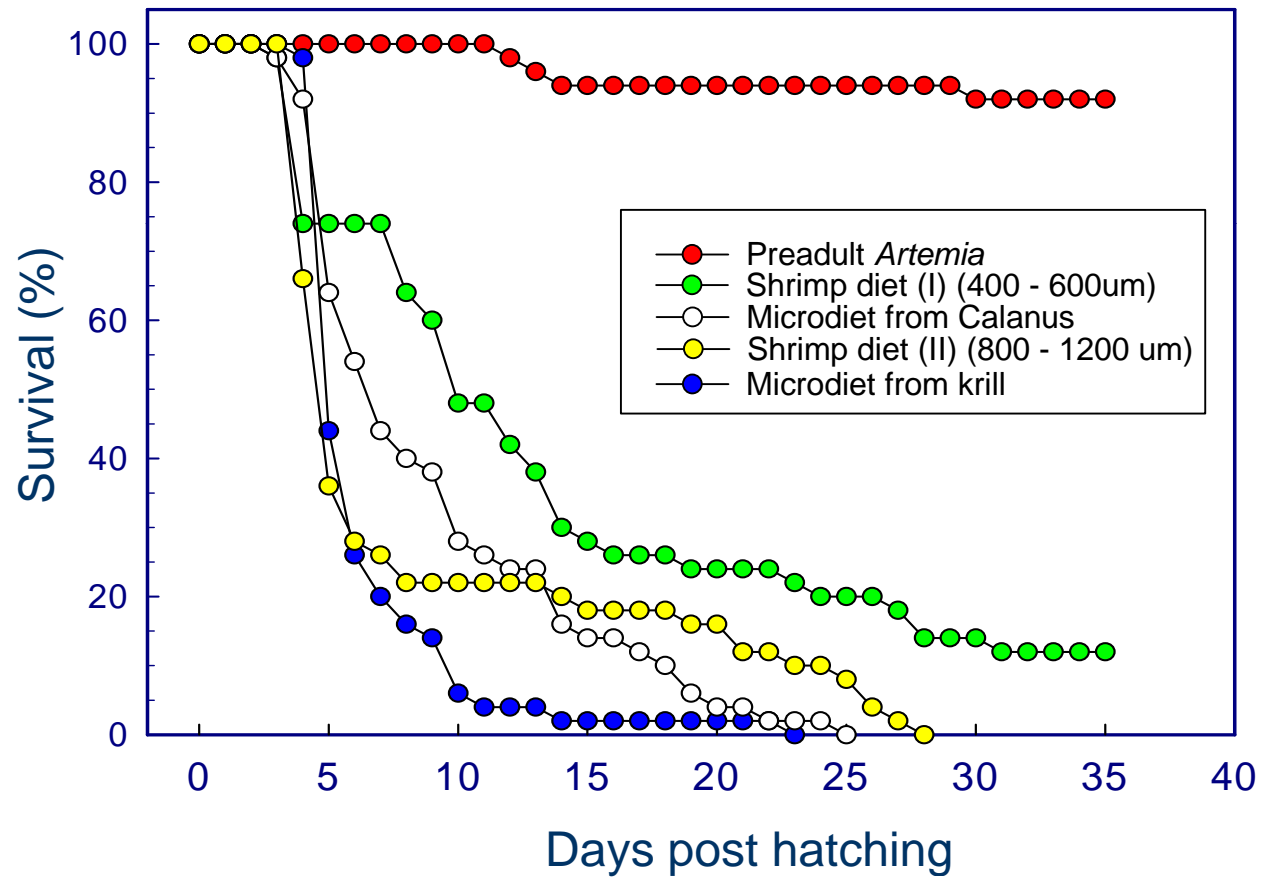
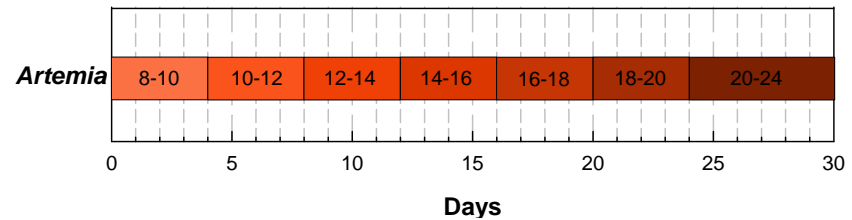


Photo T. Bardal, NTNU

$$\text{Mean eye diameter (D)} = (H_1 + W_1)/2$$
$$\text{Weeks until hatching} = (600 \mu\text{m} - D) / [(2.6 \times T) - 8.3]$$

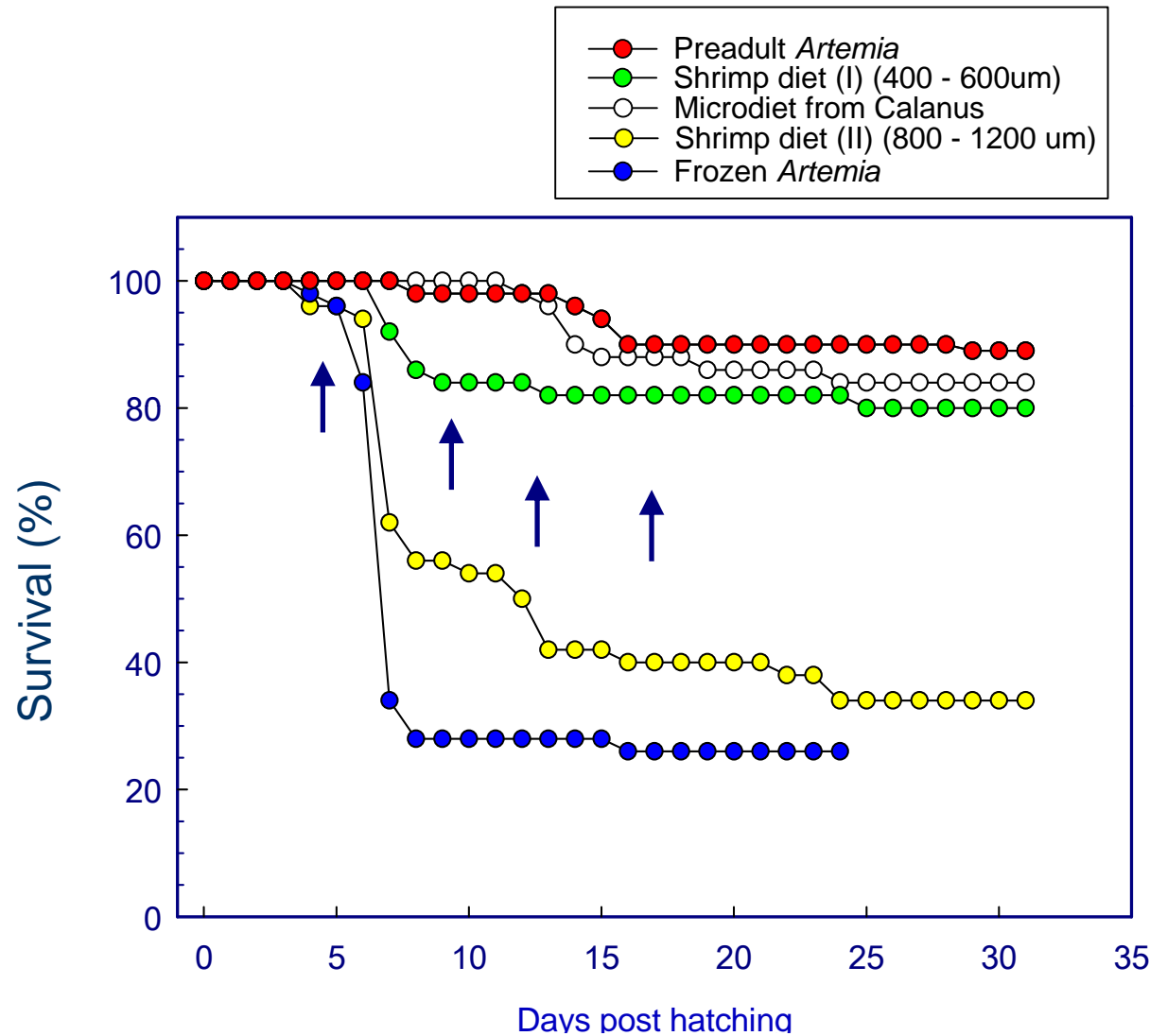
FIRST FEEDING OF LOBSTER LARVAE

Preadult *Artemia* and formulated diets



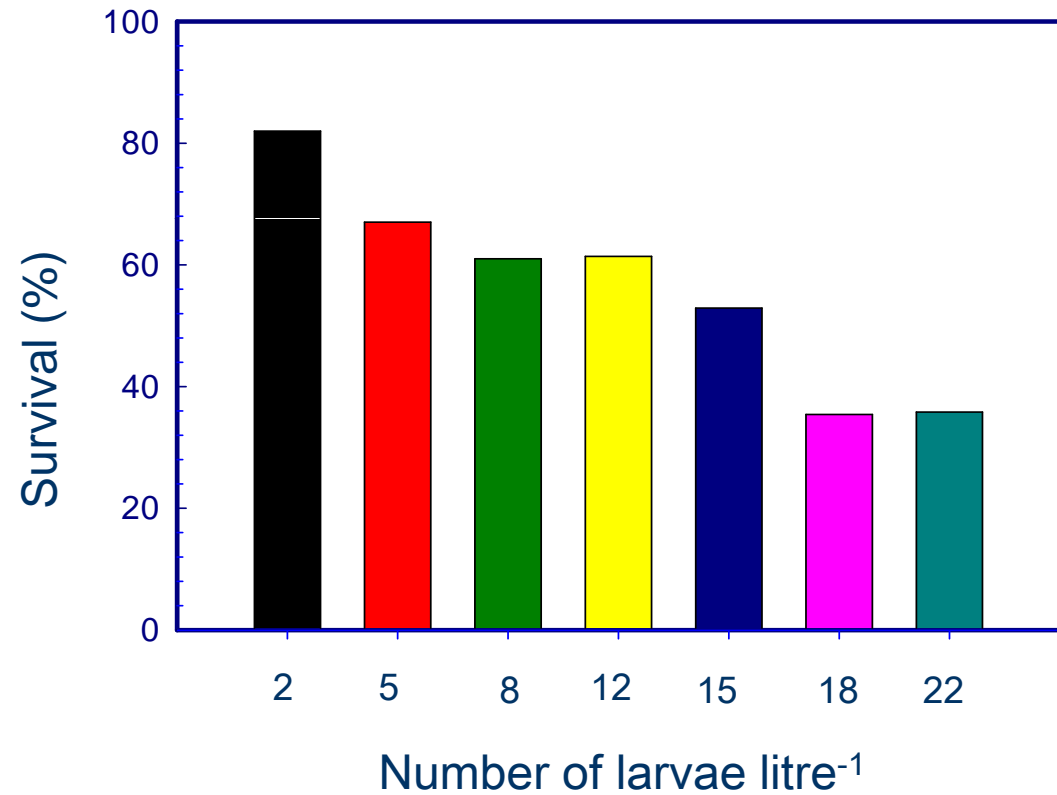
FIRST FEEDING OF LOBSTER LARVAE

Co-feeding (preadult *Artemia* and formulated diets)

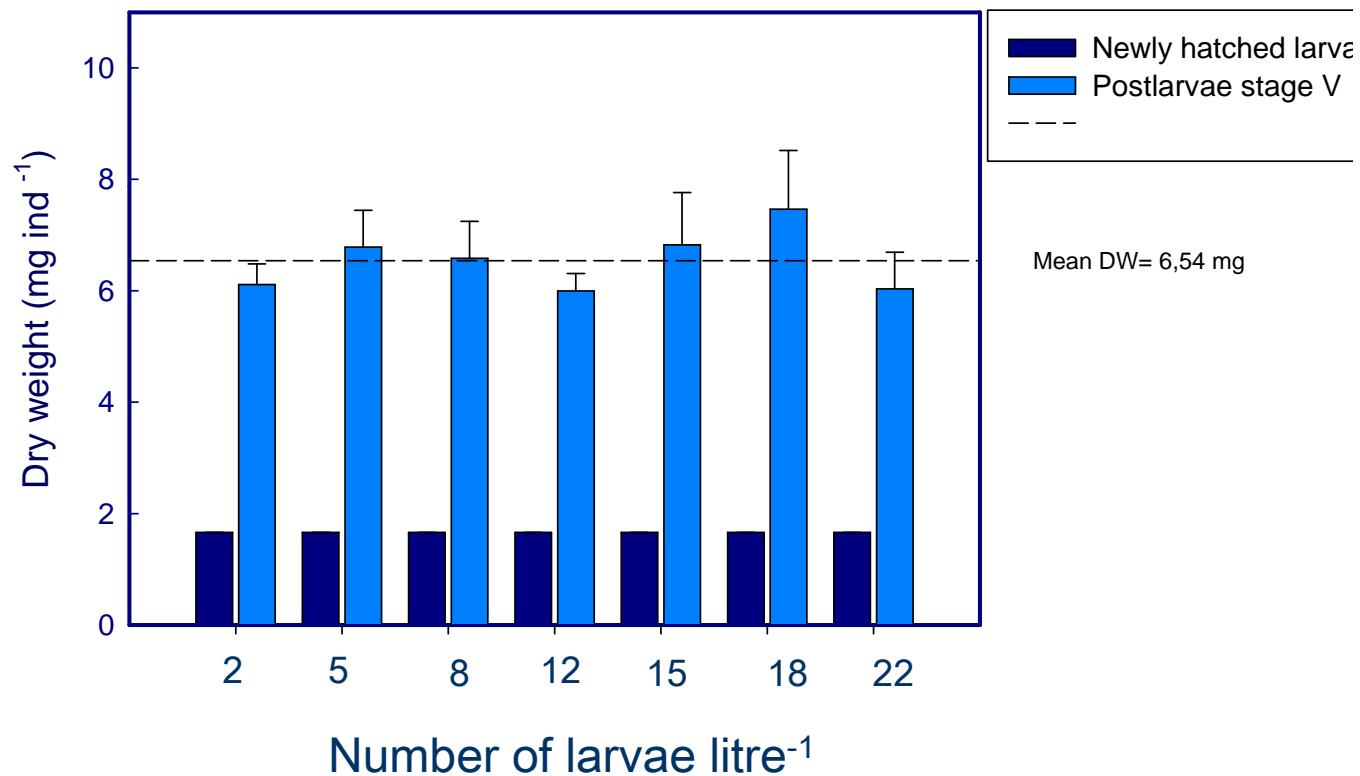


FIRST FEEDING OF LOBSTER LARVAE

Enriched *Artemia* nauplii (fed *Isochrysis galbana* (2 – 3 days) and emulsified lipids (24 h))



DRY WEIGHT OF LOBSTER LARVAE AT HATCHING AND POST LARVAL STAGE V

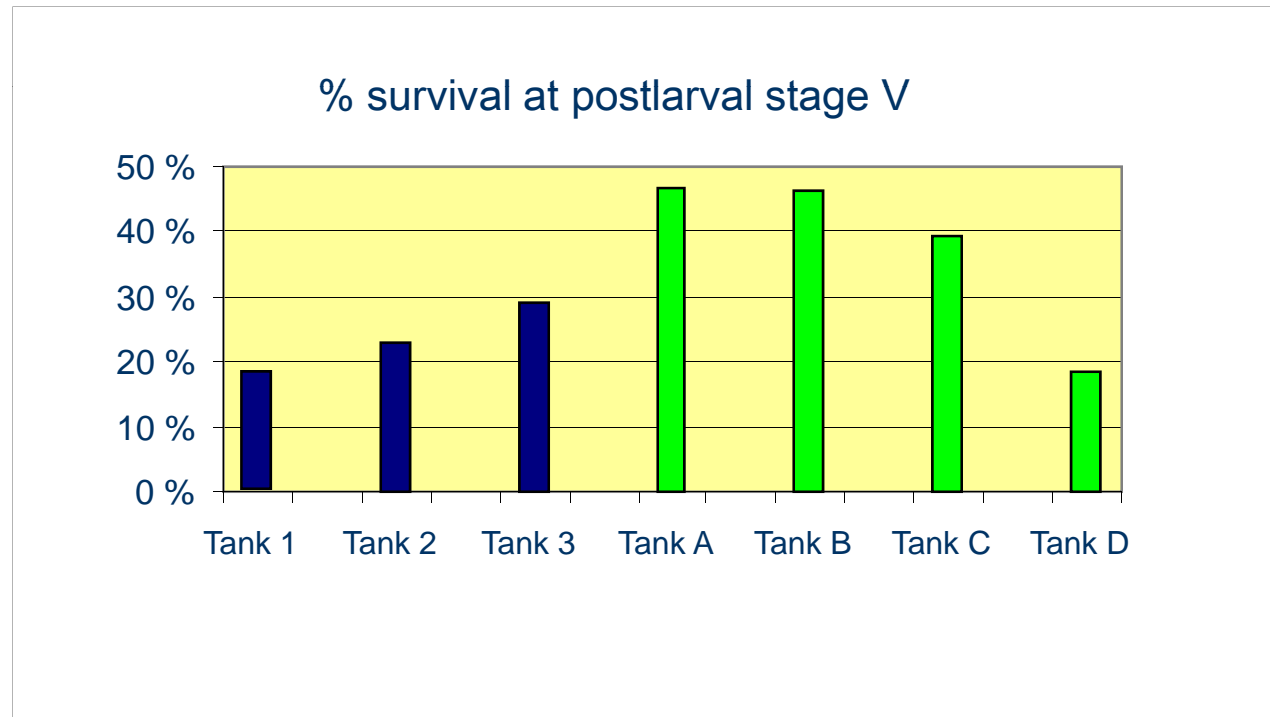


FIRST FEEDING AN OPEN SYSTEM

DIFFERENT FEEDING REGIMES

Tank 1-3 = un enriched *Artemia* + algae pasta (*Isocrysis galbana*)

Tank A-D = un enriched *Artemia* + live algae (*Isocrysis galbana*)

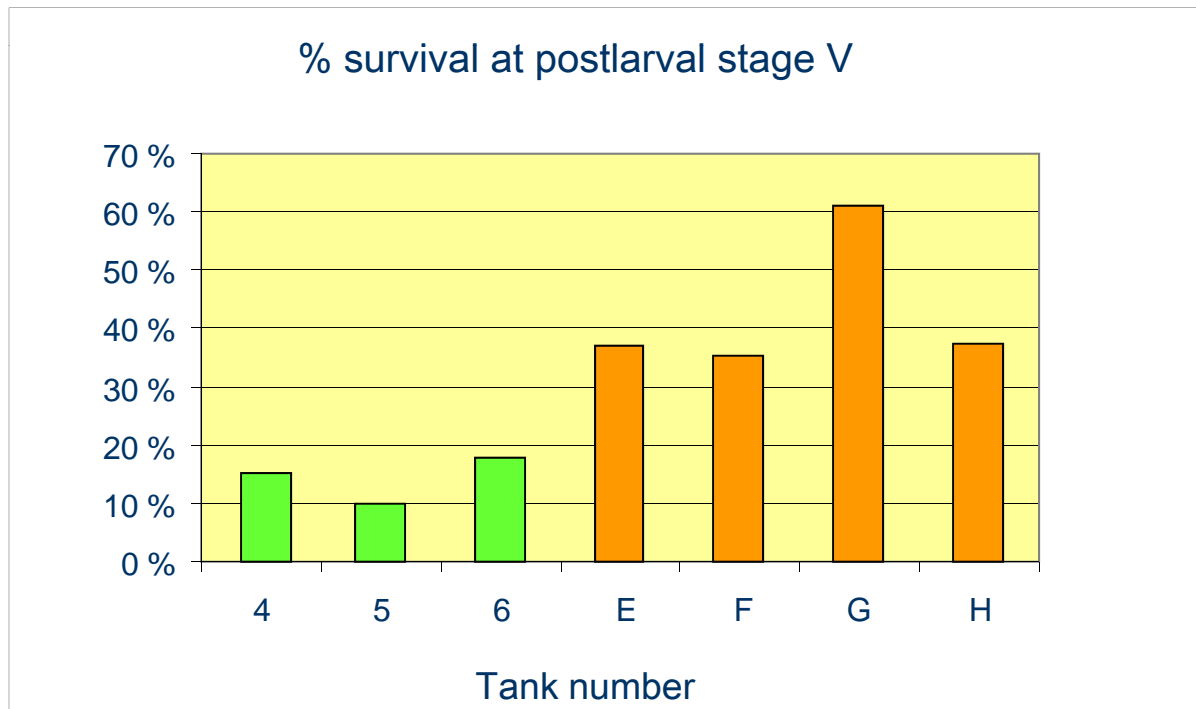


FIRST FEEDING AN OPEN SYSTEM

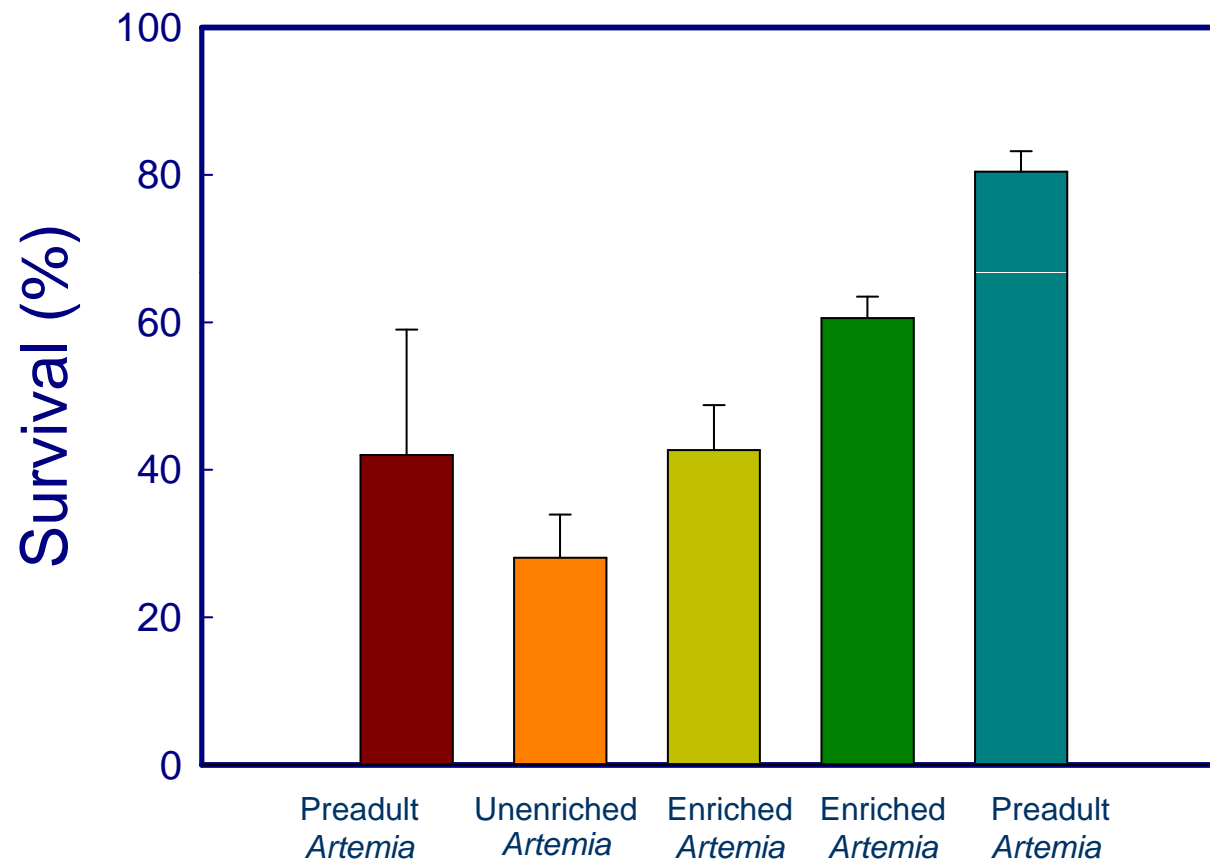
DIFFERENT FEEDING REGIMES

Tank 4-6 = unenriched *Artemia* + live algae (*Isocrysis galbana*)

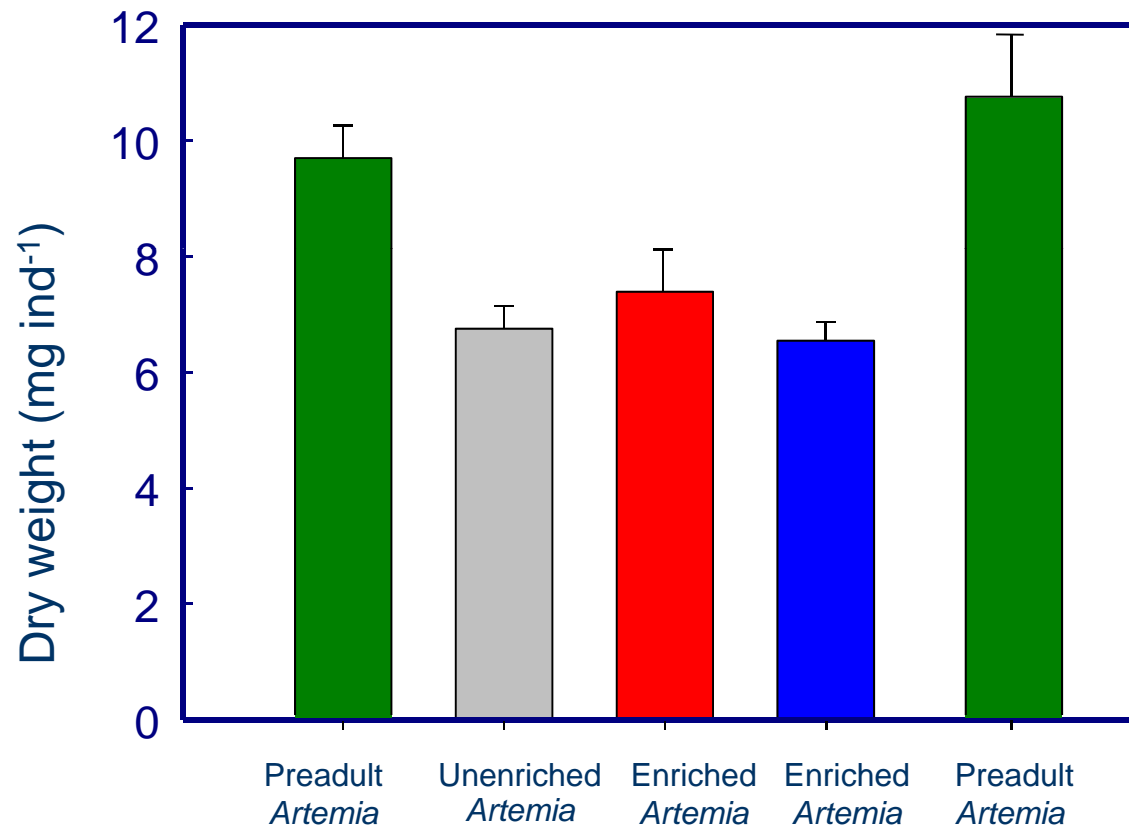
Tank E-H = *Artemia* enriched with emulsified lipids + live algae (*Isocrysis galbana*)



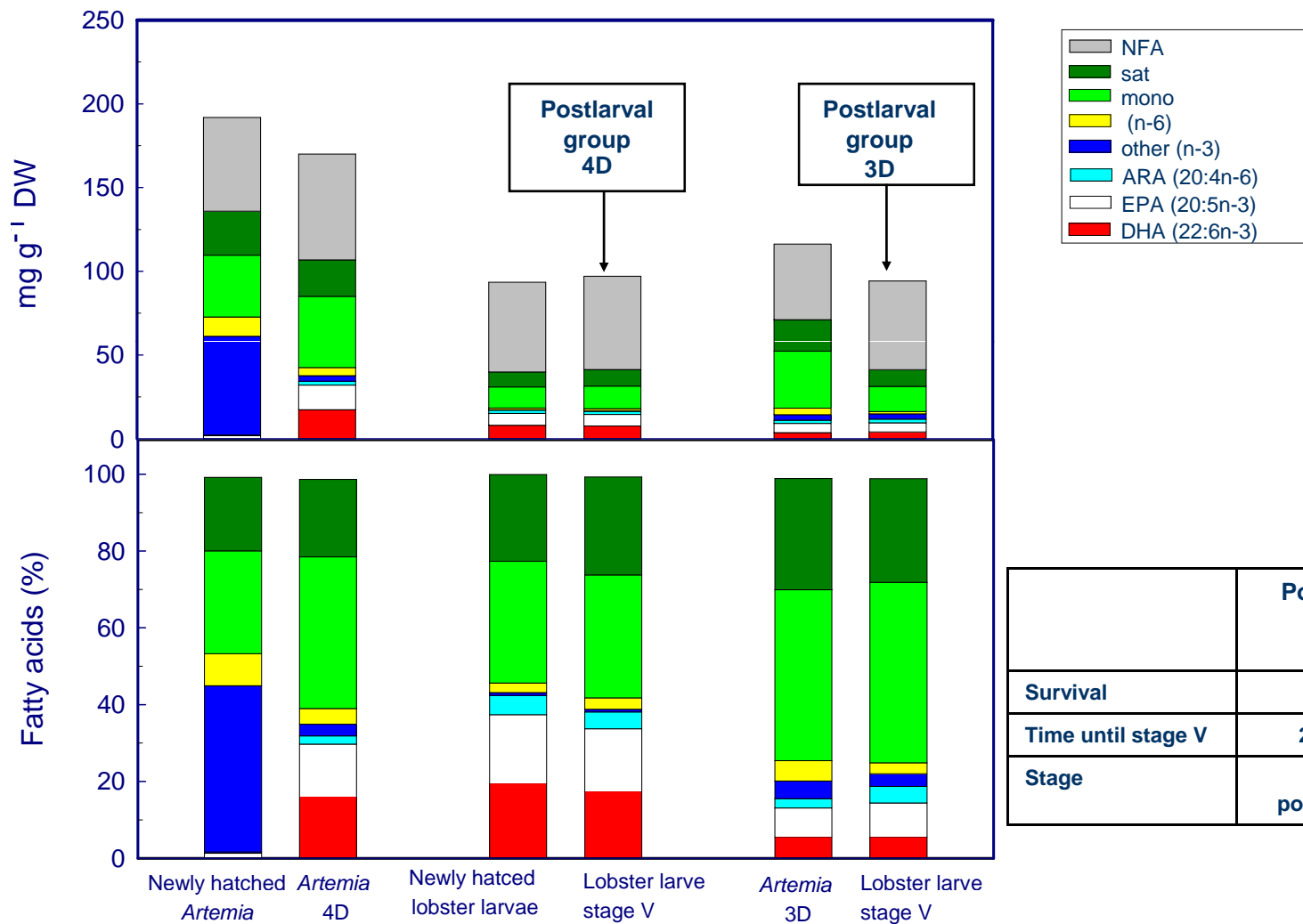
Survival of lobster larvae fed different diets (post larval stage IV)



Dry weight of lobster larvae fed different diets (post larval stage IV)



LIPID AND FATTY ACID COMPOSITION IN ARTEMIA AND LOBSTER LARVAE (NEWLY HATCHED AND STAGE V)



	Postlarval group 4D	Postlarval group 3D
Survival	78 %	43 %
Time until stage V	22 days	29 days
Stage	> 80 % postlarval V	> 80 % postlarval V

ONGROWING OF LOBSTER IN RACEWAYS



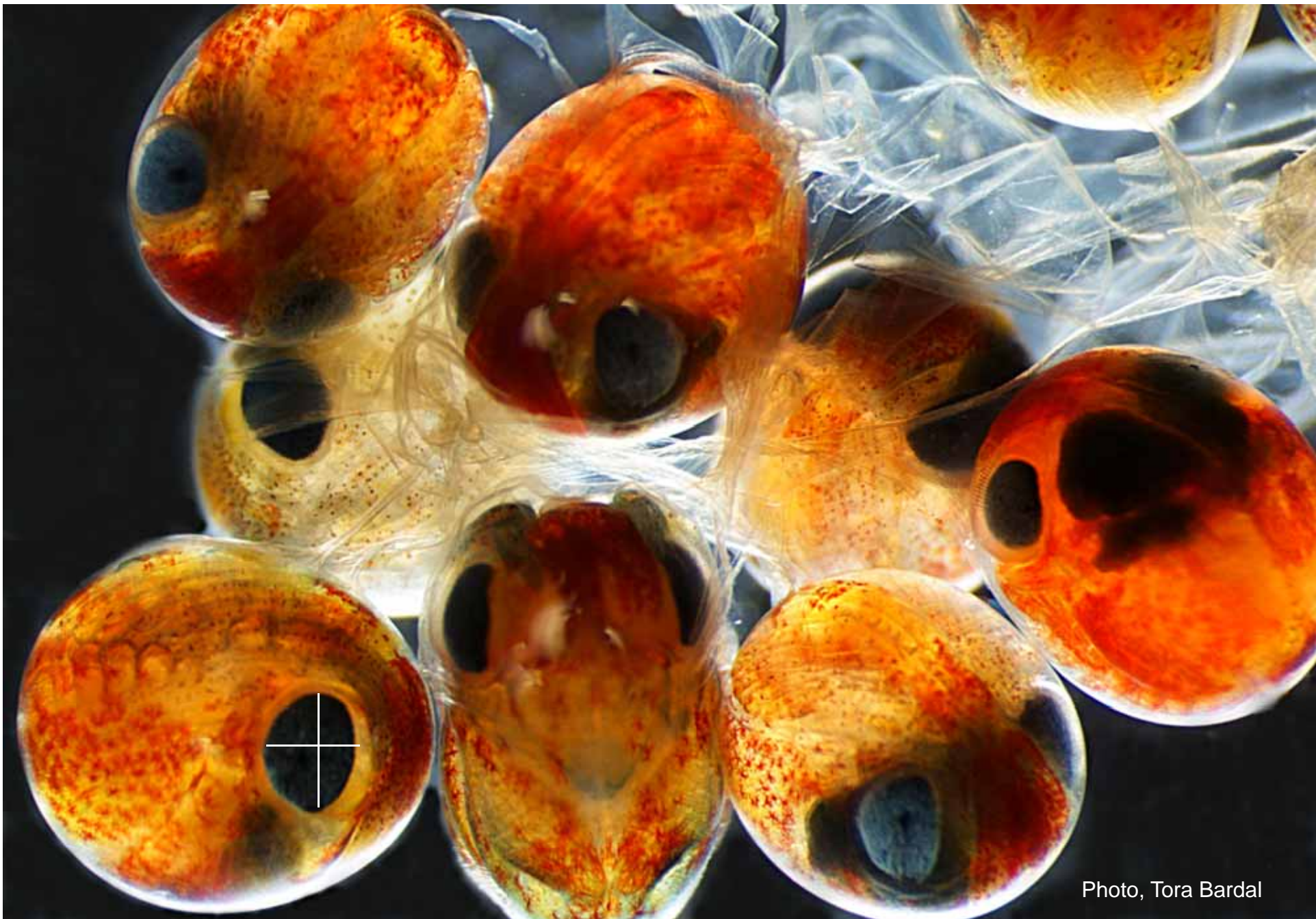
CONCLUSIONS

- High survival if the lobster larvae are kept in single rooms through the live food period (85 - 91 %), compared to an open system (35 – 83 %).
- *Artemia* is very important as live food organism for the early stages. Co-feeding can be initiated at stage III – IV. Overfeeding might reduce cannibalism.
- An open system is easy to handle compared to a single cell system. Weak individuals can initially be “removed” in an open system.
- The larval density in the first feeding units (22 – 2 larvae/litre) effects the survival (35 – 83 %).
- The content of HUFA (DHA and EPA) in *Artemia* is important for survival and probably also the growth.
- There are still major challenges related both to biological and technological aspects of lobster production.



THANK YOU

Photo, Tora Bardal, NTNU



Photo, Tora Bardal