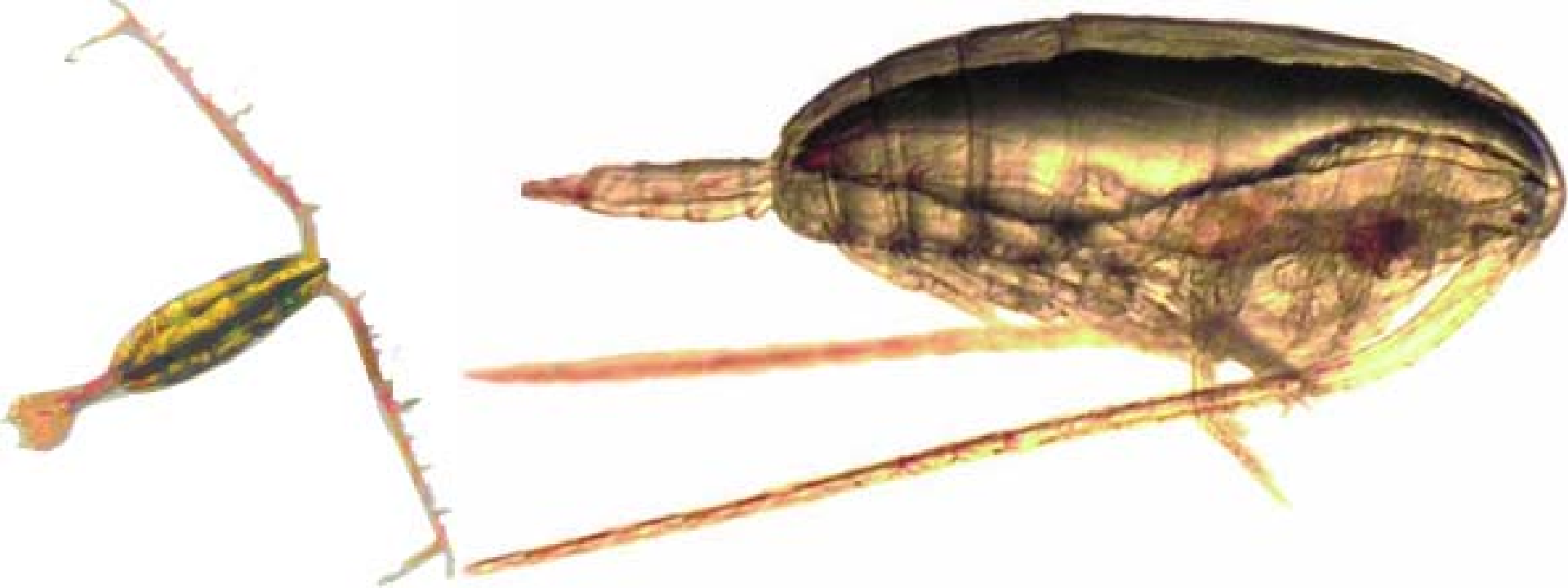
Bioindustry based on the marine copepod *Calanus finmarchicus*

Gunnar Rørstad
(CEO)

www.calanus.no

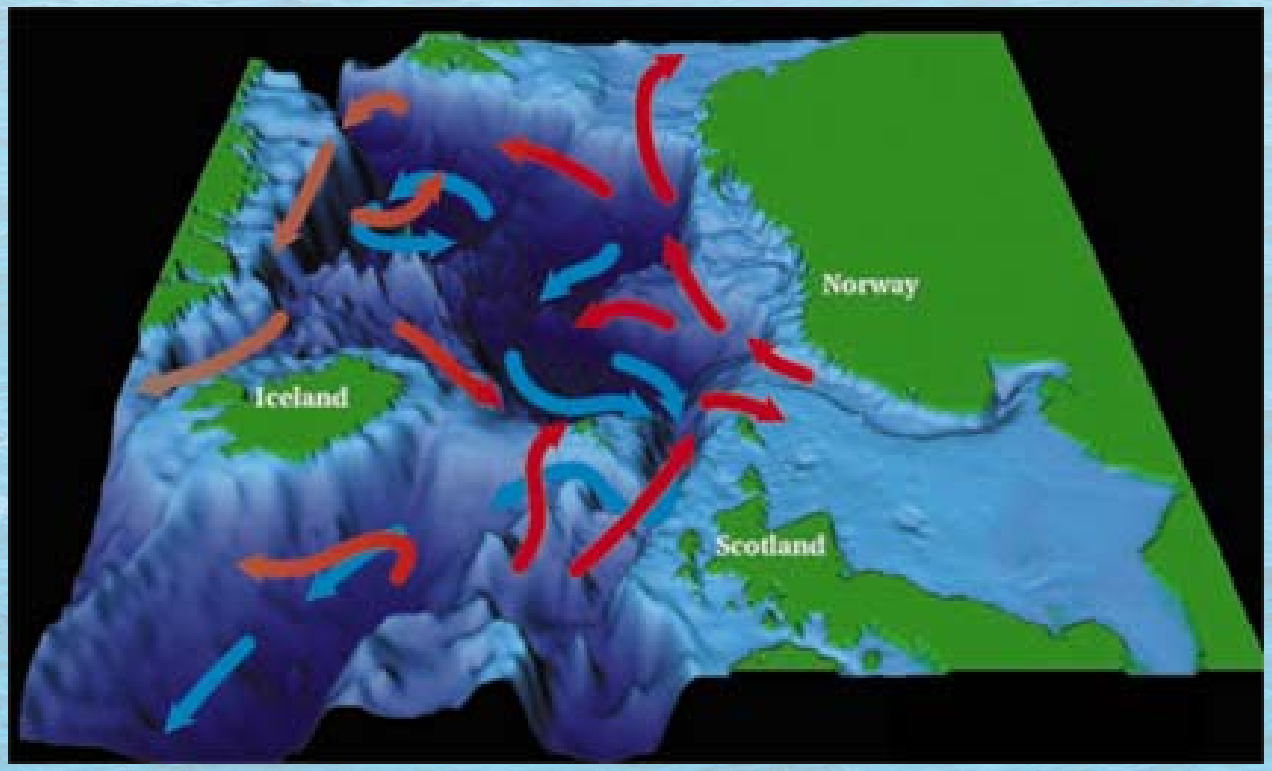


Calanus finmarchicus (length 3-4 mm):

- The most numerous animal on earth?
- No previous industrial utilization, but sustainable harvesting technology has now been developed!
- Growing global demand for new sources of ingredients and bioactive compounds.

Calanus finmarchicus

Annual biomass production of 200 - 400 mill. tons in the Nordic Seas (>20 x the biomass of all fish species)



Calanus finmarchicus

A potentially new marine industry in Norway?

1) Huge biomass production
   - Management policy to be developed by authorities
   - More basic research required on biochemistry etc.

2) Very promising harvesting technology developed
   - Energy efficient and high yield of pure copepod
   - No by-catch of fish juveniles

3) Industrial options:
   a) Raw material for aquaculture feed? *No!*
   b) Human food products? *Many possibilities!*
   c) Speciality products? *Our interest!*

About Calanus AS

- A private Norwegian company (domiciled in Tromsø)
- Owned by the founders and seed-capital investors
- Rooted on competence in marine ecology, biotechnology and drug development
- ”First mover” covering the entire value-chain, but will focus on downstream and biopharmaceutical operations
- Net profit posted both in 2007 and 2008
- Will raise equity in Q2-09 to finance investments and speed up R&D

Calanus AS charters fishing vessels for harvesting *Calanus finmarchicus*, using technology developed and provided by the company. Typical catch on a 3-4 weeks cruise: ~ 100.000 kg.

Harvesting of *Calanus finmarchicus* by slow speed towing using a specially designed (patented) trawl

A good haul!

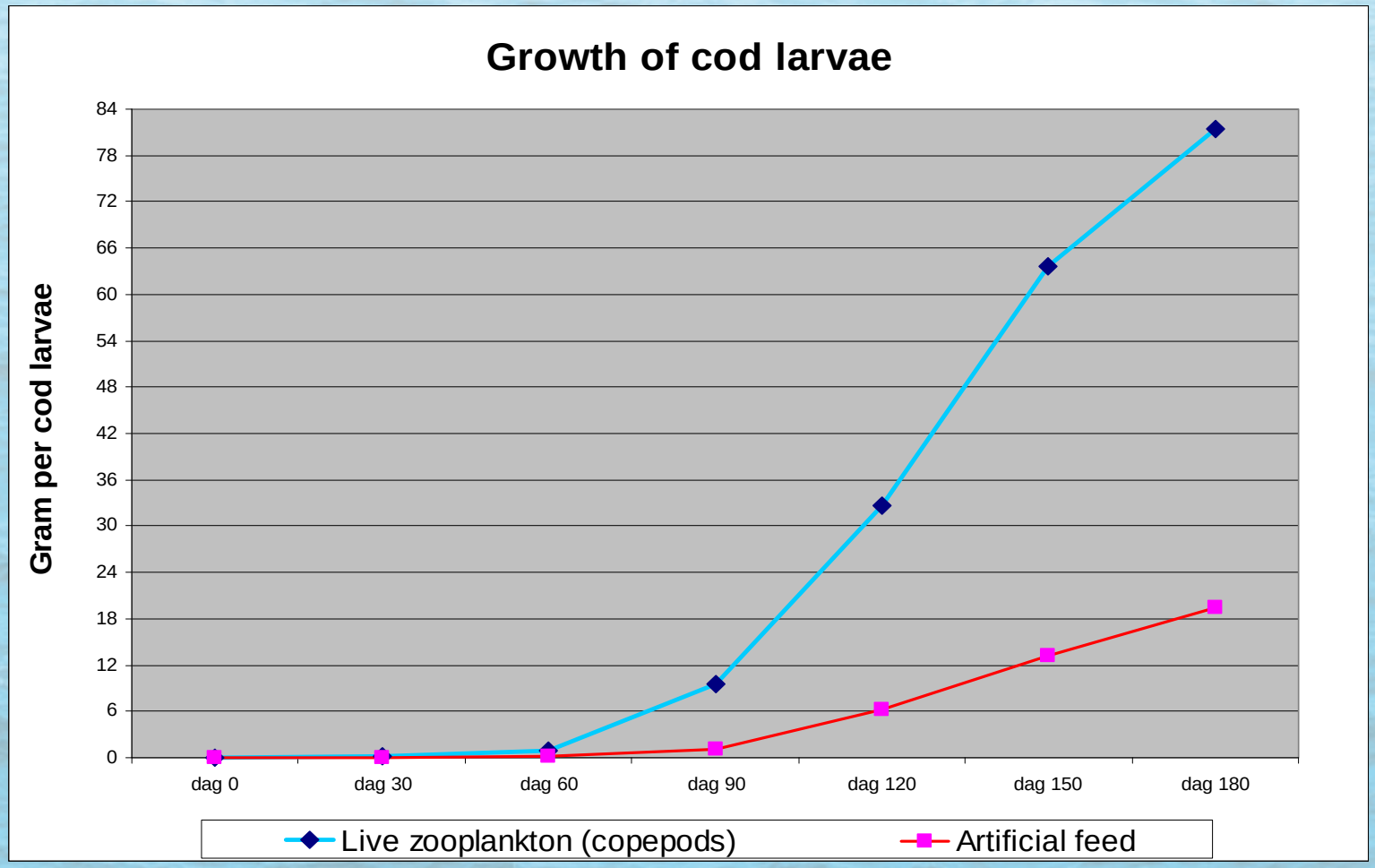
The harvest is pumped directly from the trawl into drainage tanks on board the vessel

The raw material is frozen on board and processed on land

Calanus finmarchicus
Attractive raw material for biomarine industry

- High content of marine n-3 fatty acids EPA and DHA
- The richest source of stearidonic acid (C18:4n-3)?
- High proportion of n-3 fatty acids esterified with fatty alcohols (= marine wax esters)
- Very rich in phytosterols (of phytoplankton origin)
- Pigments (>1500 ppm astaxanthin) and antioxidants
- Attractive flavor properties (intensive lobster taste)
- Protein, peptides and chitin/chitosan derivatives
- Very low levels of environmental pollutants (no need for costly purification!)

*Starter feeds for marine fish**
(Nature's own recipe)



*Source: Lofitorsk AS, 2008

Immune prophylactic principle against sea-lice (patent pending)

Calanus finmarchicus **and sea-lice are closely related. Can innate and adaptive immunity to sea-lice be induced by components from non-parasitic copepods?**

Calanus-powder

Calanus-oil

Dietary supplements (patent pending)

Pharmaceutical product candidates (patent pending)

Animal ”proof of concept” (various universities):

→ Model A

→ Model B

→ Model C

- Unique chemistry = novel candidates
- Remarkable bioactivities
- *E.g.* strong effect on risk-factors and end-points for CVD

Strategy - going forward

- Continue to improve harvesting technology
- Build (prototype) GMP-processing plant
- Recruit commercial staff (manufacture, QA, marketing and sales, project management)
- Speed up product development and marketing
- Increase R&D through collaboration with universities (including Univ. of Tromsø), NOFIMA and SINTEF
- Plan and initiate preclinical pharmaceutical development (outsourced to CRO's)

We believe that the prospects are very good for a new bioindustry based on *Calanus finmarchicus*!