



Smoltifisering og moderne smoltproduksjon - har vi glemt biologien?

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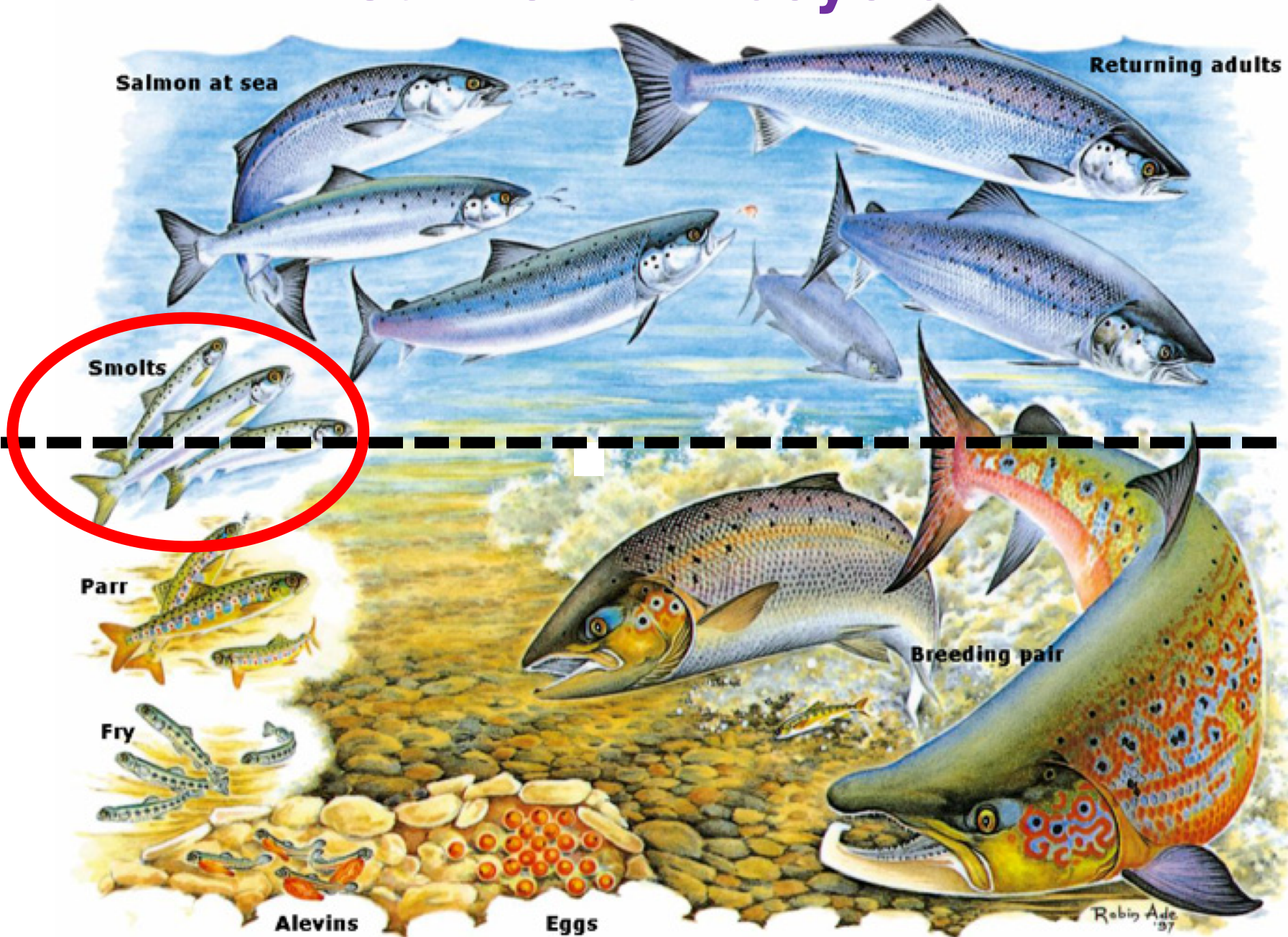
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Oversikt

- Kort om smoltifisering**
- Litt om lys, temperatur, salinitet**
- Settefisk - parr, stor smolt, post-smolts...**

Salmonid lifecycle





Parr

What is a smolt?

Smolts are the downstream migratory stage of juvenile salmon

What is smoltification?

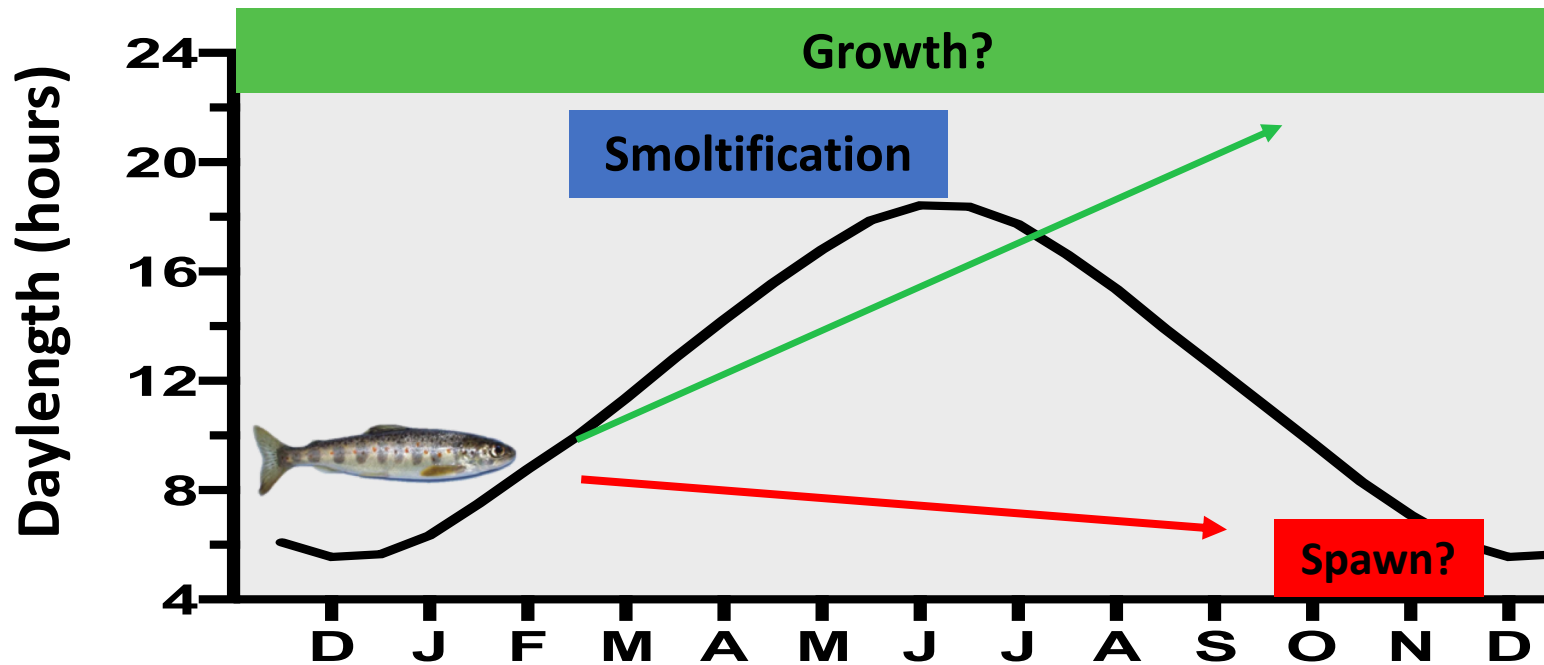
Smoltification is characterized by adaptations that are **preparatory** for a marine life



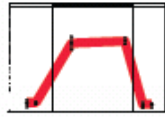
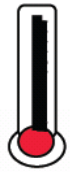
Smolt

Light provide calendar information

- Light (day length) the most important 'timekeeper' (zeitgeber)
 - Temperature more influences the rate of development

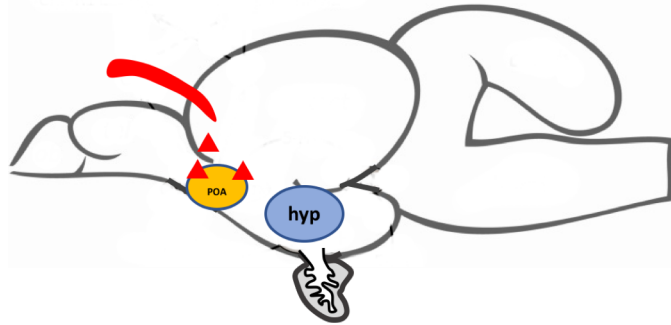


Smoltification - gradual preparation for marine life!

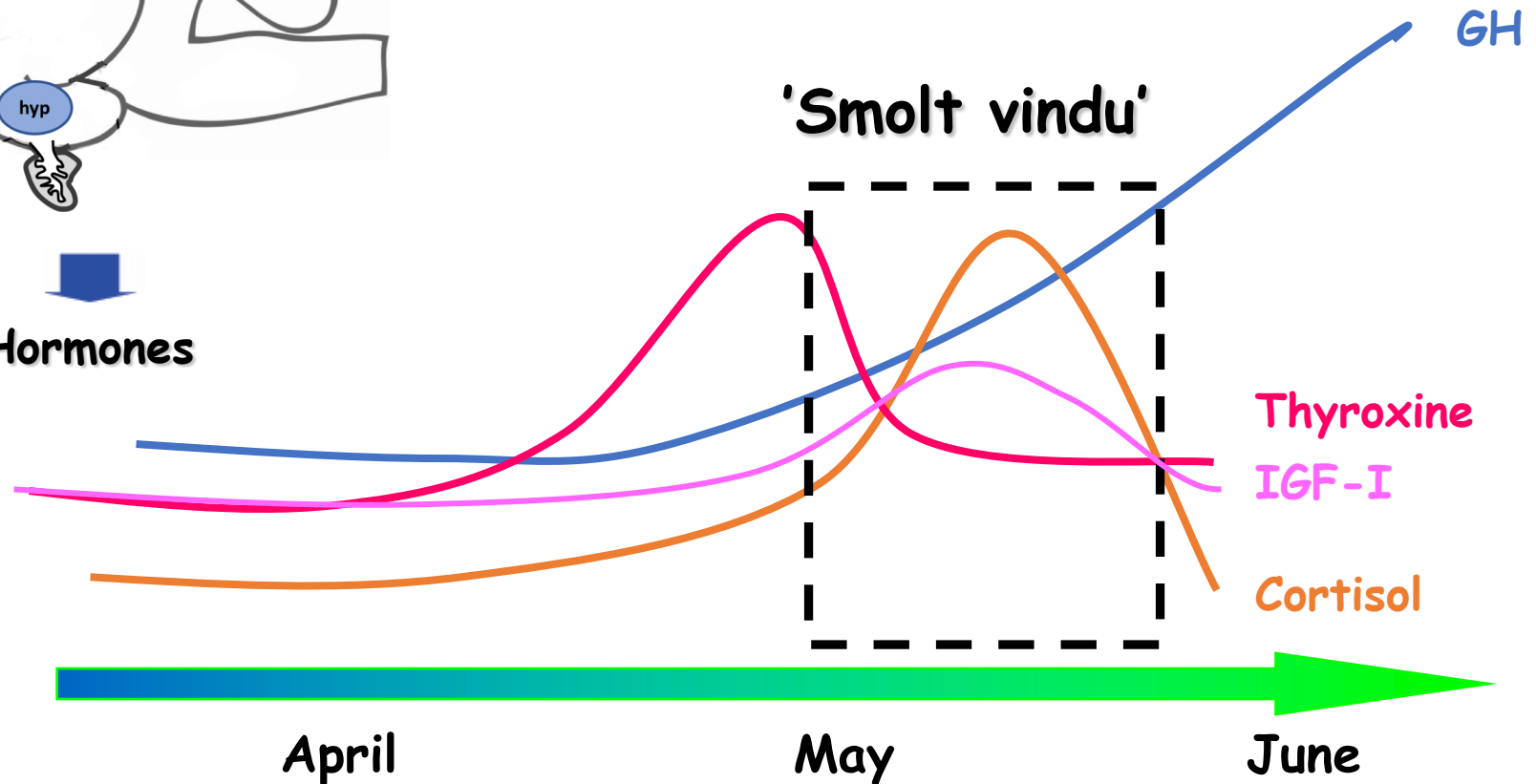


Melatonin

Biological clock



Hormones



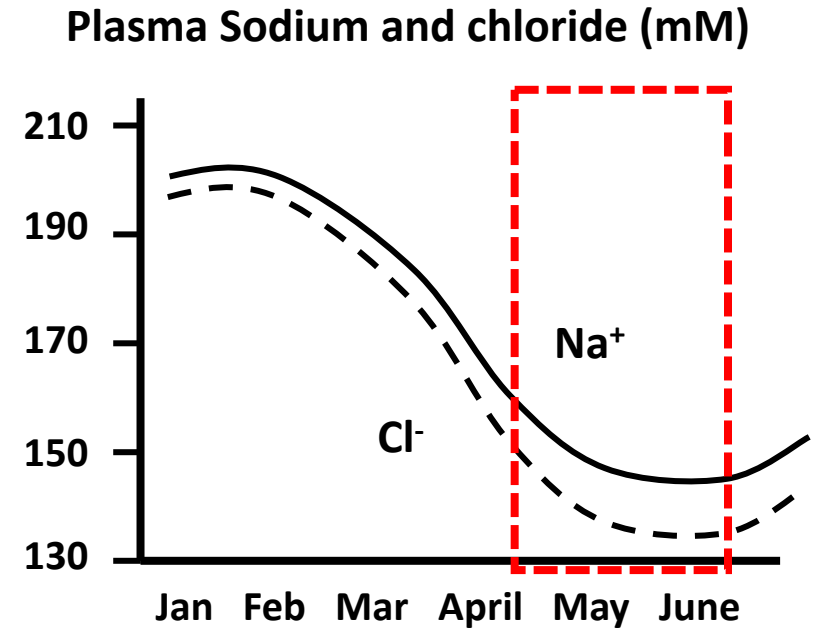
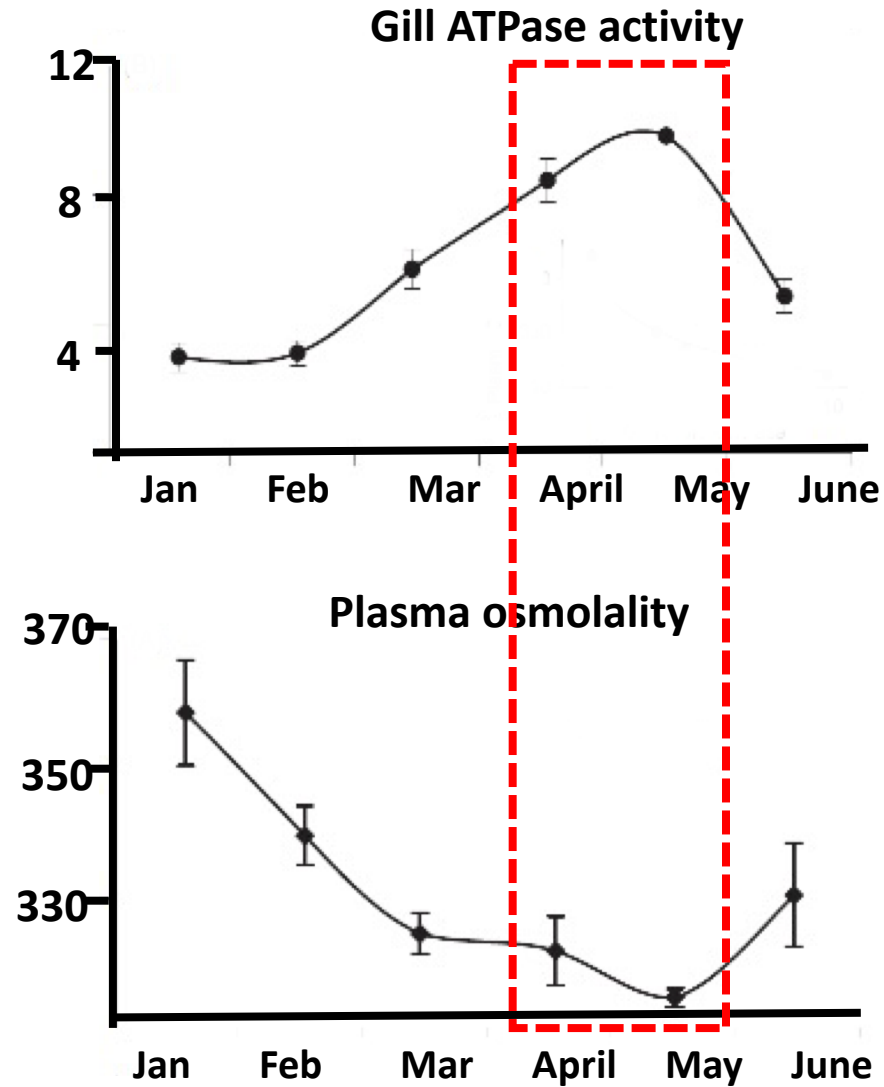
Changes that occur during smoltification



□ Physiology

- Salinity tolerance
- Retinal pigmentation
- Olfactory sensitivity
- imprinting
- Buoyancy
- Lipid and glycogen utilization
- Metabolic rate
- Scope for growth

Smoltification - seawater tolerance



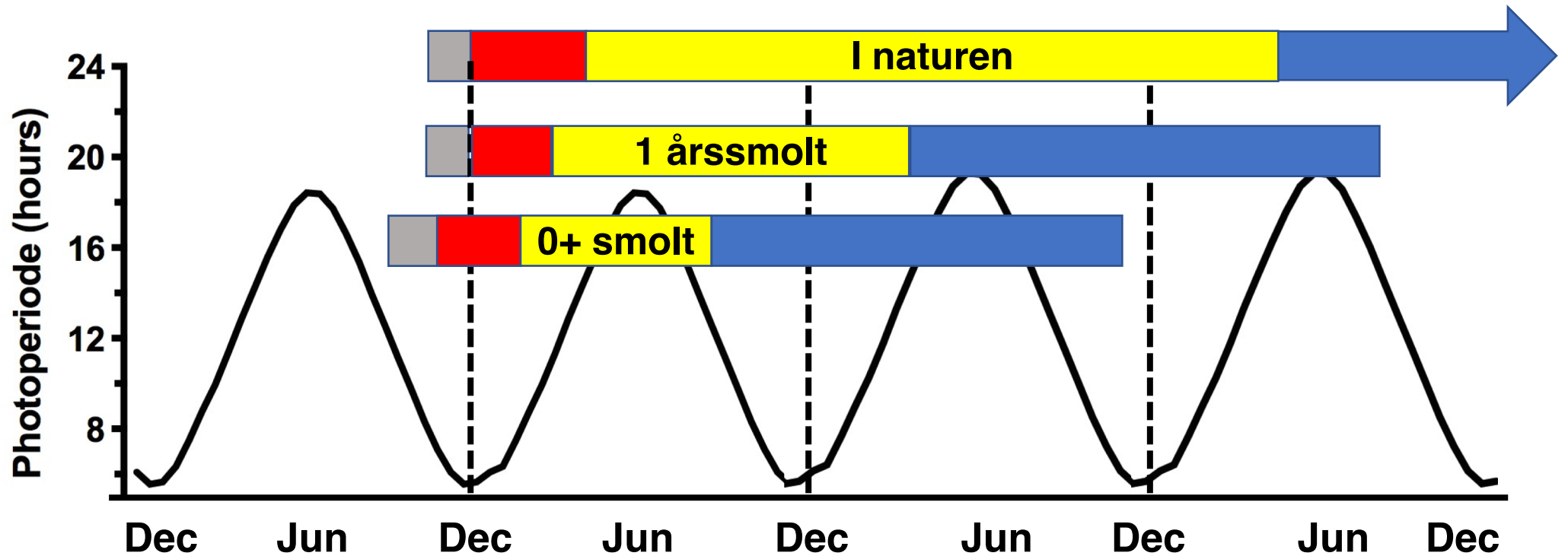
Range in SW

Cl : 130 - 150 mM

Na: 145 - 165 mM

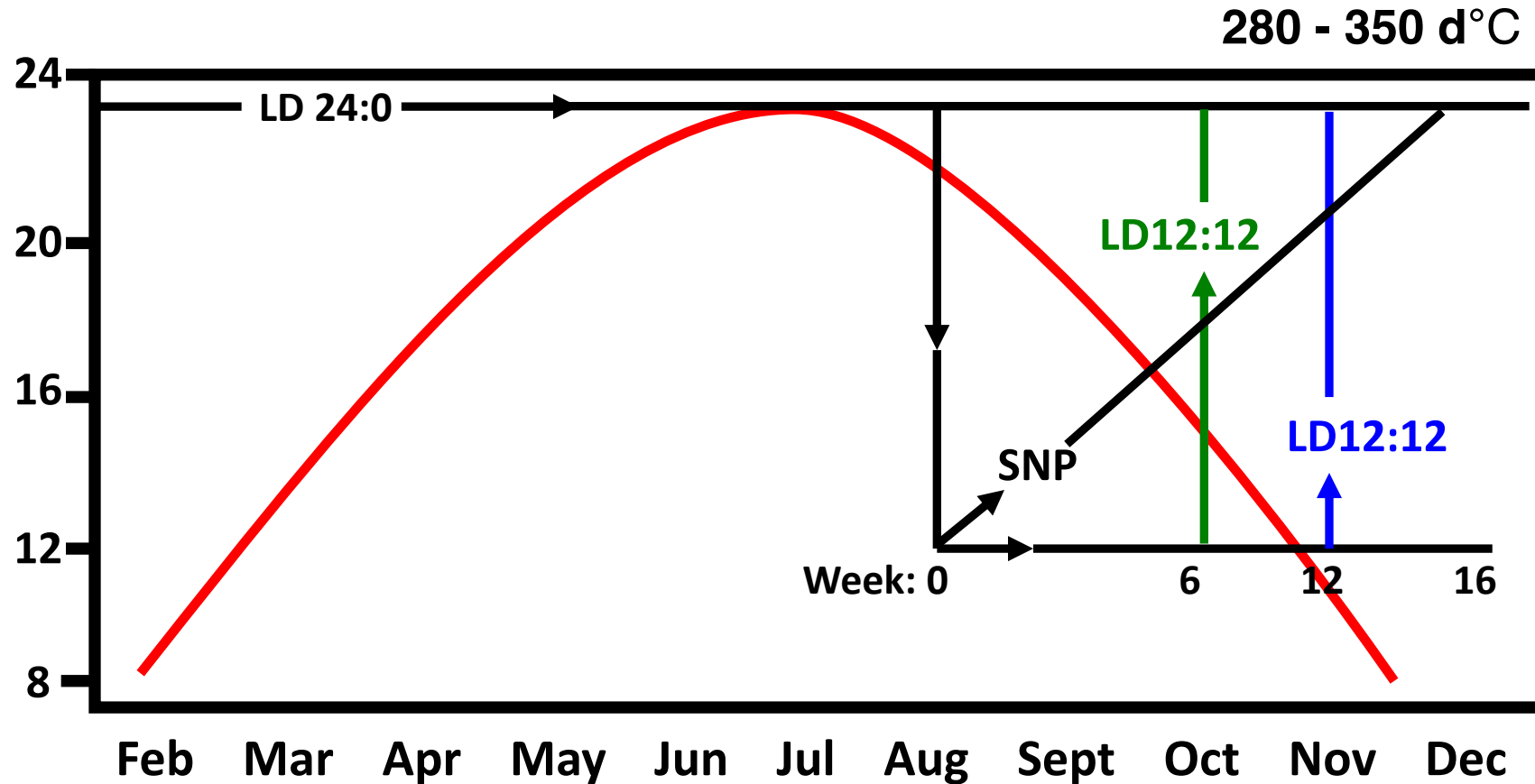
Osmolality: 320 - 350 mOsm

Season independent production



Depth and length of winter signal - are we taking shortcuts?

Photoperiod regime - season independent smolts

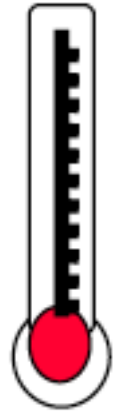


LD12:12 = 12 hours light:12 hours dark

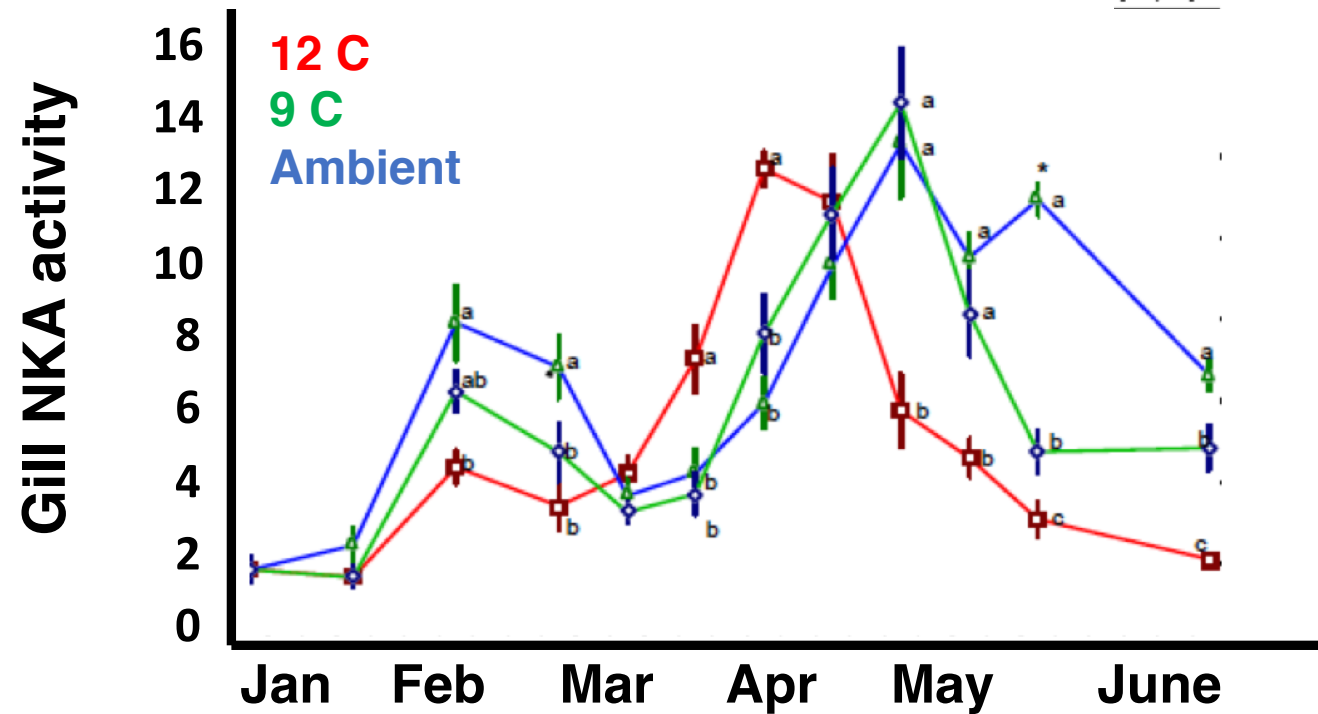
LD24:0 = 24 hours light

SNP = Simulated Natural Photoperiod

Effects of temperature during smoltification



Gill Na⁺, K⁺ ATPase activity at three different temperatures



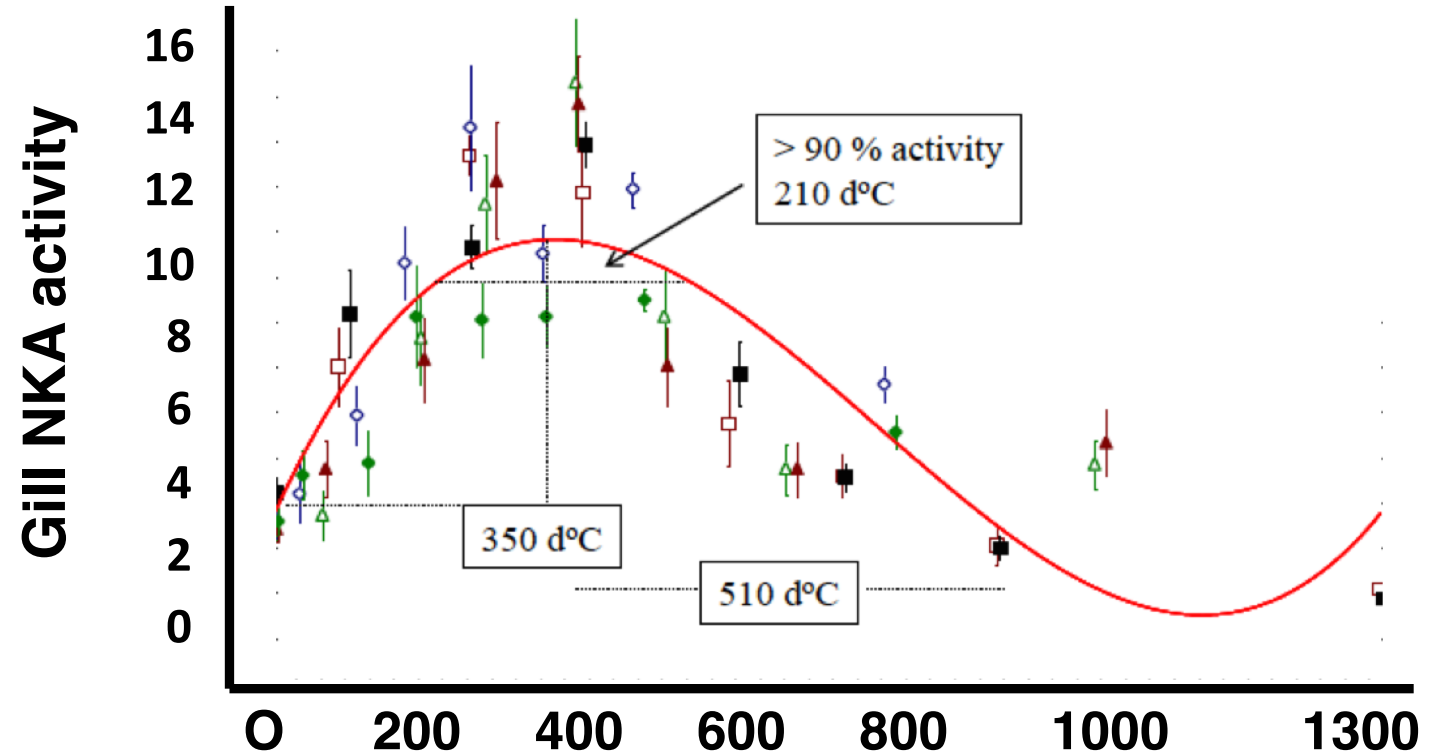
- ❑ Higher temperature advance peak gill ATPase activity
- ❑ At 12C peak activity occurs 4-6 weeks earlier

Temperature affects smolt development

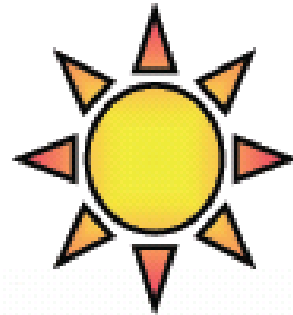
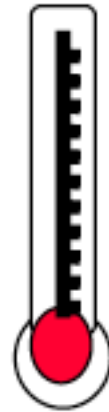
☐ Smoltvindu, de-smoltification

- Rapid loss of seawater tolerance at high temperature
- Function of temperature, smolt window 300-400d°C
- De-smoltification ca. 500 d°C

☐ Temperature range?

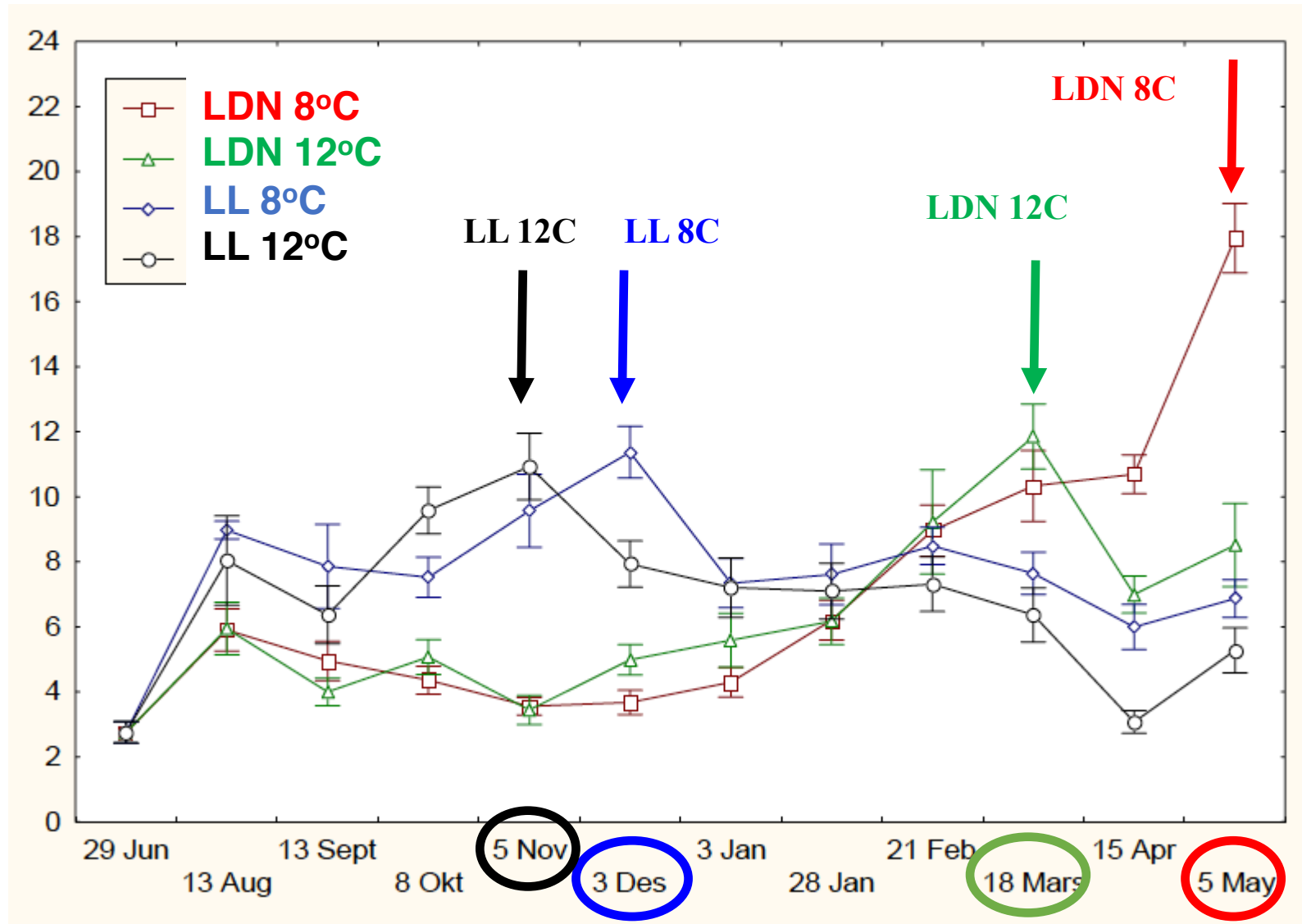


Interaction between light and temperature and possible effects of rapid growth during smoltification

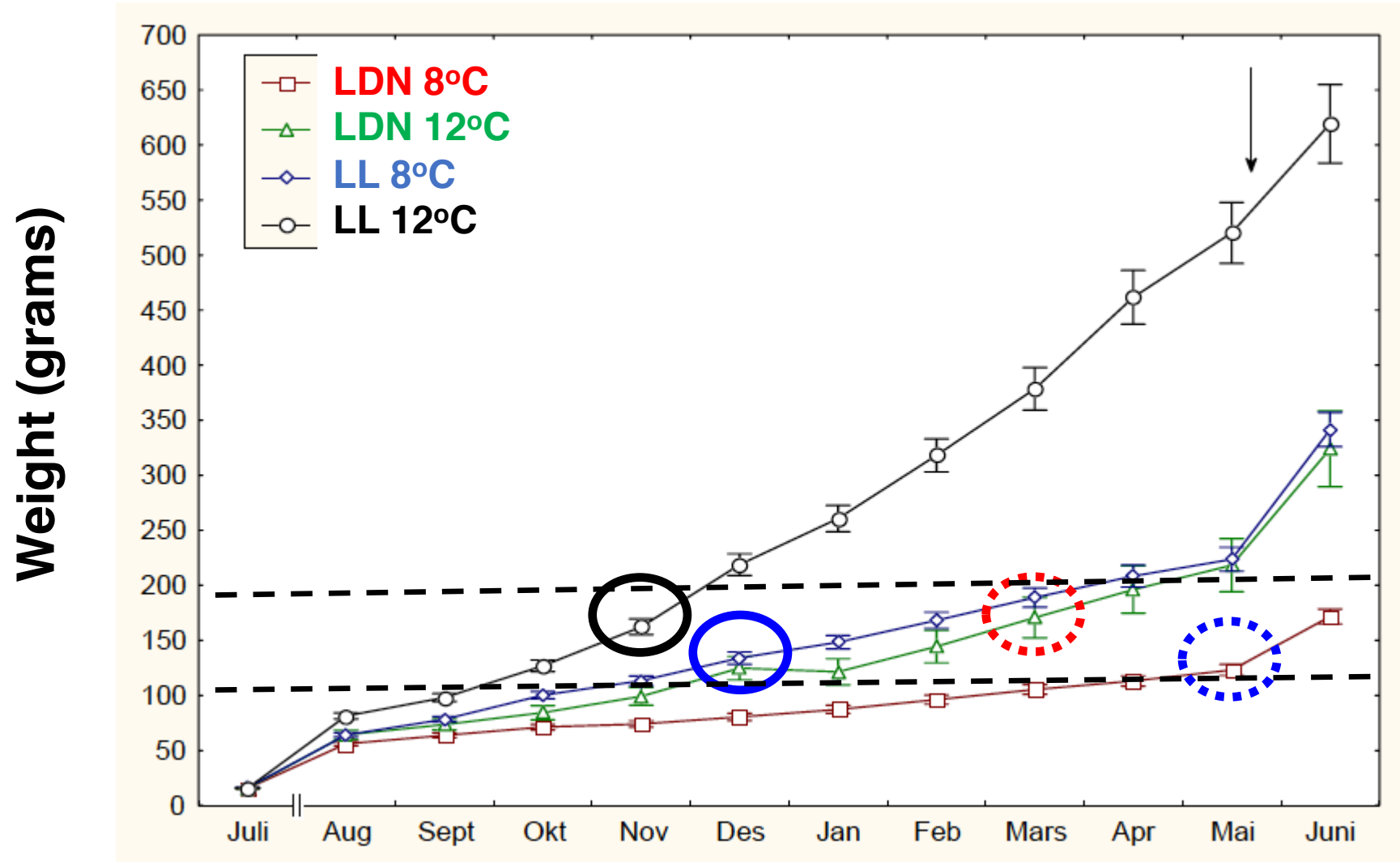


Gill Na⁺, K⁺ ATPase activity in smolts reared different temperature (8 og 12 °C) and photoperiod (LDN og LL)

Gjelle Na, K-ATPase aktivitet



Are some smolt traits also coupled to size and growth?

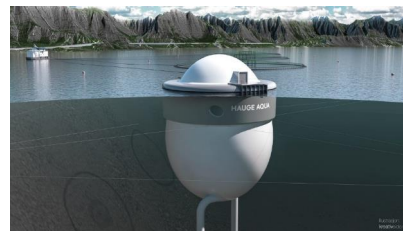
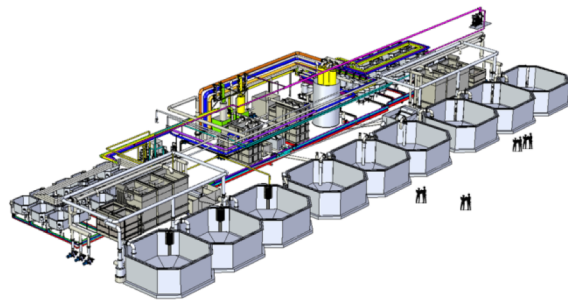
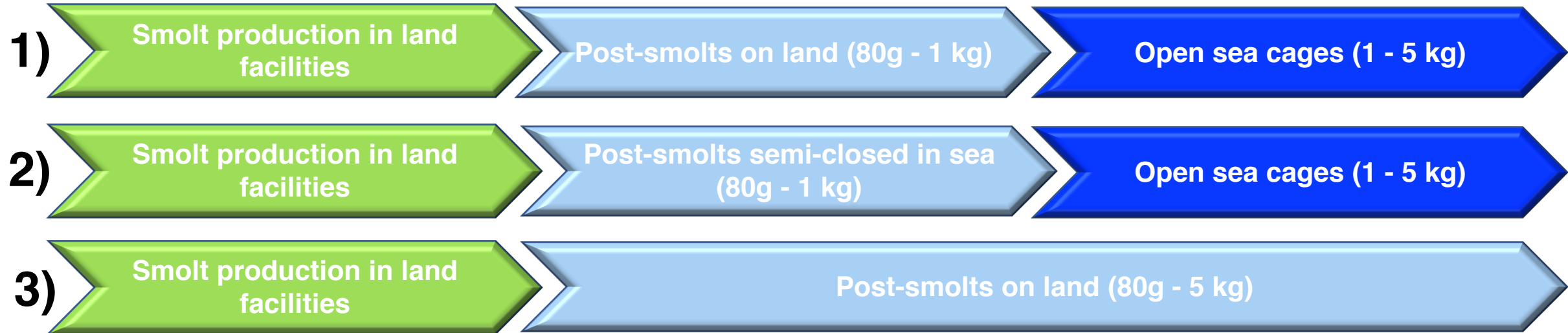


Are we abolishing the distinction between fresh and seawater?

Current/traditional production models...



Emerging production strategies...



Parr, smolt, stor smolt, post-smolt...

Hva innebærer det?

Et eksempel fra samme nyhetsartikkel

“**Post-smolt** er laks som oppdrettes i lukkede systemer, enten på land eller i sjø, og er i vektklasser over **ca. 200 gram og opp til ca. ett kilo.**”

“Dette kan gjøres både i **ferskvann, brakkvann og rent sjøvann.**”

“Ved å gradvis ta i bruk **større smolt (opp mot ett kilo)** i hele eller deler av lakseproduksjonen, for deretter å flytte den over i tradisjonelle sjøbaserte merder for en raskere tilvekstperiode,.....”

Mangler vi en bevisstgjøring rundt bruk av begrepene smolt, stor smolt, post-smolt og settefisk?

‘Standard’ smolt

‘Normal’ smolt

Settefisk

Presseoppslag



“Derfor var det først når man fant en metode for å manipulere smoltifiseringen, kun ved bruk av fôr at utviklingen virkelig skjøt fart”

“Utover at smolten blir større ved å unngå mørkestimuli, er det også dokumentert at smoltifiseringen blir langt mer synkron enn ved lysstyring”

Mot slutten for lysstyrt smolt

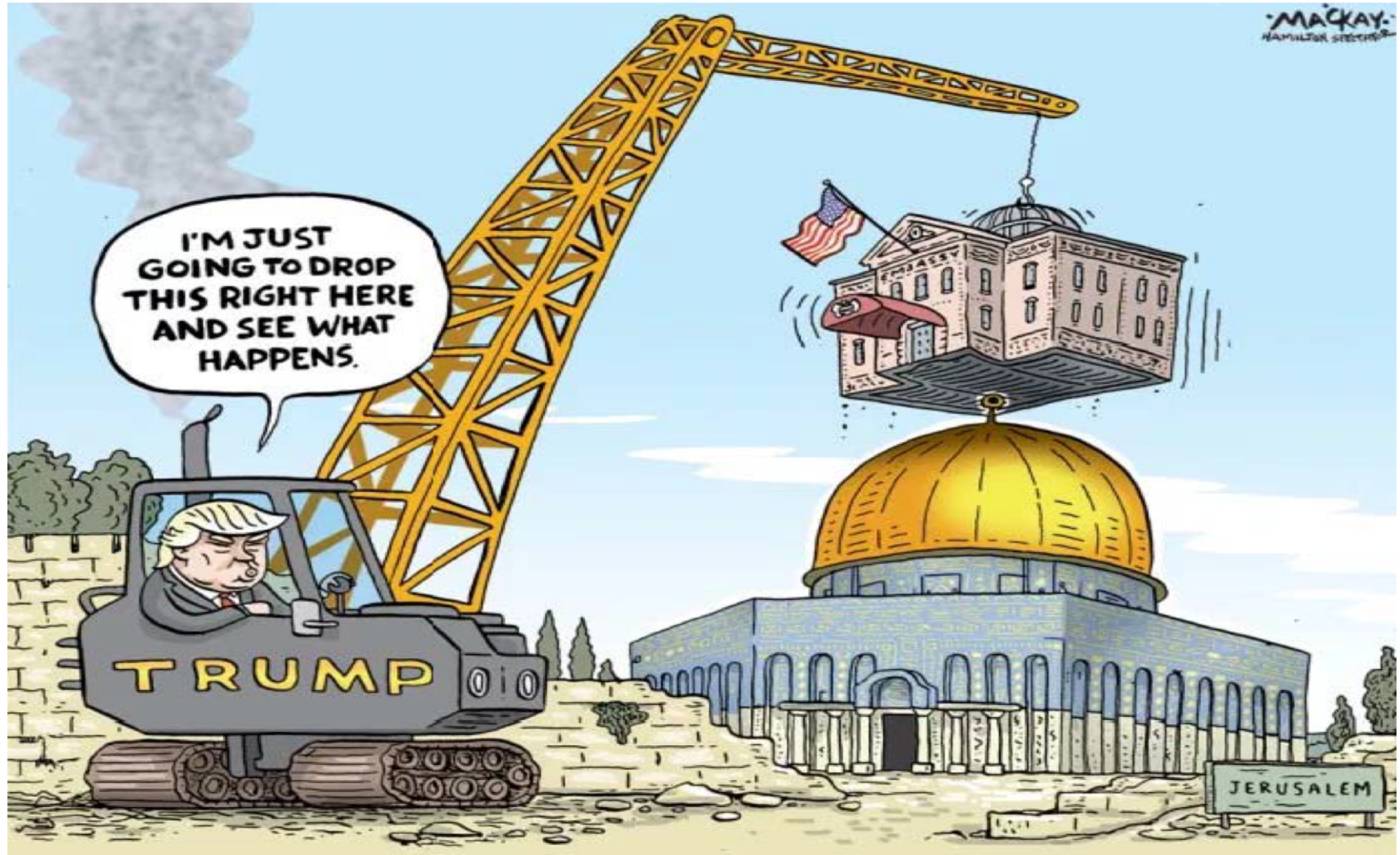


Hmm...ikke overbevist

Oppsummering

- ❑ Fotoperiode - vintersignal med påfølgende vår viktig for synkron smoltifisering
- ❑ Temperatur påvirker hastigheten til smoltifiseringsforløpet
- ❑ Enkelte egenskaper ved smoltutvikling synes også å være koblet til størrelse og veksthastighet, har vi gått glipp av noe her?
- ❑ Nye produksjonsstrategier - bruk av saltfôr, tilsetninger, salinitet
- Gode hjelpemiddel - varsom med erstatte lysstyring

Krever kunnskapsbasert innovasjon





Thanks for your attention

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