Insights into the ecology of zooplankton in an acidified ocean

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Zooplankton

Pteropod $CaCO_3$ shells can begin to dissolve within 48h in corrosive waters

Orr et al. 2005

Direct effects

H^+

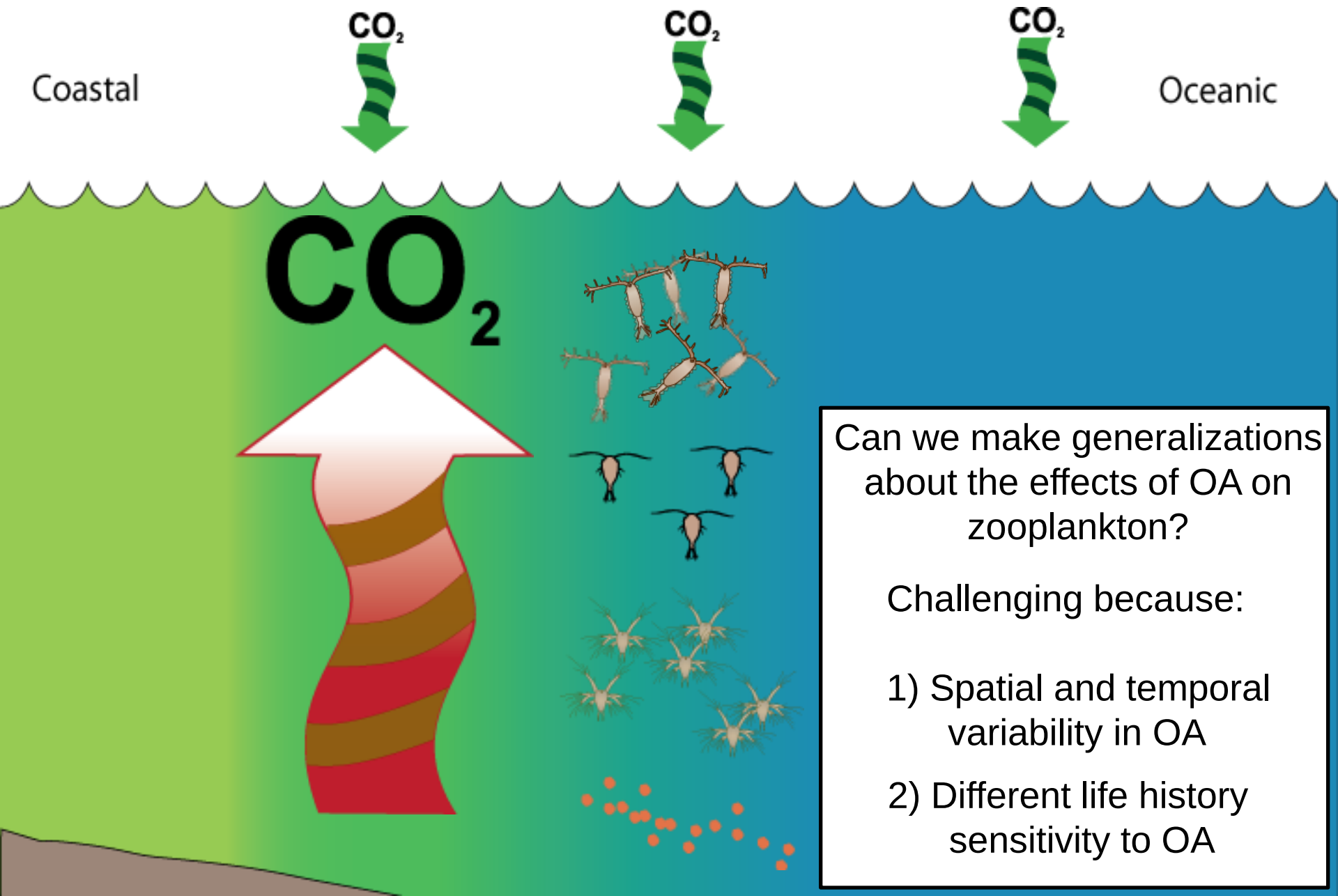
CO_2

CO_3^{2-}

Pteropods can represent >60% of Juvenile Pink Salmon diet in Gulf of Alaska

Armstrong et al. 2005

Direct Effects



Can we make generalizations about the effects of OA on zooplankton?

Challenging because:

1) Spatial and temporal variability in OA

2) Different life history sensitivity to OA

Zooplankton

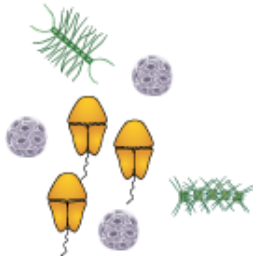
Direct effects

H^+

CO_2

CO_3^{2-}

Indirect effects



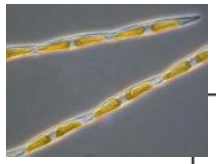
Resources

Competitors

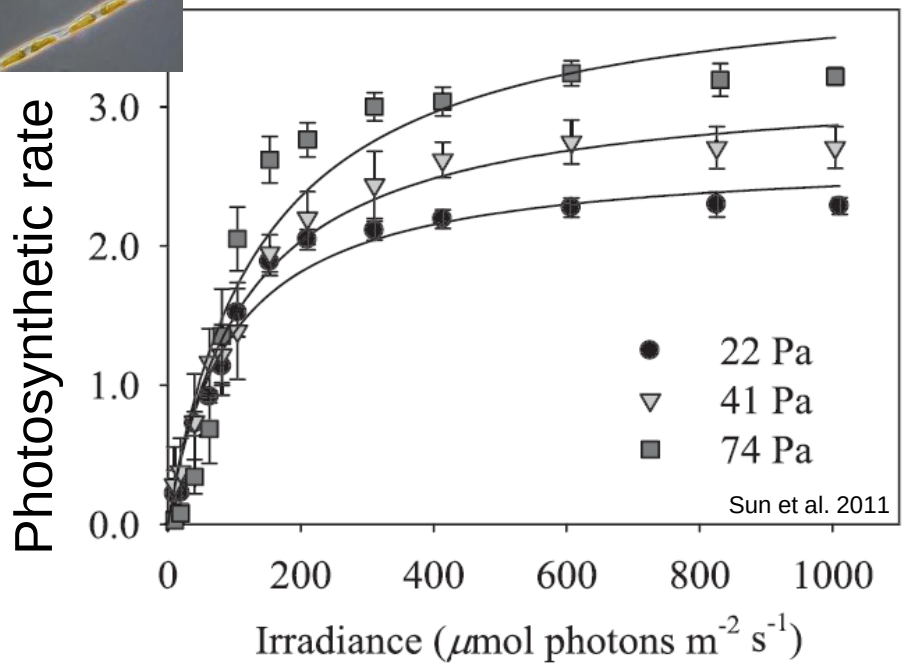
Predators

Indirect Effects

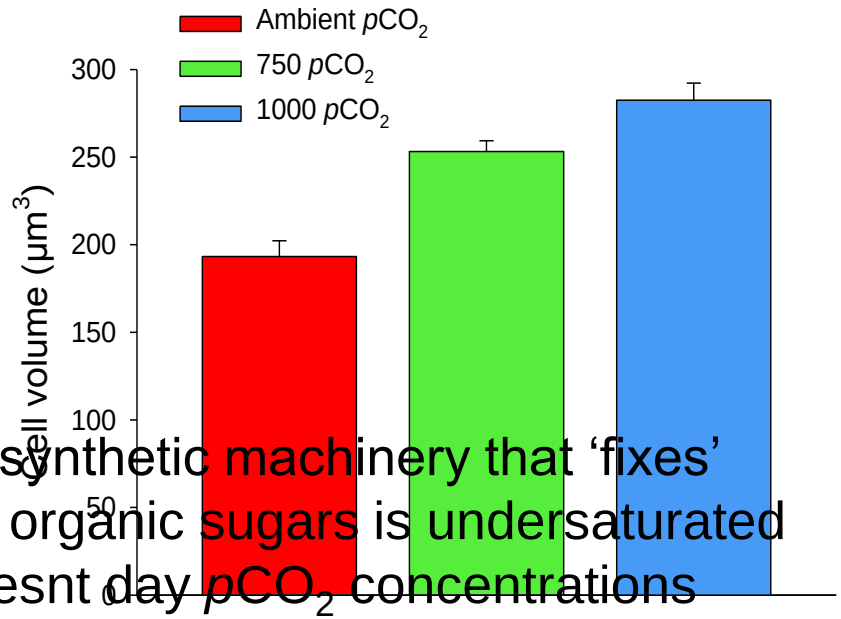
CO_2 CO_2 CO_2



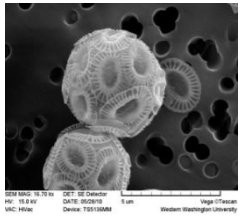
Toxic *Pseudo-nitzschia multiseries*



Higher photosynthesis under elevated pCO_2



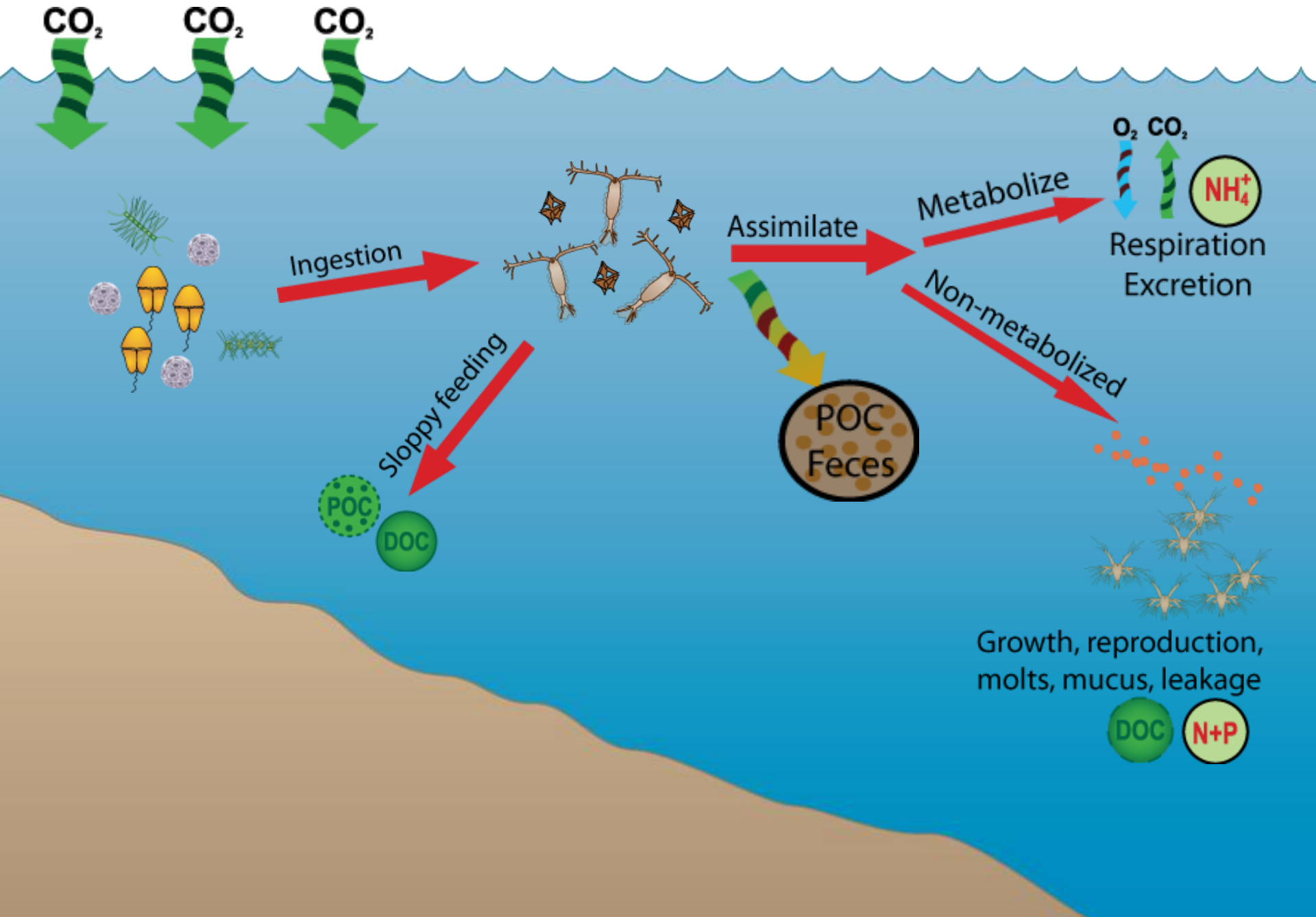
otosynthetic machinery that 'fixes'
nto organic sugars is undersaturated
presnt day pCO_2 concentrations



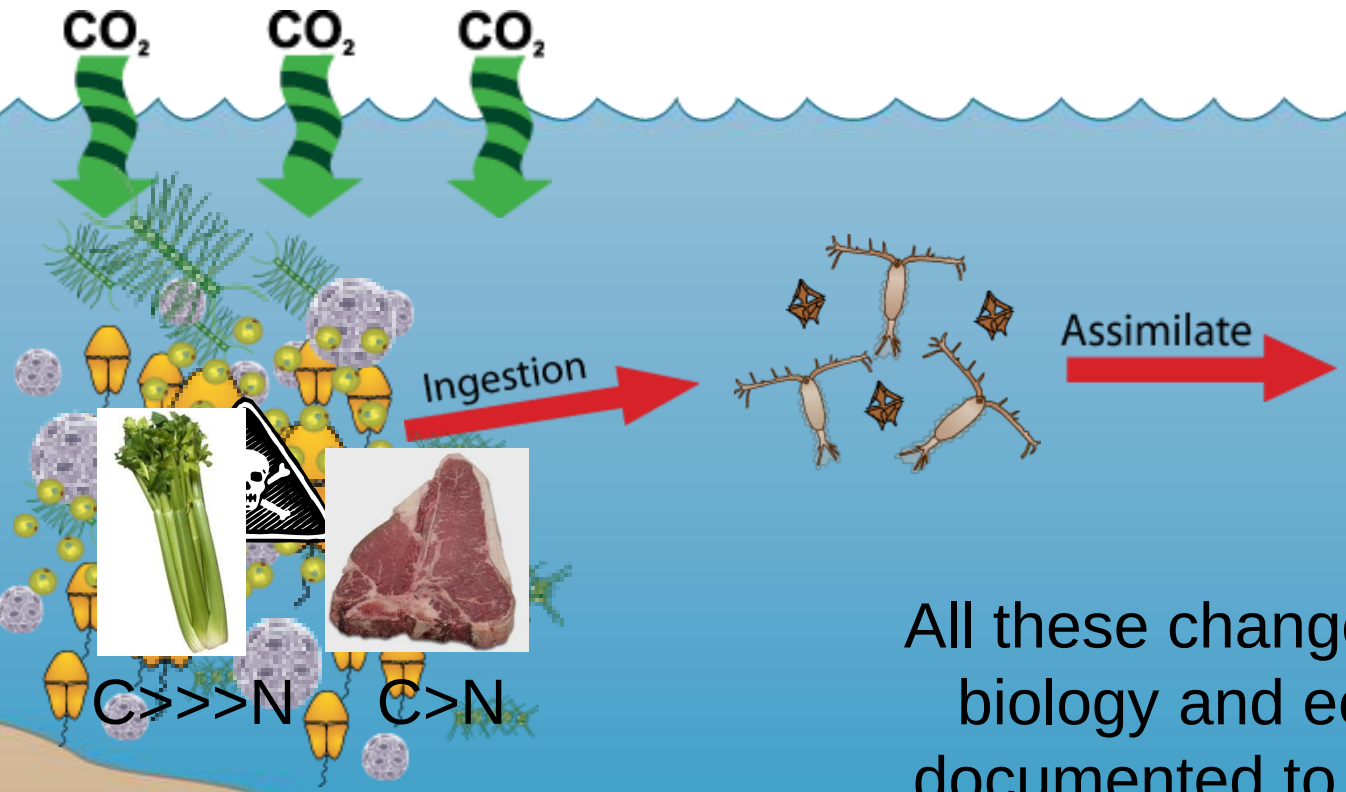
Cells got bigger under high pCO_2

Olson et al. unpubl.

Indirect Effects

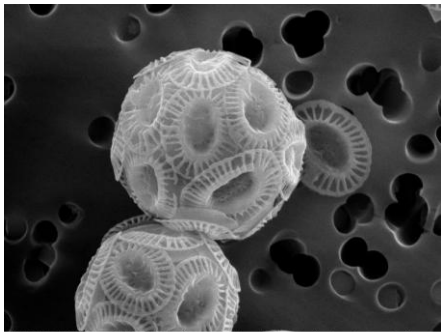


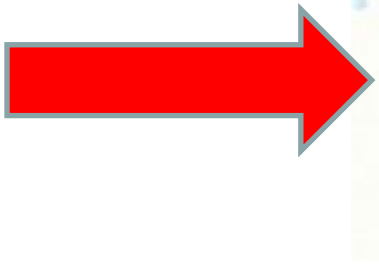
Indirect Effects

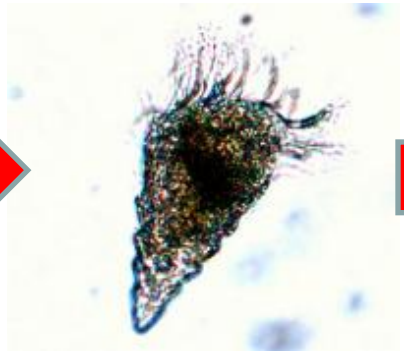


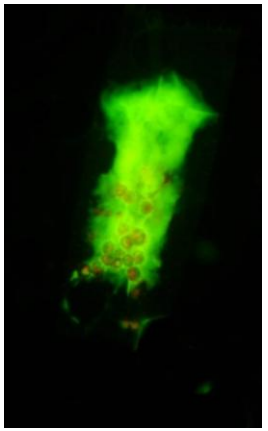
All these changes in phytoplankton biology and ecology have been documented to occur under ocean acidification scenarios!

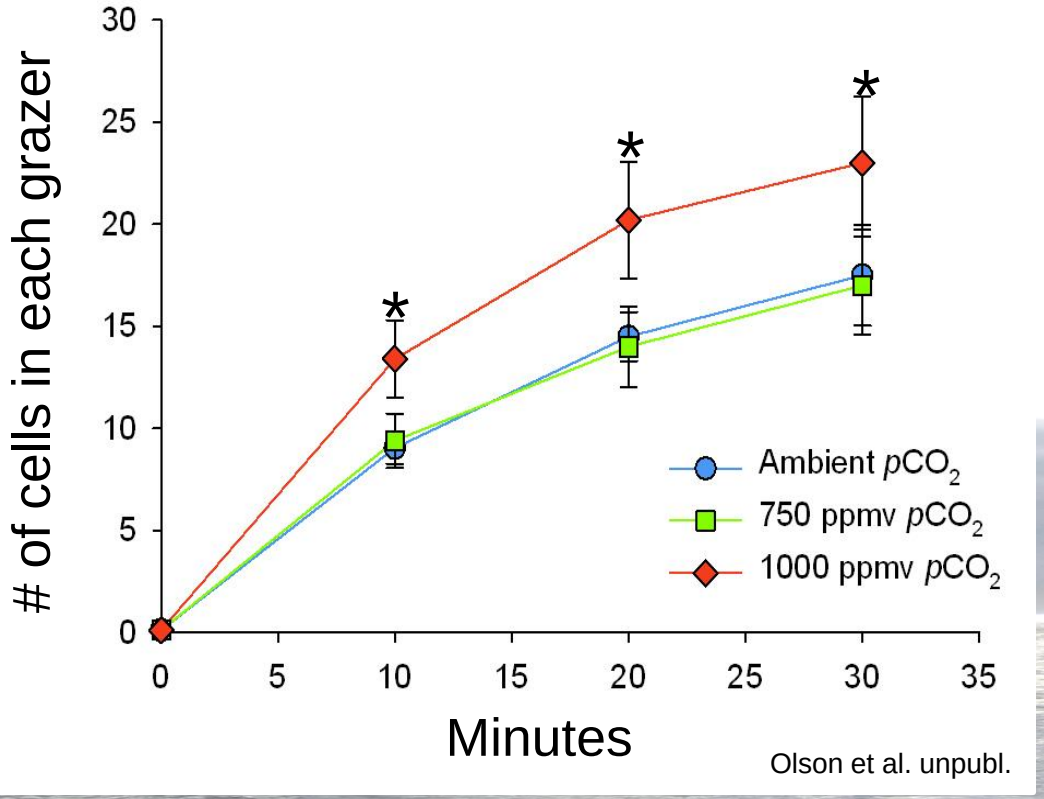
Will zooplankton consume phytoplankton prey grown under different [pCO_2] at different rates?









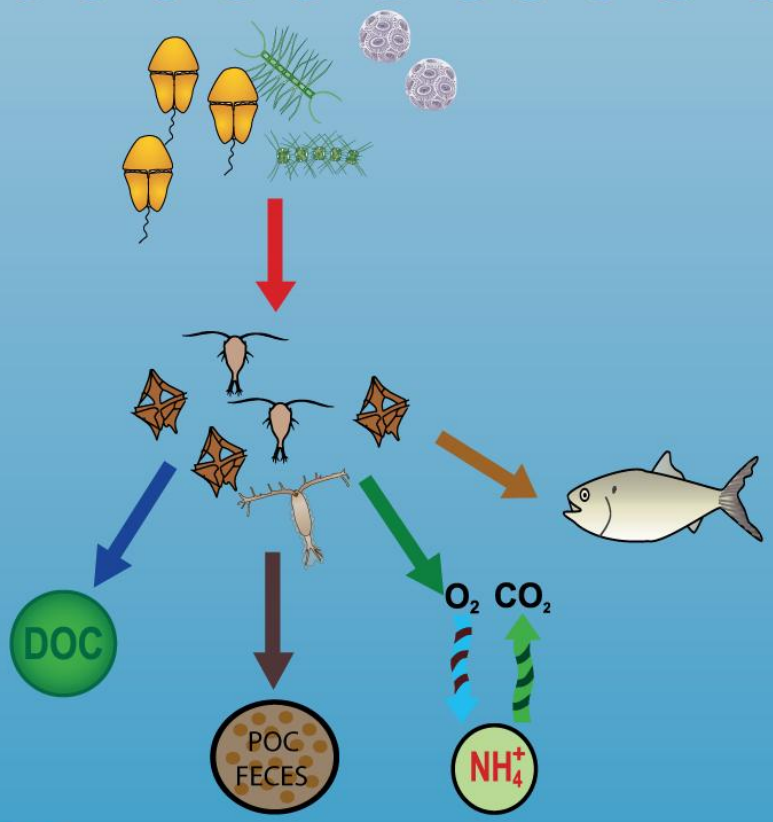


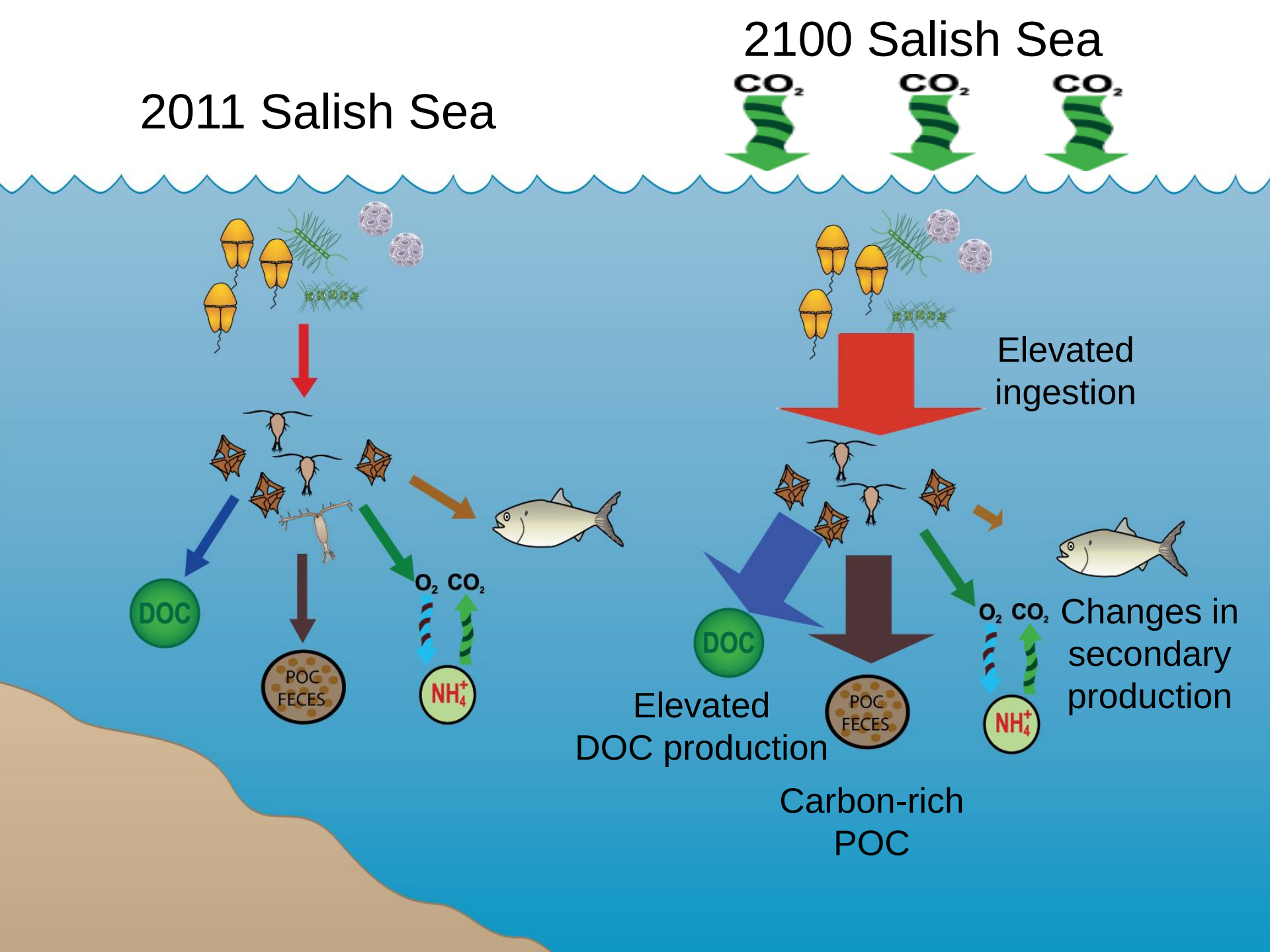
Olson et al. unpubl.

More cells were ingested that were grown under high pCO_2

What are the ecological implications of this?

2011 Salish Sea




2011 Salish Sea
2100 Salish Sea
CO_2
CO_2
CO_2
DOC
POC
FECES
O_2
CO_2
NH_4^+
Elevated
ingestion
DOC
POC
FECES
O_2
CO_2
NH_4^+
Changes in
secondary
production
Elevated
DOC production
Carbon-rich
POC