S11– ID: 18043
PICES-2024

Alterations of Pelagic Food Web Structure in the Marginal Seas of Western North Pacific Under Changing Climate

Eun-Ji Won[1], Ji-Eun Kim[1], Hee Young Yun[1], Ha-Eun Cho[1], Seok-Hyeon Youn[2], Sae-Yun Kwon[3], Kyung-Hoon Shin[1]*

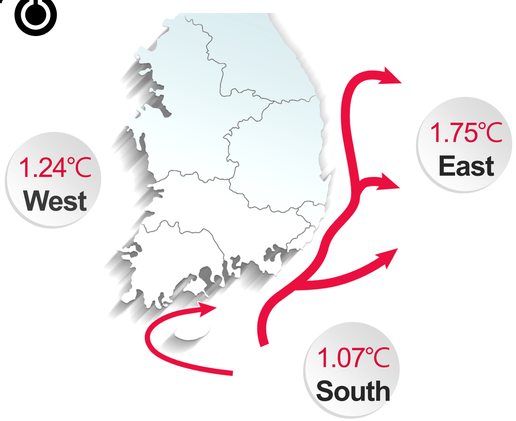
[1] Hanyang University, [2] National Institute of Fisheries Sciences, [3] Pohang University of Science and Technology

Corresponding: shinkh@hanyang.ac.kr

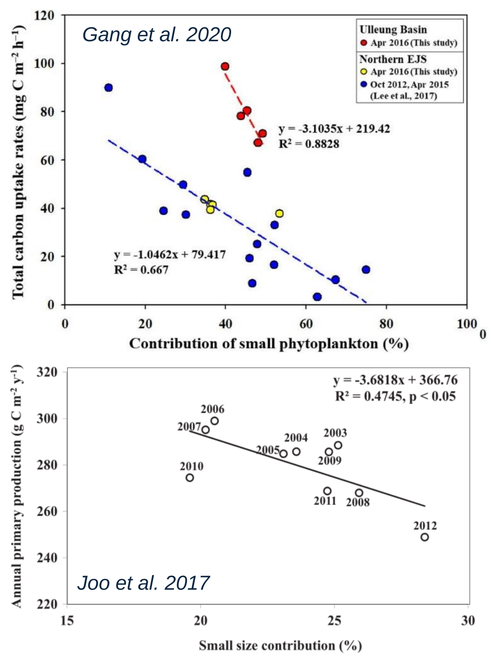
Background

East Sea (Sea of Japan)

Last several decades…



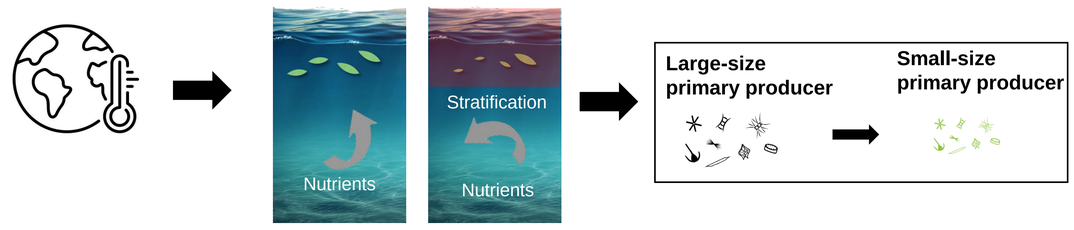
▷ The annual average surface water temperature increase in the coastal waters of Korea was about 2.5 times higher than the global average, with the East Sea experiencing the largest rate of increase.



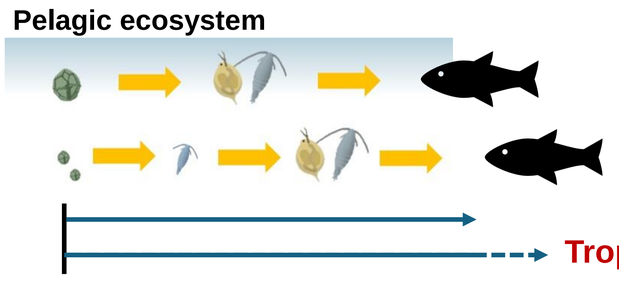
▷ The size of phytoplankton in coastal waters is also steadily decreasing.

Hypothesis

Cause Global warming causes ocean stratification, which limits the availability of nutrients and reduces the size of phytoplankton.



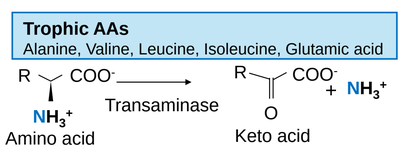
Effect As phytoplankton become smaller, larger zooplankton cannot directly consume small plankton and need one more step to connect them. This causes the trophic position of high trophic level organisms be expanded.



Accurate TP measurement

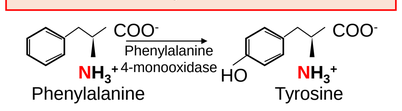
[Amino acid $\delta^{15}N$ enrichment pattern in food chain]

Trophic AAs
Alanine, Valine, Leucine, Isoleucine, Glutamic acid



C-N bond breakdown = **$\delta^{15}N$ fractionation**

Source AAs: Phenylalanine

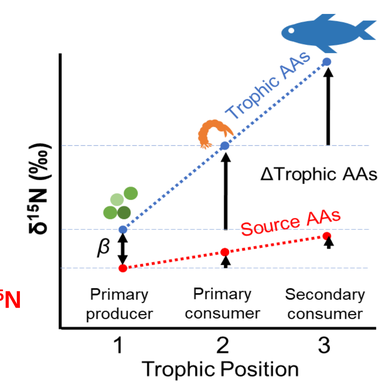


C-N bond maintained = **Little changes in $\delta^{15}N$**

Modified from Chikaraishi et al (2007)

$$TP_{AAs} = (\delta^{15}N_{Glu} - \delta^{15}N_{Phe} - 3.4) / 7.6 + 1$$

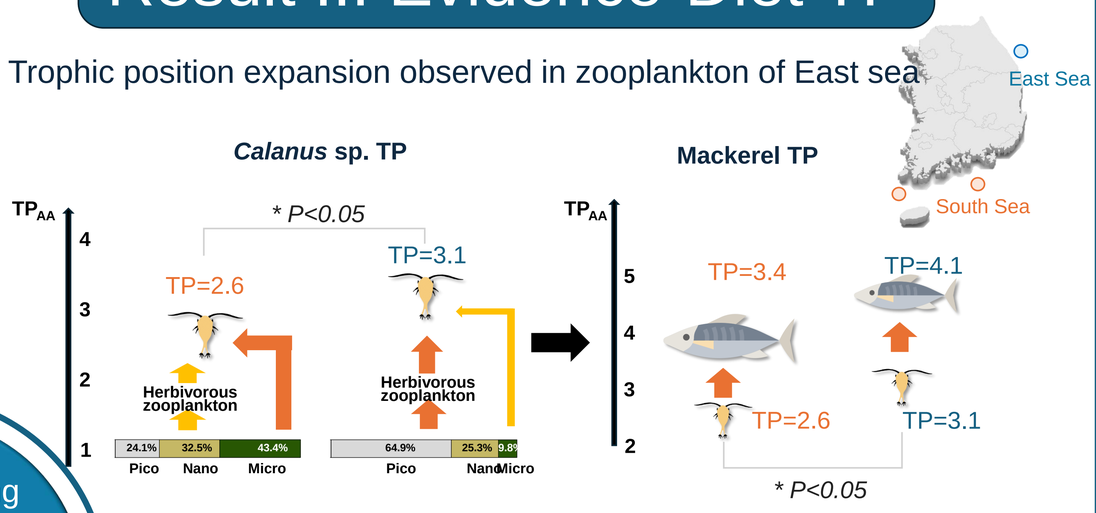
Chikaraishi et al., 2009



Global warming not only affects the ecosystem structure, but is also related to pollutants and their accumulation

Result II: Evidence-Diet TP

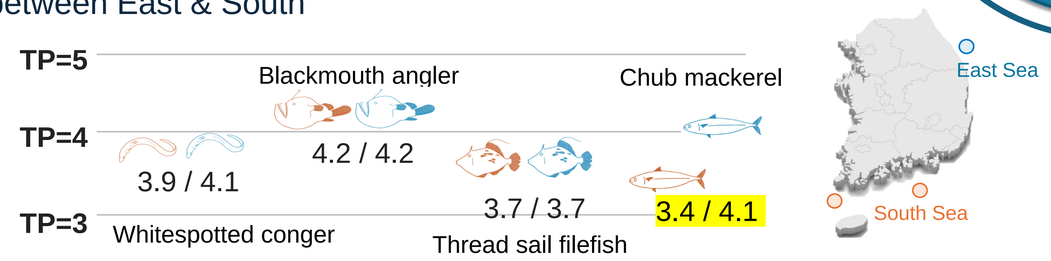
▶ Trophic position expansion observed in zooplankton of East sea



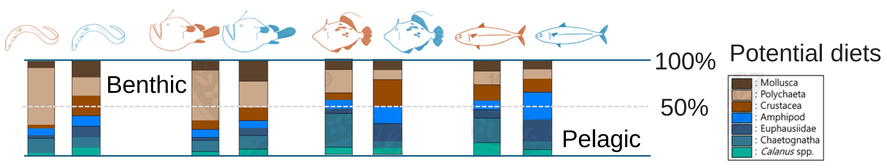
Phytoplankton communities affect to TP of Calanus *spp.*

Results I: TP & Phytoplankton

▶ Only mackerel showed significant differences in TP between East & South

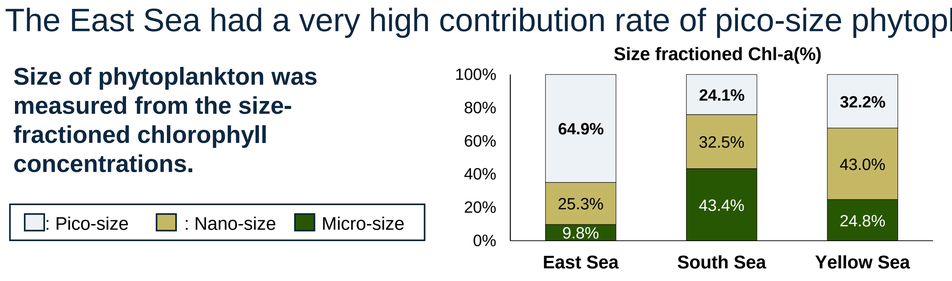


▶ MixSIAR Diet contribution showed only mackerel is pelagic fish



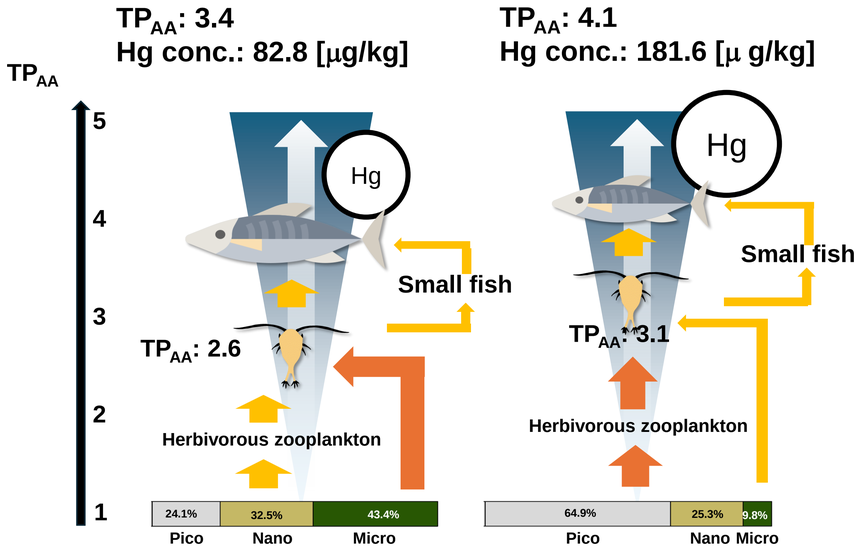
▶ The East Sea had a very high contribution rate of pico-size phytopl.

Size of phytoplankton was measured from the size-fractioned chlorophyll concentrations.



Result III: Evidence-Hg

▶ Mackerel from the East Sea showed high mercury concentrations despite their relatively small size



▷This study reveals that ecosystem alterations due to global warming consequently affect the high trophic position and humans by increasing the trophic position of higher consumers and the accumulation of harmful substances.