Density dependent growth and body condition of chub mackerel in the western North Pacific
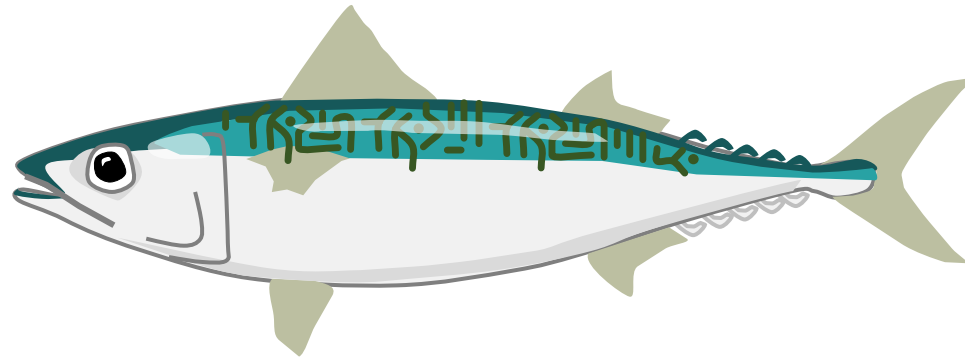

Akihiro MANABE and Yasuhiro KAMIMURA

Original Article

Intra- and inter-specific density dependence of body condition, growth, and habitat temperature in chub mackerel (*Scomber japonicus*)

Yasuhiro Kamimura [1,*], Makoto Taga [2], Ryuji Yukami [1], Chikako Watanabe [1], and Sho Furuichi [1]

Intra- and inter-specific density dependence of body condition, growth, and habitat temperature in chub mackerel (*Scomber japonicus*)

Kamimura et al. (2021, ICES Journal of Marine Science)

Backgrounds

- Increased abundance since 2013

- Changes in growth & maturity during

  the low abundance period (Watanabe and Yatsu 2004, 2006)

- Shift in life-history parameters affects the

  population dynamics

- What is going on during the population "rise"
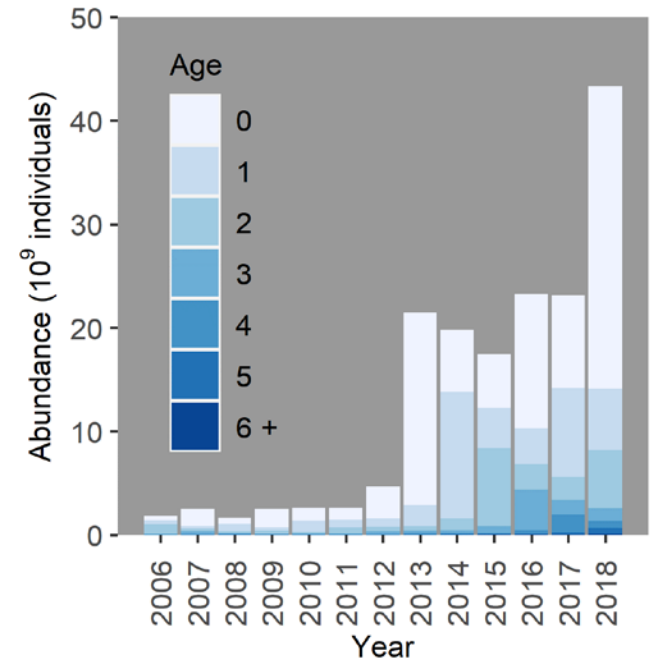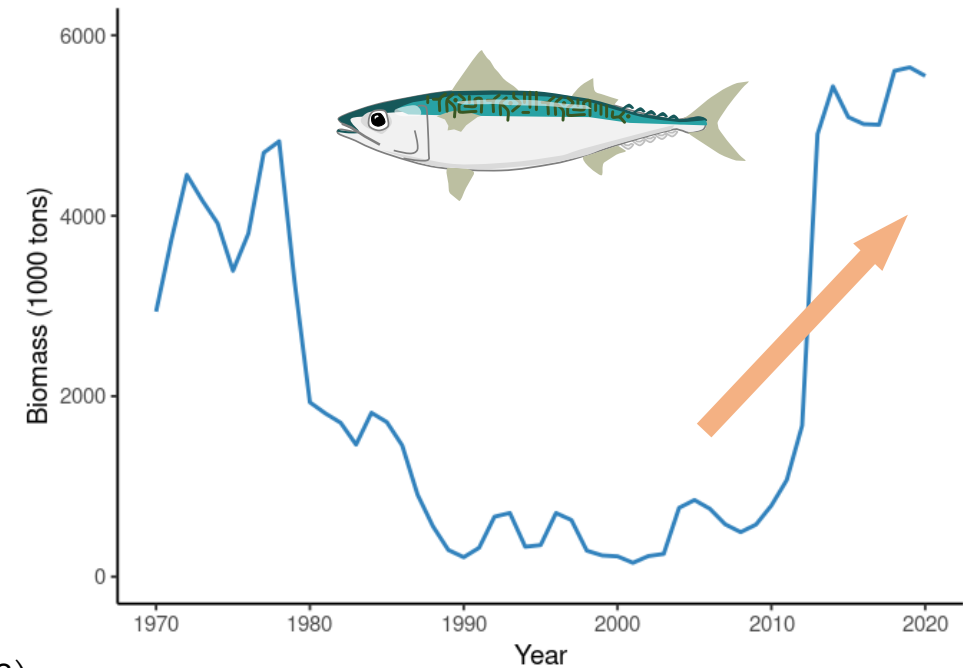
Backgrounds

Body condition is often used as a proxy of individual fitness, as it reflects the size of individual energy reserves (Rueda et al., 2015; Brosset et al., 2017)

It is widely accepted that fish body condition can affect growth, reproductive potential, and survival (Lloret et al., 2014)

Annual and seasonal changes in body condition of chub mackerel in the eastern North Pacific
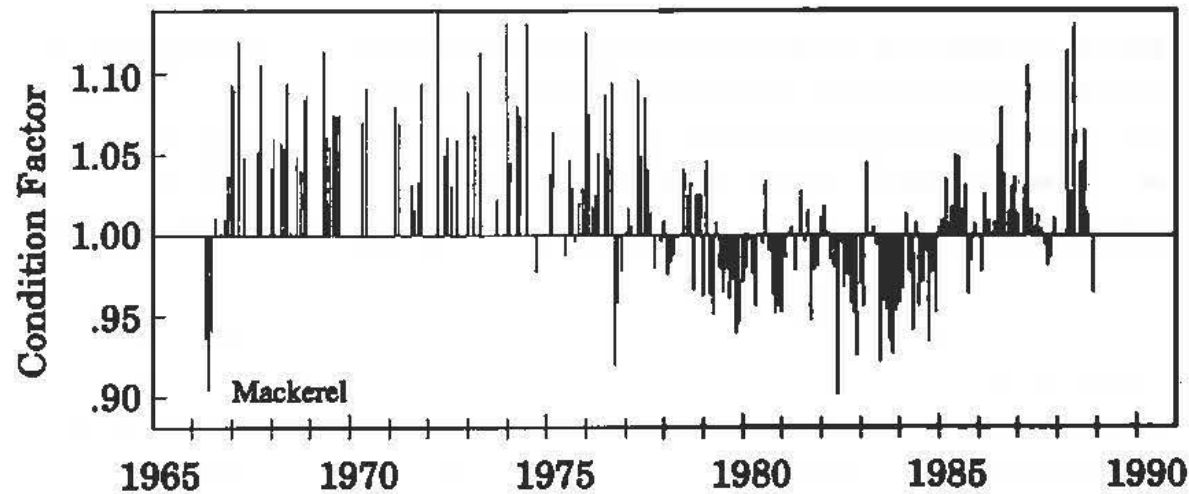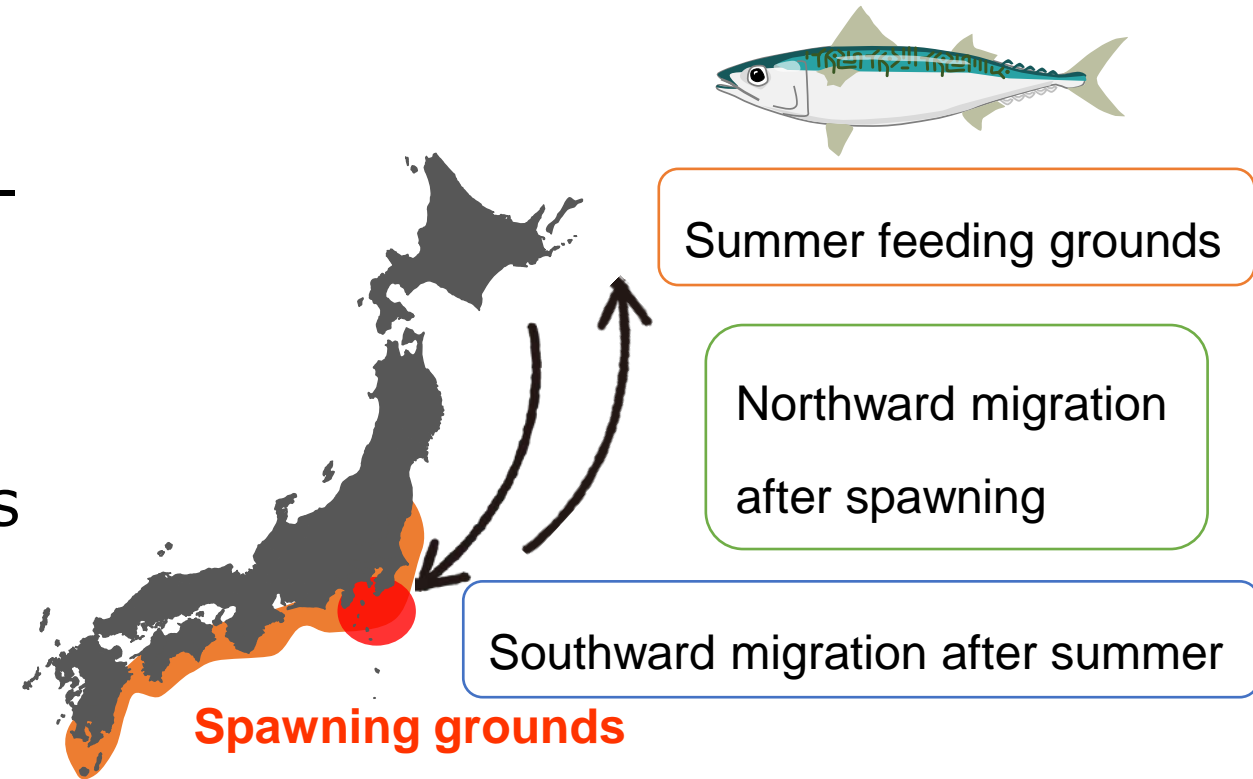

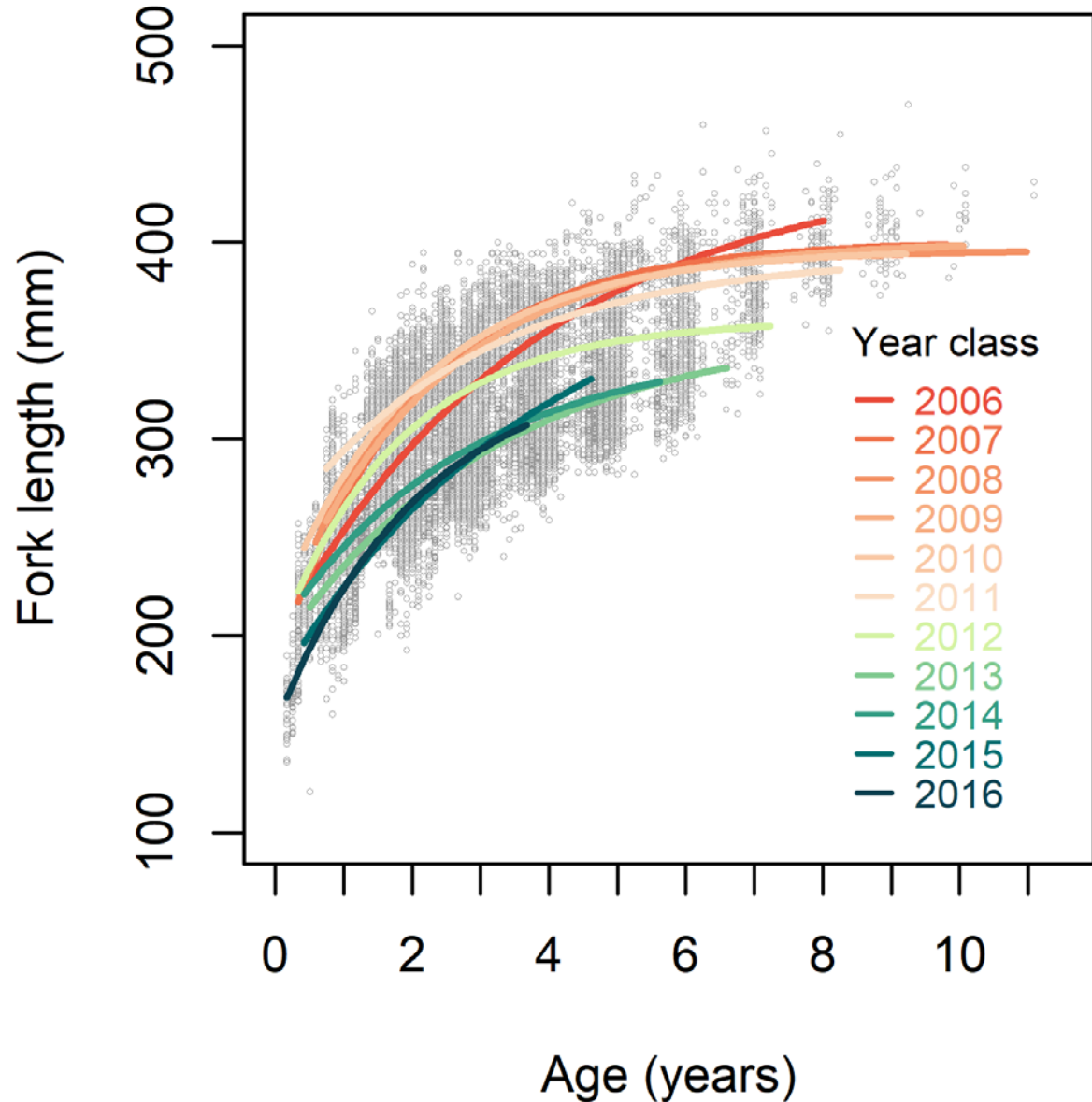Chub mackerel body condition has also been paid attention
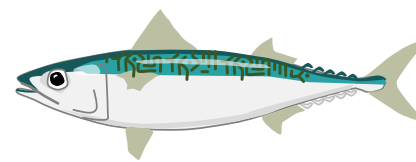
(Parrish & Mallicoate, 1995)

Aims

- Clarify the density-dependence of growth and body condition

- Identify seasonal changes in density-dependence and the drivers of fluctuation in body condition

- In this presentation, we mainly focus on intra-specific effect

Summer feeding grounds

Northward migration after spawning

Southward migration after summer

Spawning grounds
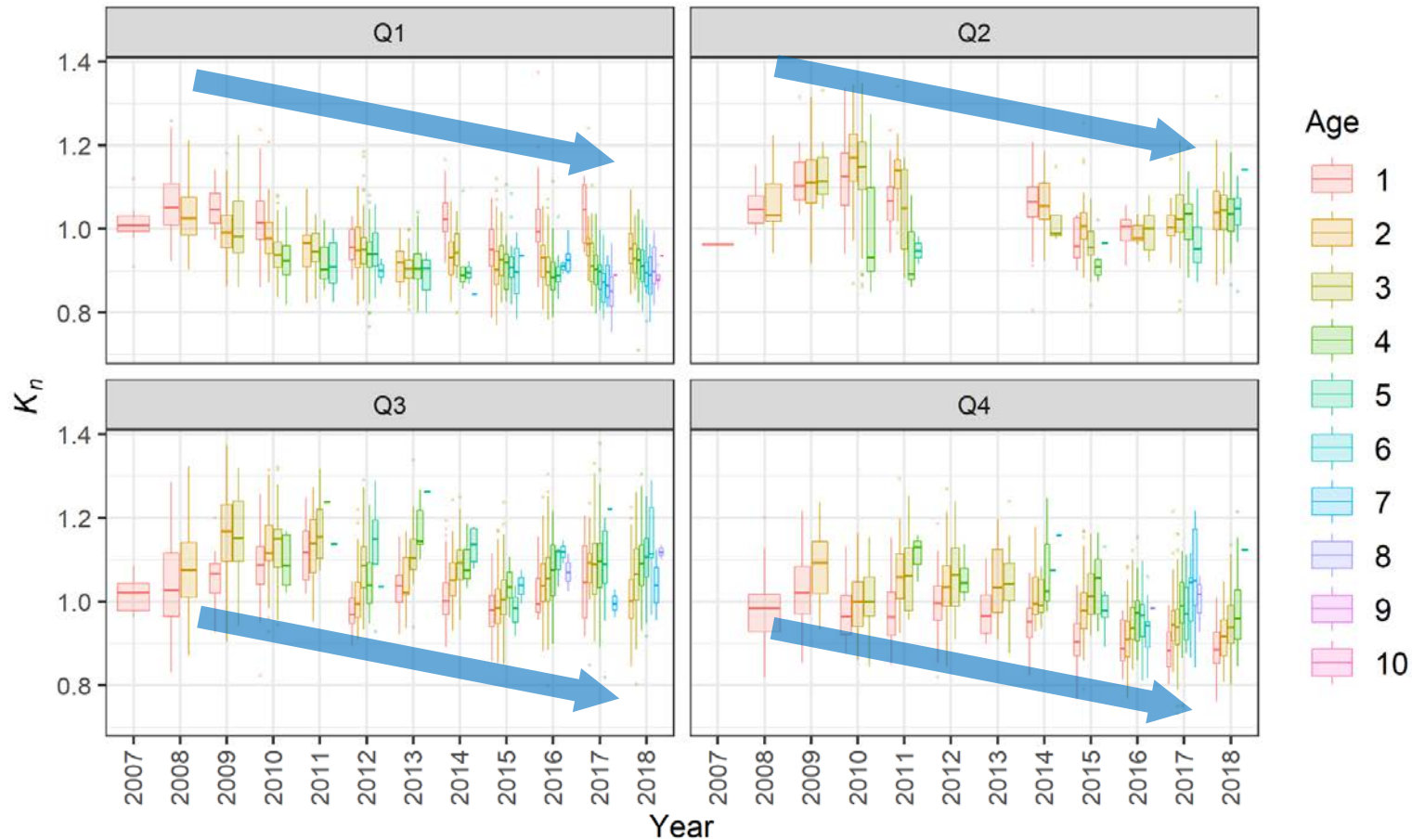
The growth trajectories based on VBGF

The estimated FL at age :

high for the **2007–2011** year classes

low for the **2013–2016** year classes
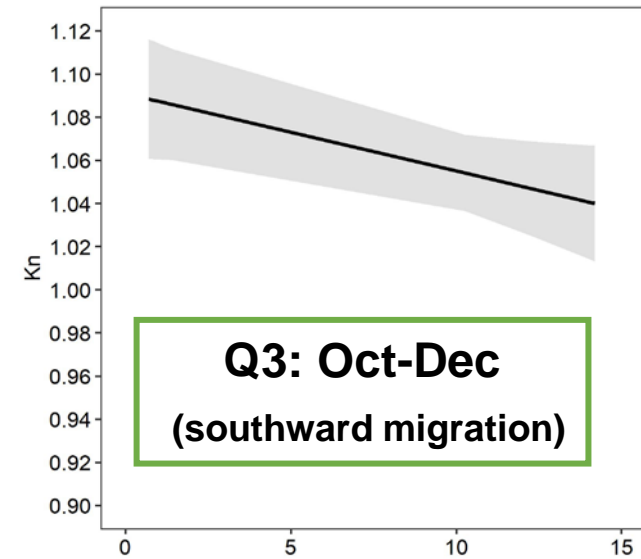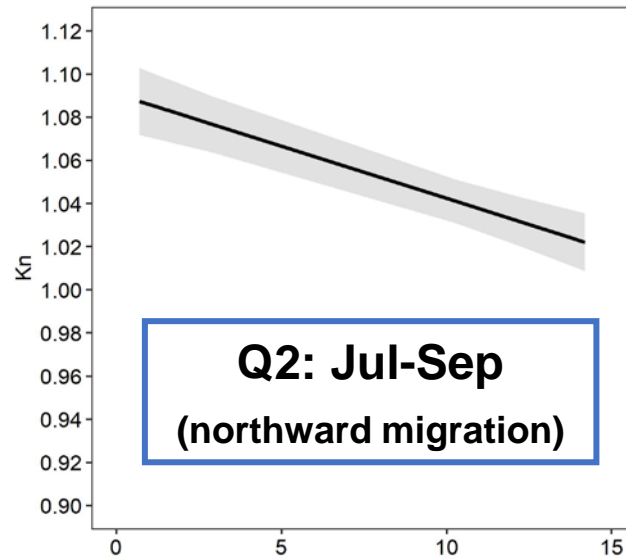
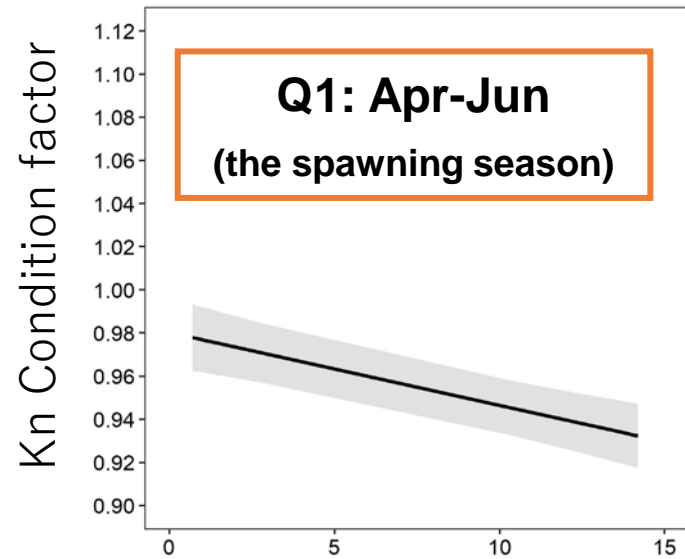# Annual changes in relative condition factor Kn

Relative condition factor K_n = W / Predicted W by W-L relationship

Decreasing trend of Kn in the recent years

Effects of chub mackerel abundance on K_n

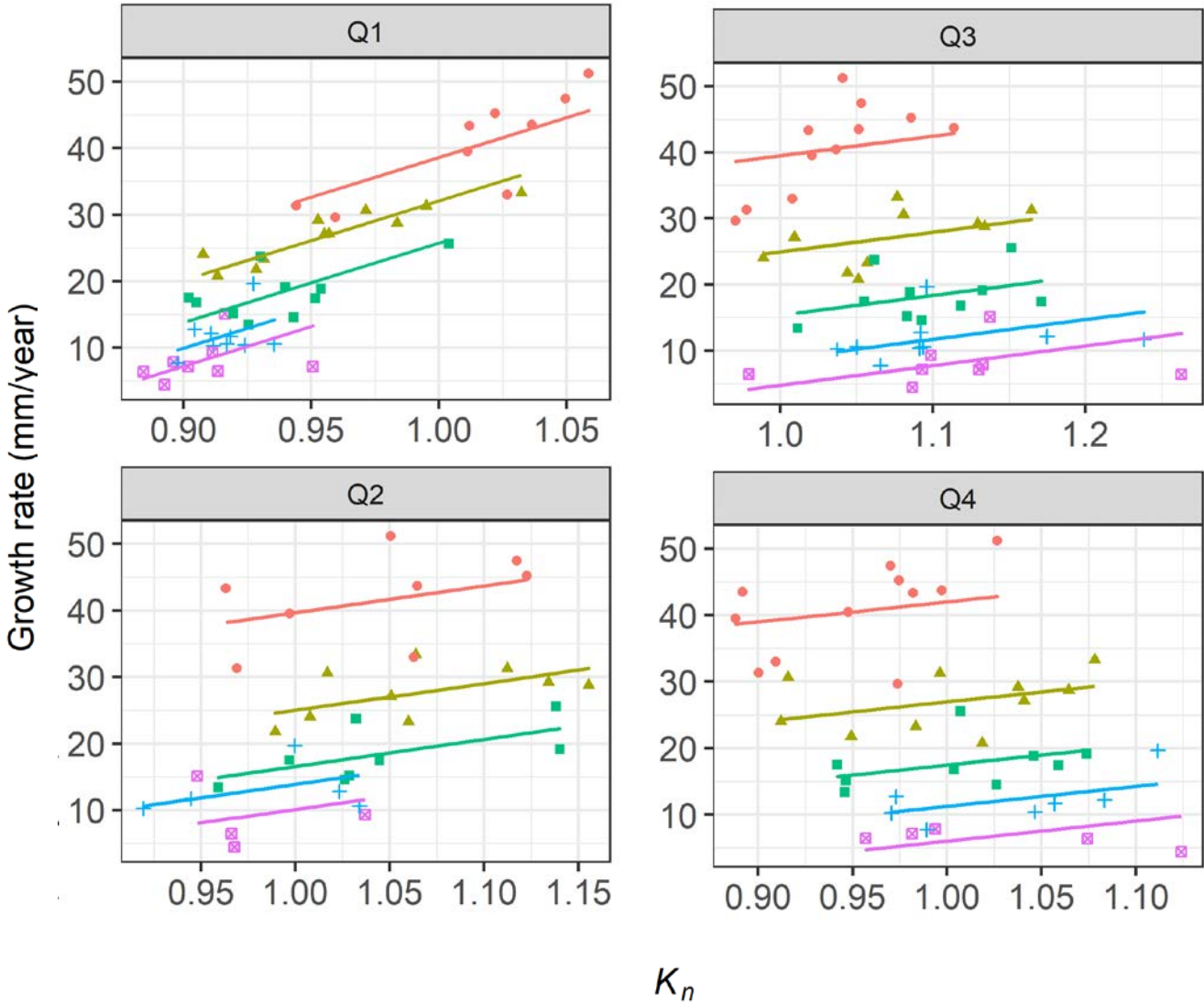## Abundance had stronger negative effects on K_n than other factors in Q1, Q2, and Q3

based on Kamimura et al. (2021)

Effects of other variables (sardine abundance, age, temperature, current index, latitude, and longitude) on K_n were detailed in Kamimura et al., (2021)
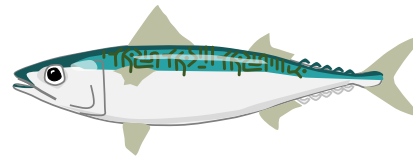
Growth rate and condition factor

Growth rate $G_L = L_{year+1} - L_{year}$

Growth rate and condition factor are significantly correlated

Fatter body, faster growth for all seasons for ages 1-5

Summary

- Increase in abundance of CM in the recent years

- Decrease in growth and **condition factors**

- **Condition factor** is negatively related to **abundance of CM**

- **Growth rate** is positively correlated to **condition factor**

> **At least in Q1-3 (Apr-Dec), density dependent effect plays**
>
> **a substantial role to the decline in condition factor and growth rate**

Other factors, such as age, sardine abundance, and the Oyashio current, also may affected body condition and growth at a specific season