PICES-2025 Session4 AbstractID=18459
Nov. 12, 2025, Yokohama, Japan

Recent Expansion of Tropical Small Pelagic Fish in Japanese Coastal Waters: Case Studies of *Encrasicholina punctifer* and *Sardinella aurita*

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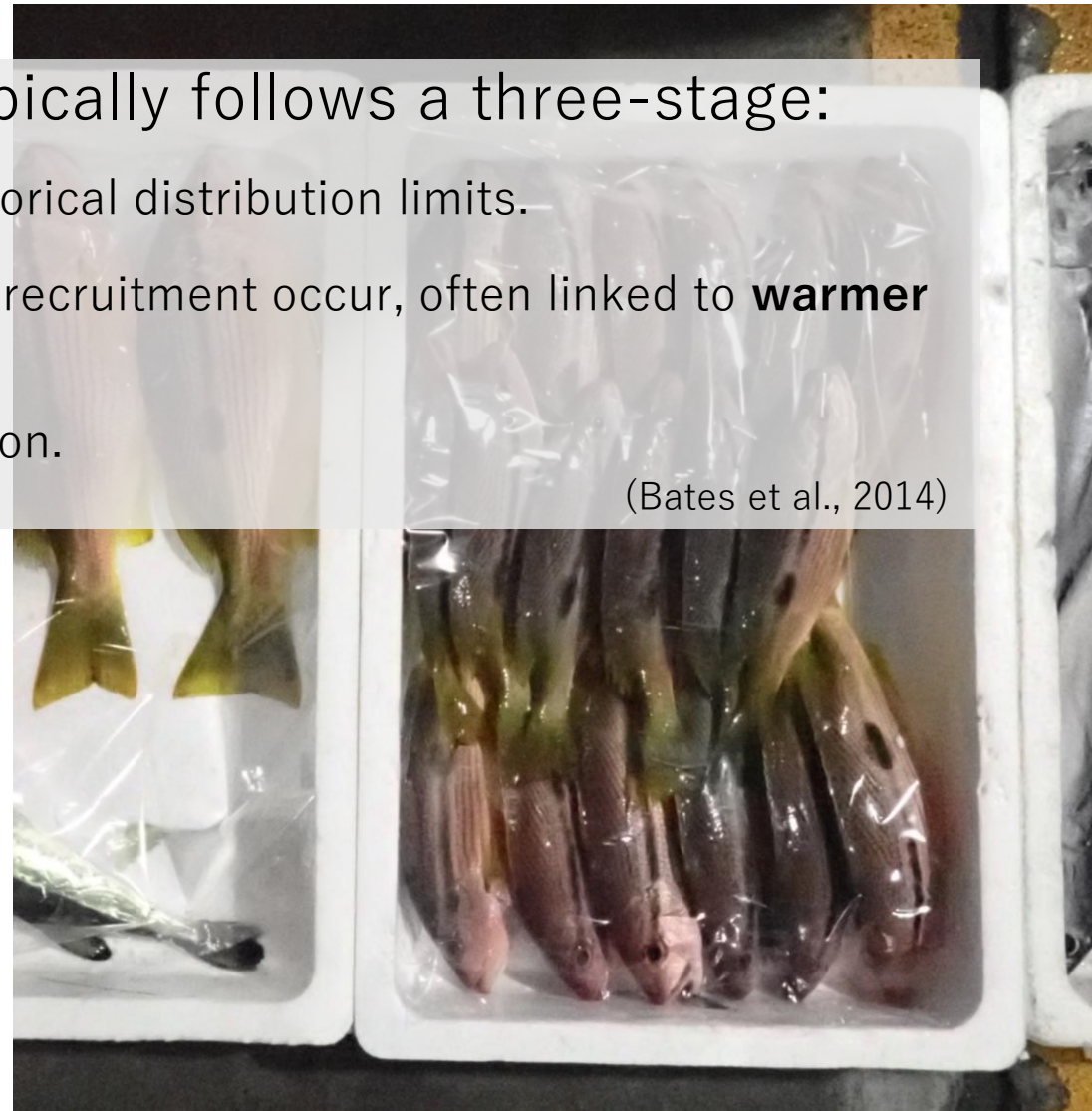
Increasing Occurrence of Tropical Fish in Japanese Coastal Waters

- The **range expansion of tropical species** typically follows a three-stage:
  1. **Initial arrival**: Individuals appear beyond their historical distribution limits.
  2. **Establishment**: Overwintering, reproduction, and recruitment occur, often linked to **warmer winter temperatures**.
  3. **Persistence**: Stable presence and local reproduction.

(Bates et al., 2014)

➥ **Identifying which stage a species is in helps assess the future sustainability of its availability.**

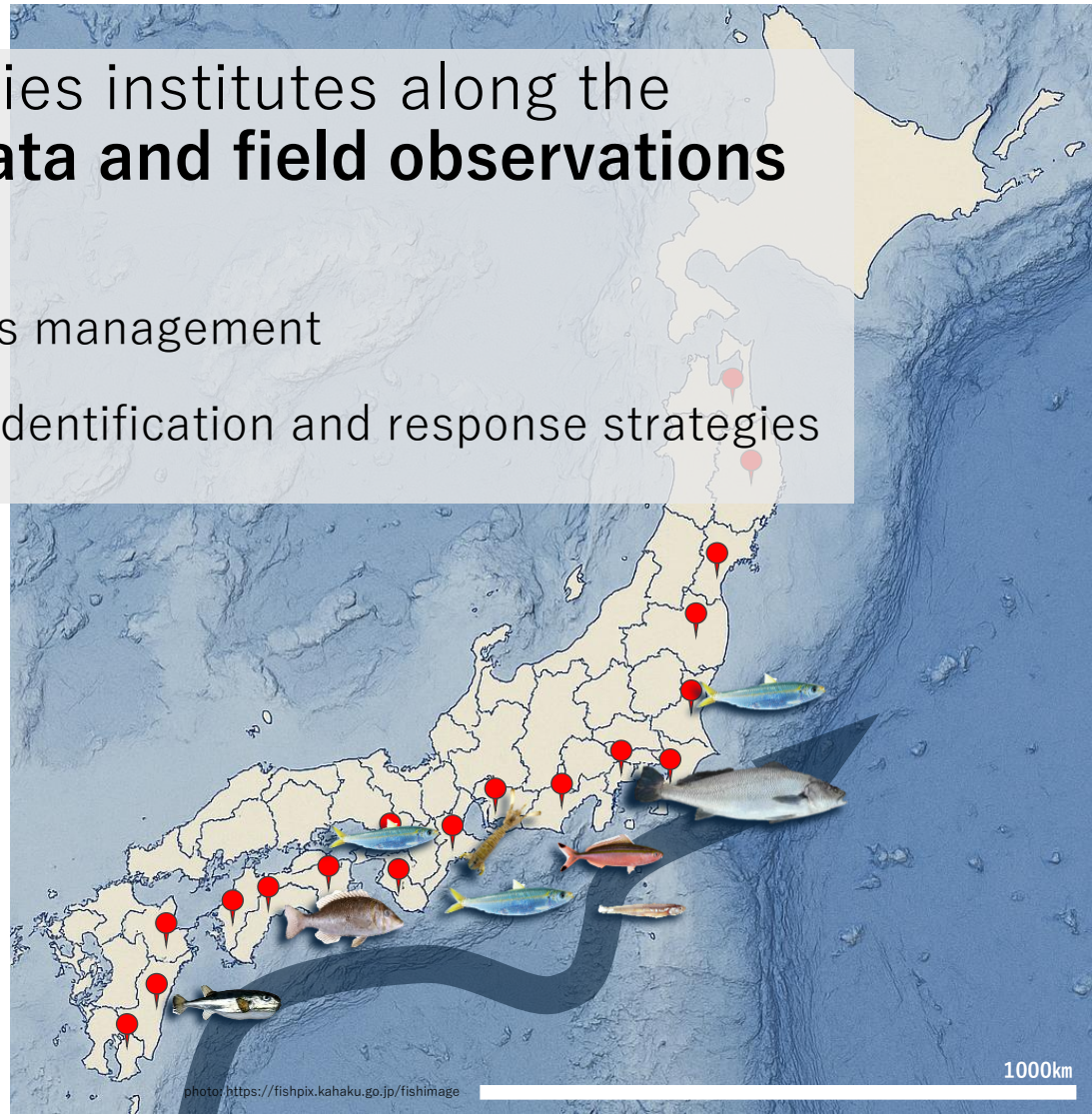


Fisheries Collaboration in Response to Tropical Species Expansion

- In response to environmental changes, fisheries institutes along the Pacific coast of Japan are actively **sharing data and field observations** (Watai et al.,2024).
  - **Exchanging information** for adaptive fisheries management
  - **Sharing field knowledge** to improve species identification and response strategies

➥ **Publishing reports on species occurrence and distribution to support adaptive management and enhance regional collaboration.**

(e.g., Saguchi et al., 2024; Suzuki, 2024)

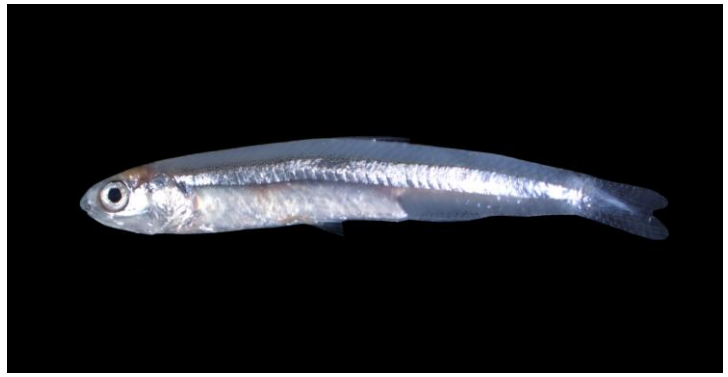


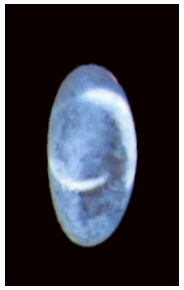
Information Exchange on Tropical-Origin Species in Coastal Japan

Case Studies: Range Expansion of …

Encrasicholina punctifer

- 1950s: First records in central Japan (e.g., Suruga Bay) (Nakai et al., 1969)
  2010s–2020s: Expanded to southwestern and central coastal areas (e.g., Shibushi Bay, Osaka Bay) (e.g. Omi et al., 2024)

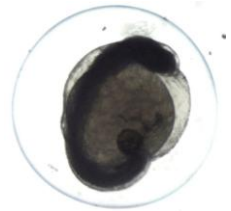




(Shao et al., 2024)

Sardinella aurita

- Rarely observed in Japan during the 20th century
- Rapid increase since the early 2000s
- Especially along the southern Pacific coast (Hata et al., 2020)



Main case studies informed by:

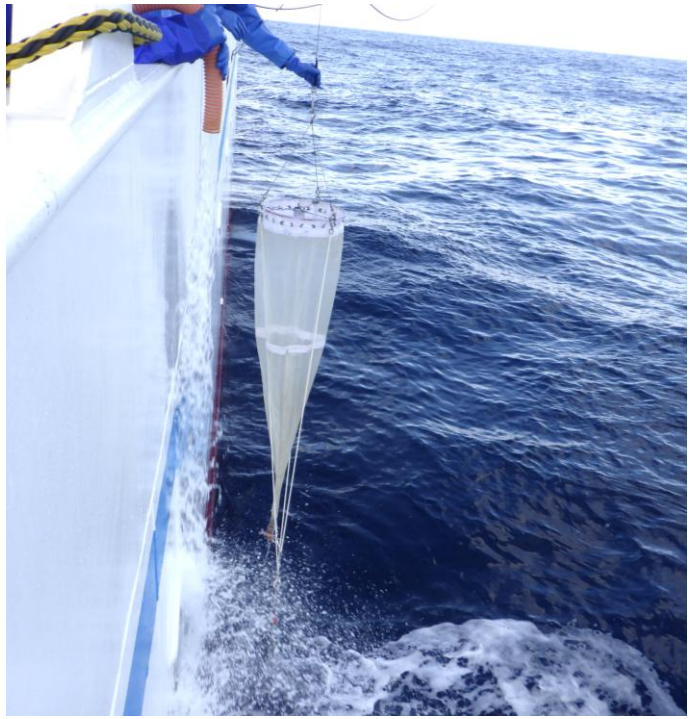
Suzuki, 2024 – Recent records of ***Encrasicholina punctifer*** in Japanese waters

Saguchi et al., 2024 – Occurrence of ***Sardinella aurita*** on the Pacific coast

Study Methods

- Interview surveys:
  - Hearing from prefectural officers
  - Market data used to confirm occurrence and catch records
- Egg and larval surveys:
  - Monthly plankton sampling using Norpac nets (0–150 m depth).
- Field surveys:
  - Conducted in Saiki Bay (Oita) and other prefectures
  - Targeted juvenile and adult sardines and anchovies
  - Species composition of *shirasu* catch monitored

(Saguchi et al., 2024; Suzuki, 2024)



Occurrence of *Encrasicholina punctifer* by Prefecture (2022)

Prefecture	Size (TL)	Bycatch Rate / Notes
Kanagawa	juvenile (**50–70** mm) post-larvae (~**30** mm)	Possibly >**50%** E. punctifer
Shizuoka	juvenile (**38–45** mm) post-larvae (**20–30** mm)	**10-30**% among anchovy larvae
Aichi	juvenile / adult (**58–80** mm)	**2**% by weight in anchovy catch
Mie	juvenile / adult (**58–80** mm)	Bycatch confirmed; rate not specified
Ōita	larvae (**18–49** mm)	Bycatch rate: **8–17**% (Sep–Oct)

Presence by Prefecture

(Suzuki, 2024)

Occurrence of *Sardinella aurita* by Prefecture (2022-2023)

Prefecture	Size (TL)	Notable Catch Events
Kanagawa	**33–36** mm (larval stage)	2023 Aug: confirmed in *shirasu* catch
	adult	2015: **1.4** t, 2016: **0.9** t, 2018: **0.9** t 2019–: tens to hundreds of kg annually
Shizuoka	**20–25** mm (larval stage)	2023 Aug: mixed in *shirasu* catch (**1–3**%)
Aichi	**50–180** mm (varied by month/year)	2022 Sep: **241** t, Oct: **100** t, Dec: **0.5** t
Mie	**80–200** mm (varied by month/year)	2022 Nov: **1.1** t, Dec: **29.1** t (Kumano-nada)
Osaka	**119–153** mm	2022 Sep: “several tons/day” reported
Others	Not specified or limited data	Catch confirmed; often labeled as “mixed” or “miscellaneous”

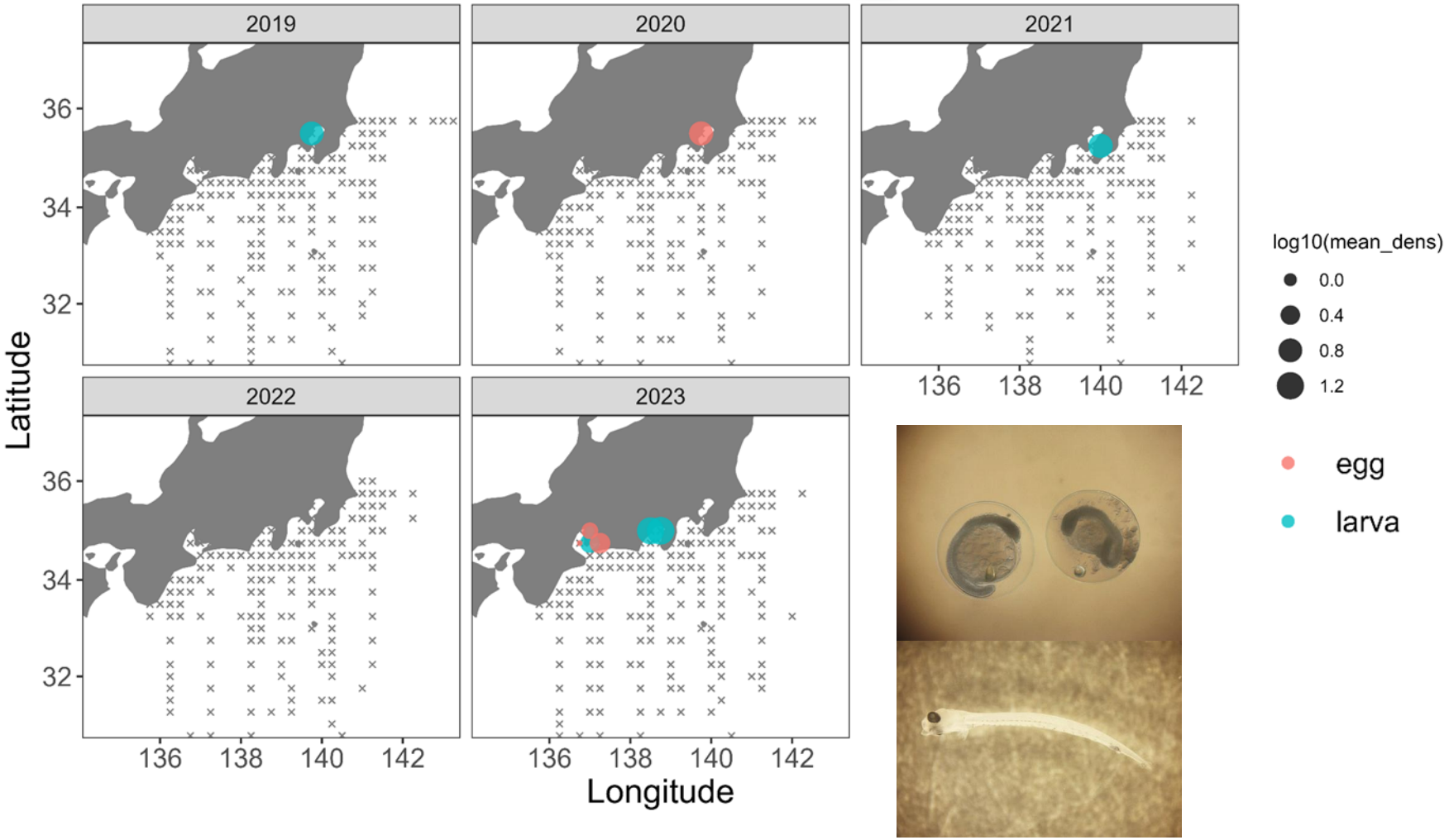
Presence by Prefecture

(Saguchi et al., 2024)

Egg and Larval Survey Results (2019–2023)

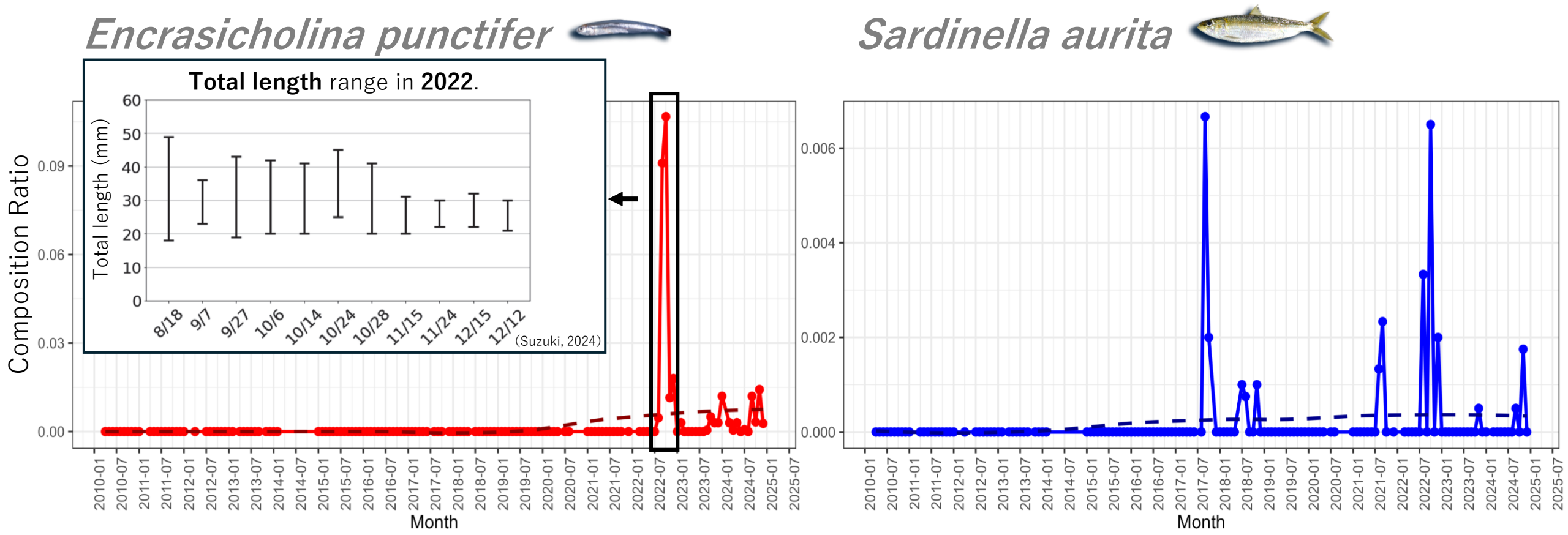
Encrasicholina punctifer

Sardinella aurita



Catch Trends of *E. punctifer* and *S. aurita* in Oita Prefecture

- Monthly Trend composition

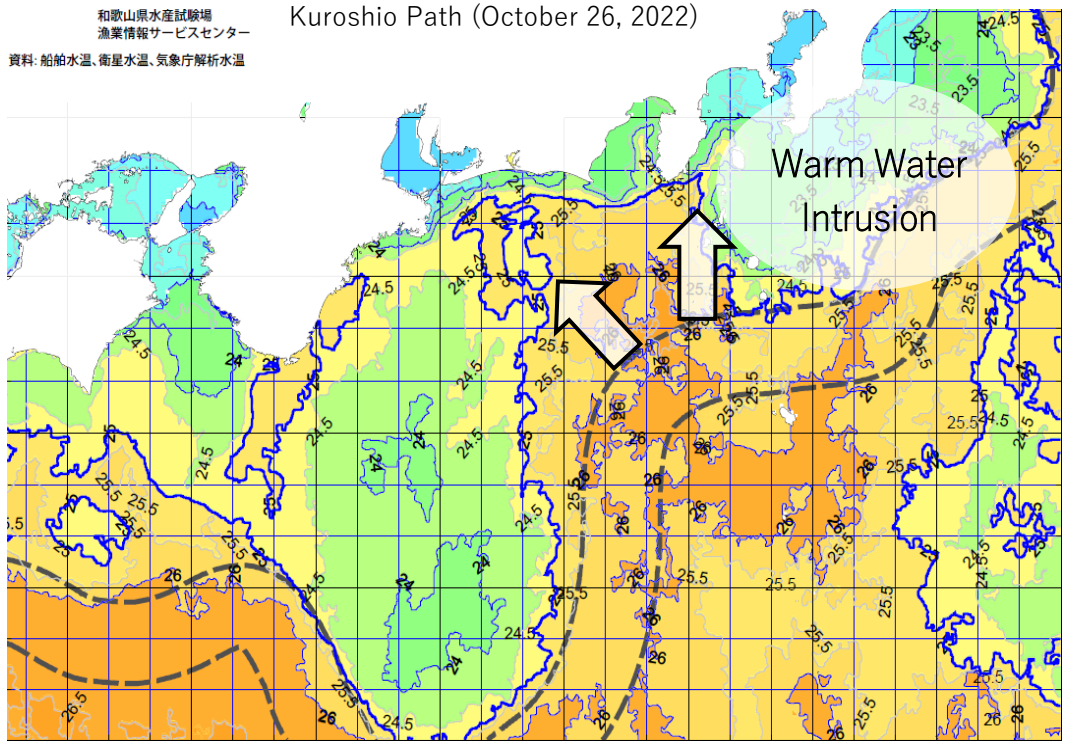


- *E. punctifer* increased sharply in 2022 and continues to appear intermittently.
- *S. aurita* has appeared sporadically since 2017.

Key Points on *Encrasicholina punctifer* Occurrence

- **Distribution Expansion**
  Simultaneous appearance in Kanagawa, Shizuoka, Aichi, Mie, and Oita (2022)
- **Catch Records**
  Up to 17% bycatch rate in Oita; juveniles confirmed in multiple regions
- **Spawning Indication**
  Continuous juvenile presence suggests possible local reproduction
- **Environmental Link**
  Appearance likely influenced by Kuroshio path shifts and warm water intrusion

(Suzuki, 2024)



Source: Kanto-Tokai Ocean Conditions Bulletin, Japan Meteorological Agency *(October 26, 2022)*

Key Points on *Sardinella aurita* Occurrence

- **Catch Surge**
  Up to 241 tons/month in Ise/Mikawa Bays (2022)
- **Resource Increase**
  Possible strong year class since 2022
- **Juvenile Bycatch Rate**
  Sporadic appearance since 2017
- **Spawning Indication**
  - Eggs and larvae observed in Ise Bay, Suruga Bay, and Tokyo Bay (2023)
- **Rapid Expansion**
  Increasing abundance suggests rising importance as a fishery resource
- **Stock Assessment Issues**
  Catch often recorded as “miscellaneous” or “mixed,” making assessment difficult

(Saguchi et al., 2024)

Regional Collaboration in Tracking Warm-Water Pelagic Species

Tracking species appearance

- Monitoring when, where, and which species appear
- Helps assess future distribution and spawning potential under climate variability

Sharing local expertise

- Exchanging identification methods and field responses across regions
- Provides practical insights for adaptive fisheries management

Collaborative detection and response

- Cooperation among prefectural fisheries institutes
- Enables timely detection of ecological changes and coordinated regional responses

(Sashida et al., 2025)

Thank you for your attention

Processed Products of *Encrasicholina punctifer* in Taiwan