Delayed by the Kuroshio Current: Unusual Spring Recruitment of Japanese Glass Eels in Japan but not in Taiwan

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ABSTRACT

The Japanese eel is an economically important species in East Asia, and its aquaculture depends on wild-caught glass eels. Recently, unusual spring recruitment of Japanese glass eels has been observed in Japan. From 2011 to 2023, glass eels were collected from the Yilan River in Taiwan and the Kiyotake and Sagami rivers in Japan using site-specific fishing methods. Recruitment patterns were compared using catch-per-unit-effort (CPUE). Normal recruitment occurred from October to March in Taiwan and from November to April in Japan, but unusual recruitment after the normal season was observed only in Japan. This pattern may be linked to seasonal changes in the Kuroshio Current, allowing larvae to bypass Taiwan and recruit to Japan.

INTRODUCTION

- Seasonal changes in Kuroshio Current speed may affect recruitment delay of Japanese glass eels in Japan

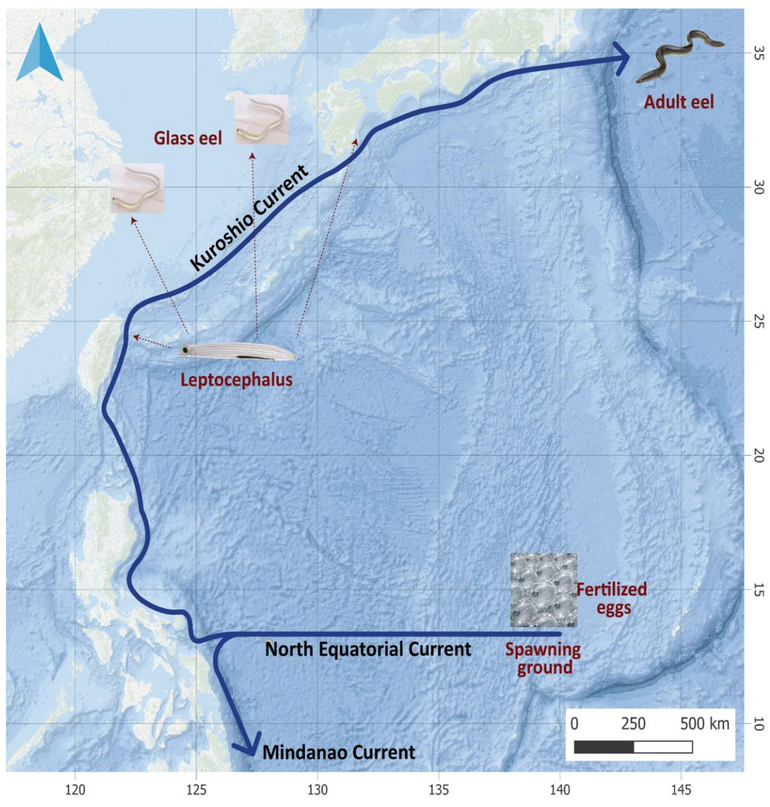


Fig 1. *Migratory route and life cycle of the Japanese eel (Anguilla japonica) in the western North Pacific*

METHODOLOGY

- Catch per unit effort (CPUE) was calculated from three sampling locations from 2011–2023

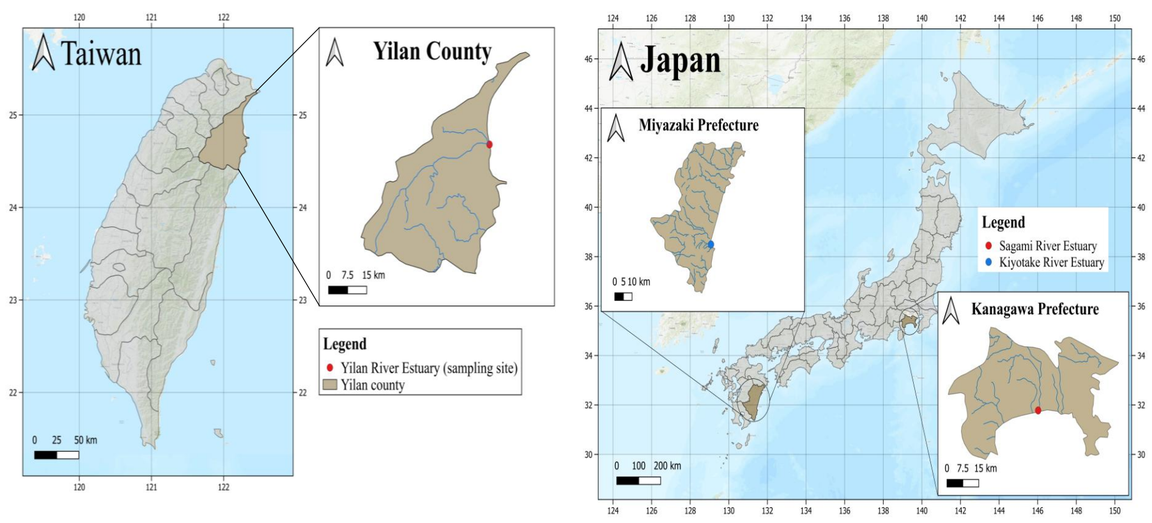


Fig 2. *Sampling sites for collection of Japanese glass eels*

Table 1. *Collection of Japanese glass eels*

Site	Method	Timing	Frequency
Yilan River estuary (Taiwan)	Fyke net	Flood tides around first and last quarter moon	1 or 2 times per month (2 hours)
Kiyotake River estuary (Japan)	Small net	Rising tides nights around new moon	Once per month (2 hours)
Sagami River estuary (Japan)	Scoop net	Around spring tide nights	Once per month (2 hours)

- Particle-tracking simulations were used to compare larval transport between Taiwan and Japan. Virtual particles were tracked for up to 240 days, and their routes, travel duration, release month, and arrival month were analyzed to explain delayed spring recruitment in Japan.

RESULTS

- Seasonal changes in the Kuroshio Current pathway and transport speed alter larval drift routes, allowing some late-arriving larvae to bypass Taiwan and reach Japanese estuaries after April.

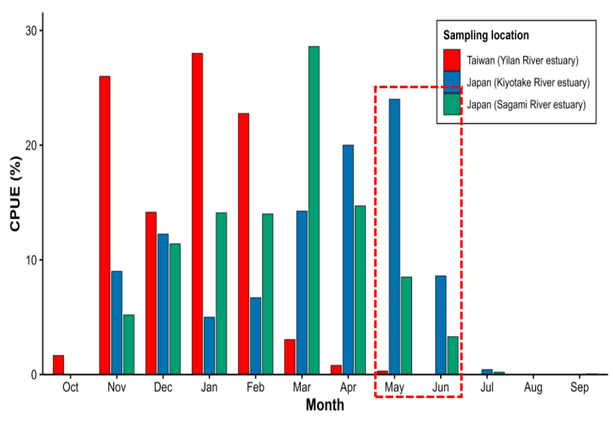


Fig 3. *Monthly recruitment pattern of Japanese glass eels in Taiwan and Japan from 2011–2023. Spring recruitment after the normal season was observed mainly in Japanese estuaries.*

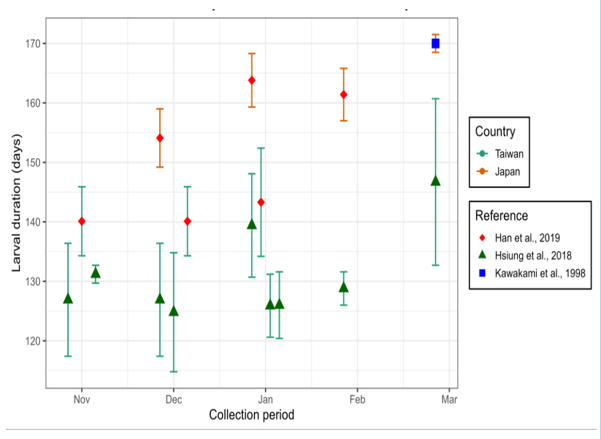
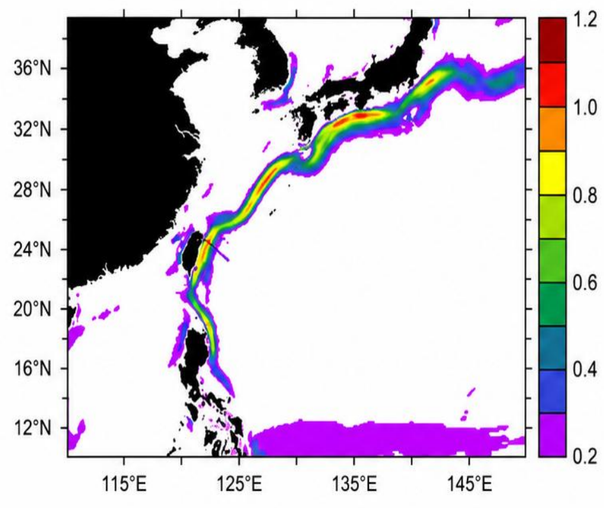


Fig 4. *Larval duration of Japanese eels in Taiwan and Japan. This suggests that larvae reaching Japan have a longer duration, indicating delayed recruitment of glass eels*



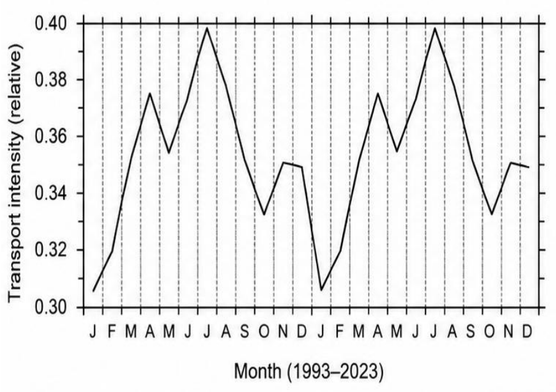
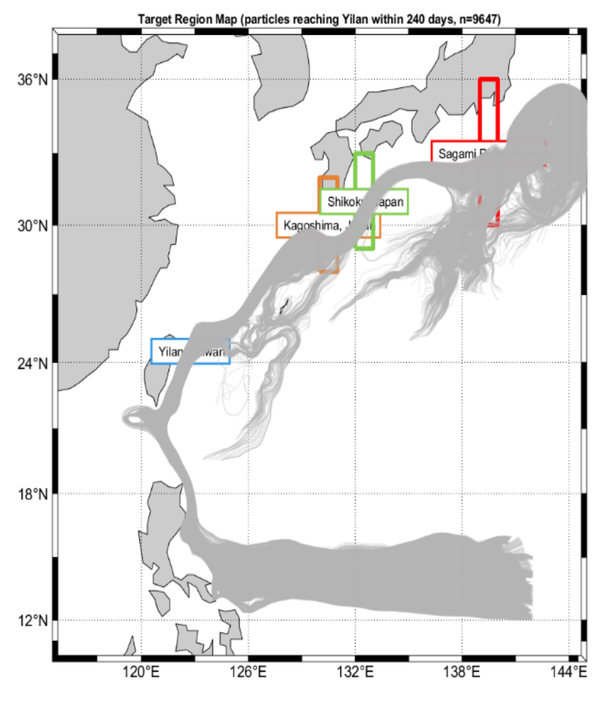


Fig 5. Seasonal variability of Kuroshio Current transport intensity along the Taiwan East Coast from 1993–2023



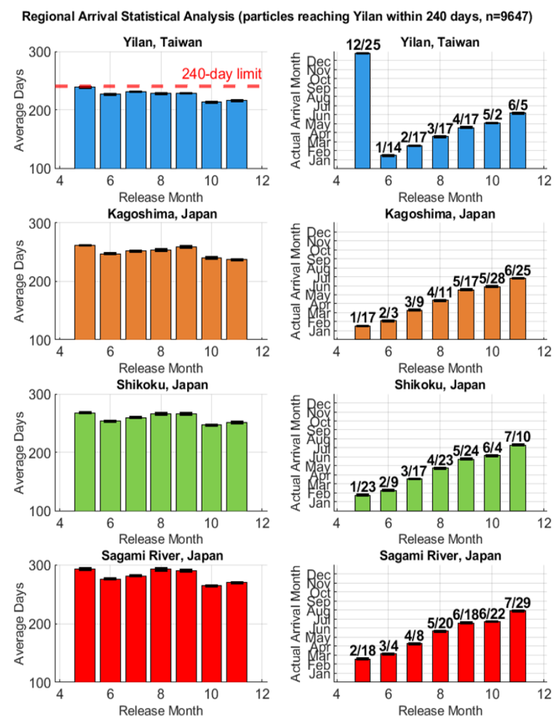


Fig 6. Simulated larval transport duration and arrival timing in Taiwan and Japan, showing delayed springtime recruitment in Japanese estuaries associated with variability in the Kuroshio Current

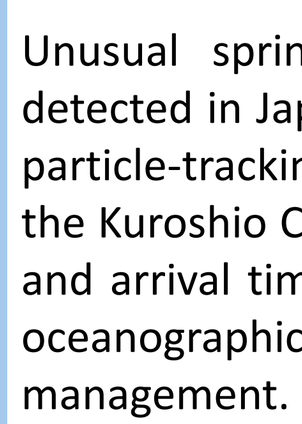
CONCLUSION

Unusual spring recruitment of Japanese glass eels was detected in Japan but not Taiwan. Longer larval duration and particle-tracking results suggest that seasonal variability in the Kuroshio Current may influence larval transport pathways and arrival timing. These results highlight the importance of oceanographic variability in eel recruitment and management.

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PERSONAL DETAILS



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