

# Case studies of the local stock assessment in the Northwest Pacific: Difficulties in the stock assessment for seamount bottom fisheries



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# Emperor Seamounts

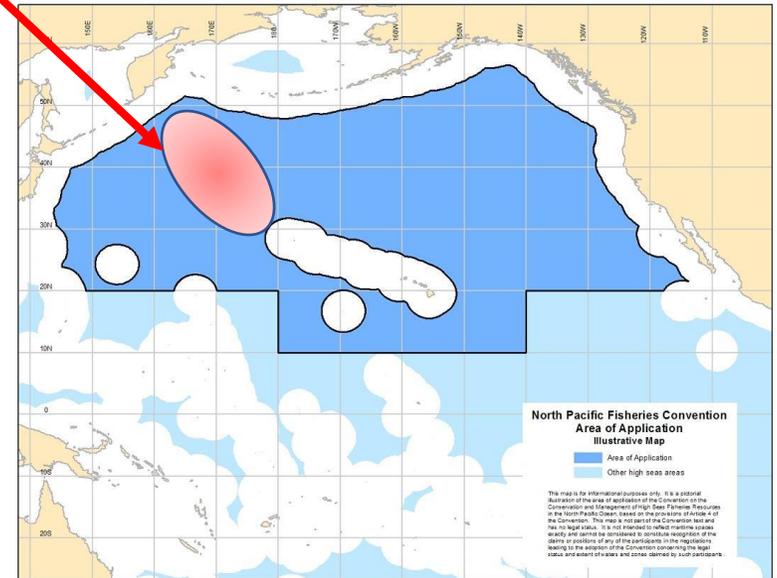
- High seas fishery ground for bottom fisheries
- Used by Japanese, Korean and Russian vessels
  - Trawl, gillnet, longline
- Main target:
  - North Pacific armorhead *Pentaceros wheeleri*
  - Splendid alfonsino *Beryx splendens*
  - ... etc.
- Managed by North Pacific Fisheries Commission (NPFC)



North Pacific armorhead



Splendid alfonsino



## Convention Area of NPFC

Modified from

[https://www.npfc.int/about\\_npfc/convention\\_and\\_npfc\\_area\\_of\\_application](https://www.npfc.int/about_npfc/convention_and_npfc_area_of_application)

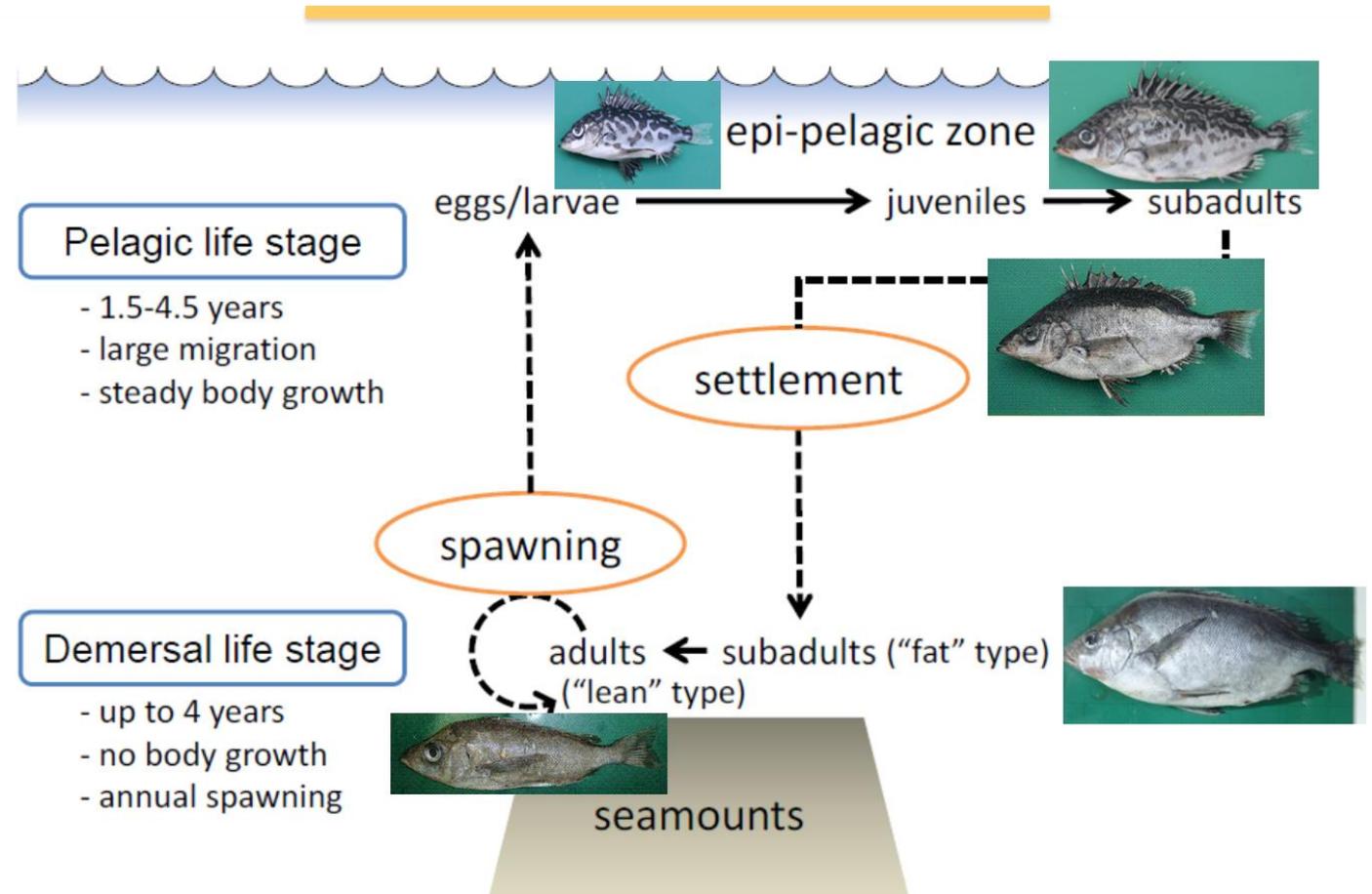
# Aim of this presentation

- Stock assessment is not successful for bottom fisheries in the Emperor Seamounts ... Why?
- Review difficulties hindering stock assessments for North Pacific armorhead (and splendid alfonsino)
- Offer a case study of difficulties in stock assessment and challenging area of development

# Unique life history of armorhead

- Large size at recruitment
- No growth after settlement/maturation (= determinate growth)
- Body weight/height reduction during demersal period

Armorhead does not fit with assumptions in many stock assessment models

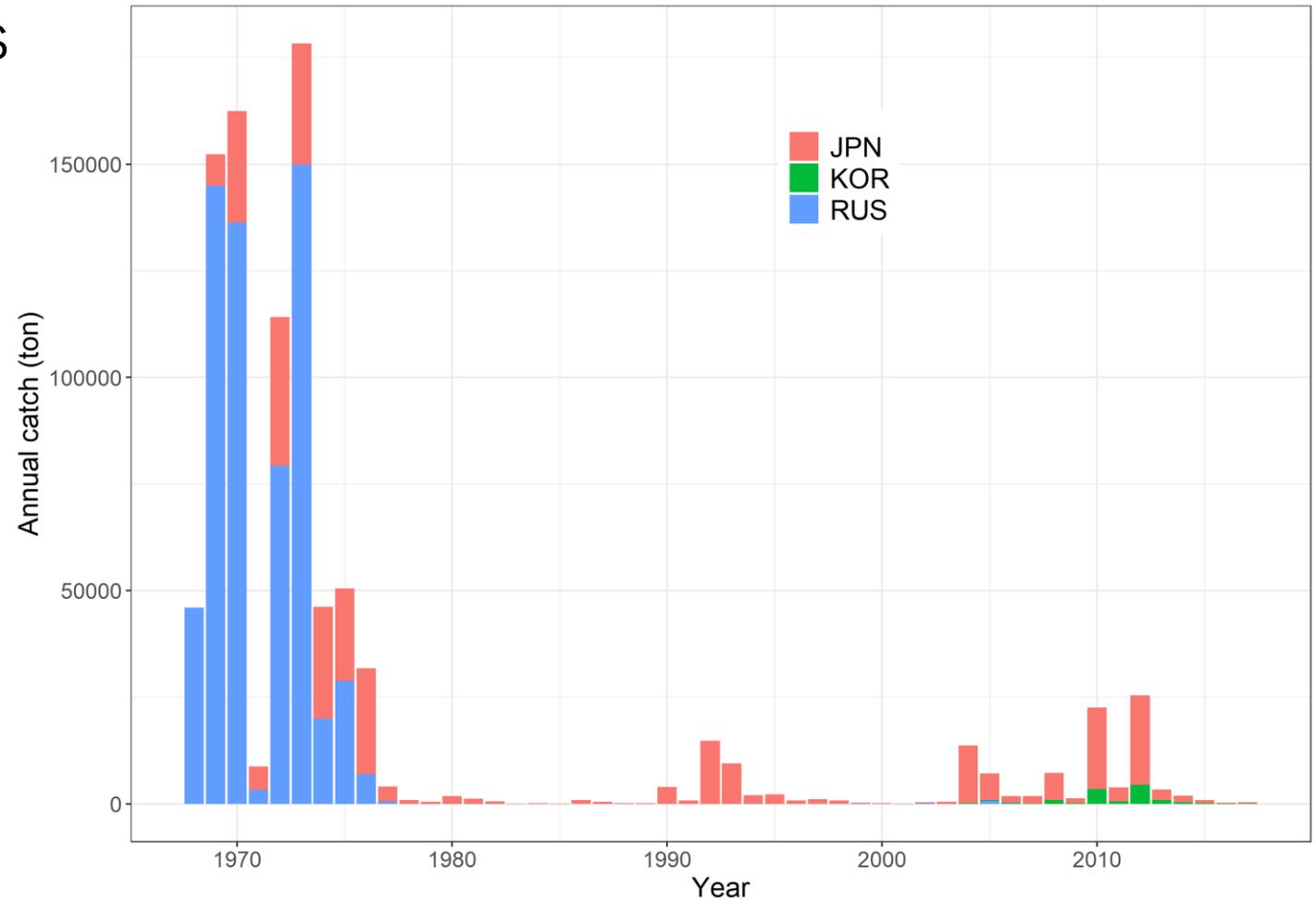


Kiyota et al. 2016 Pacific Science

# Extreme fluctuation of recruitment

- Collapse in late 1970's
- Catch remains low in most years
- Rapid/unpredictable increase of catch due to episodic recruitment

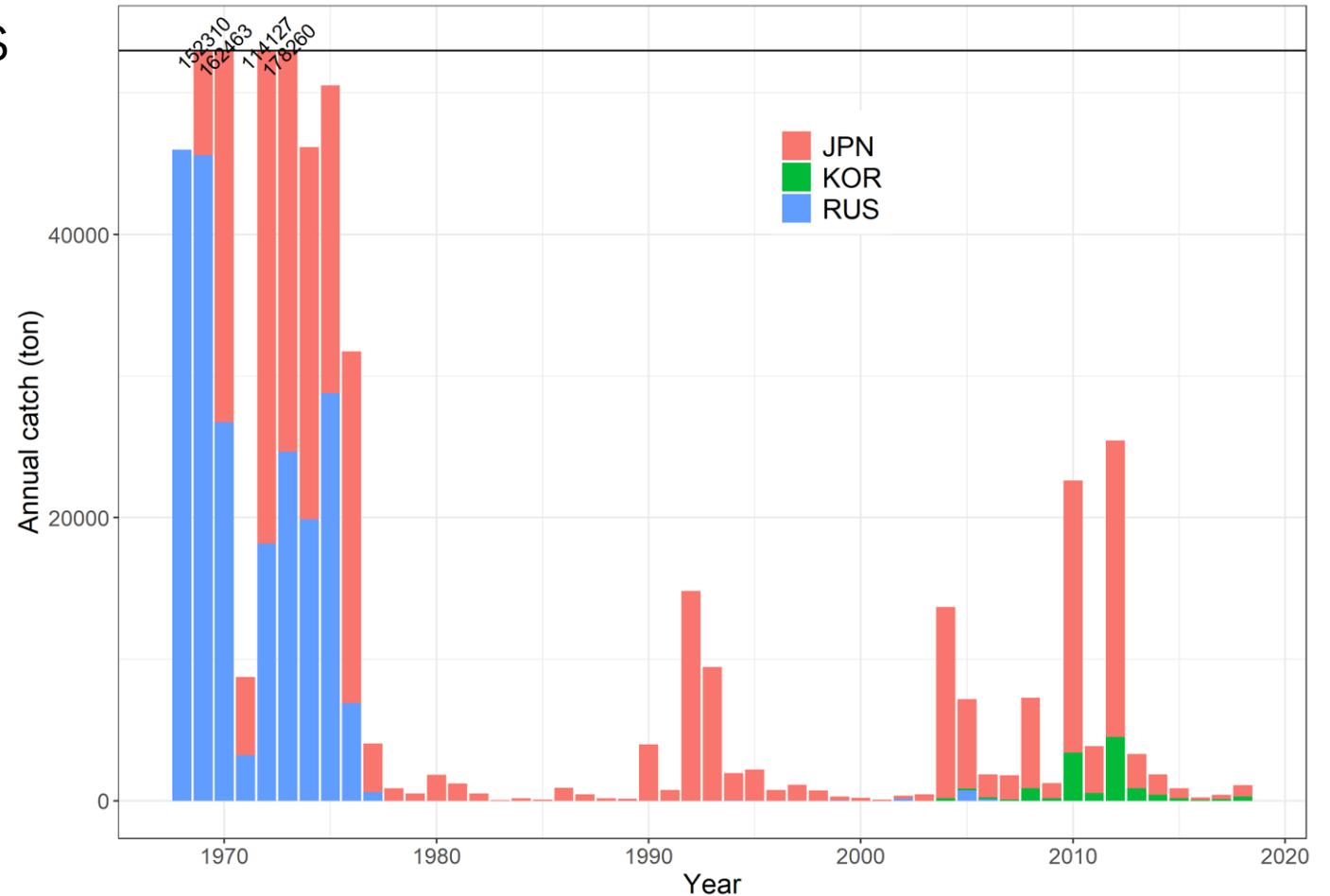
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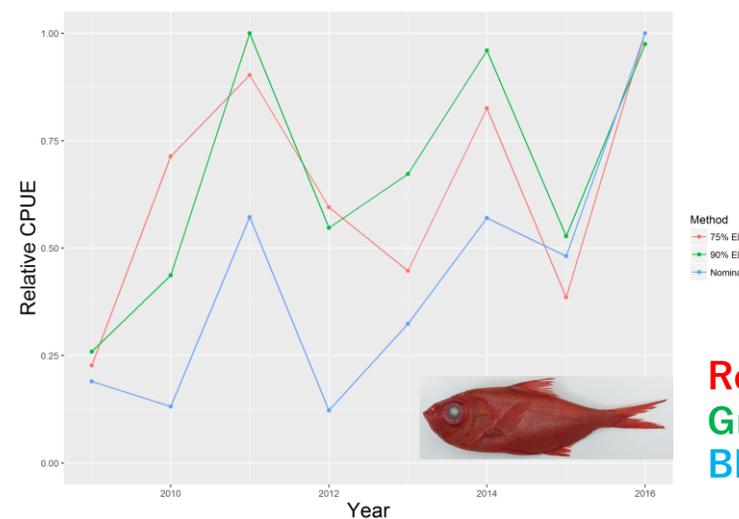
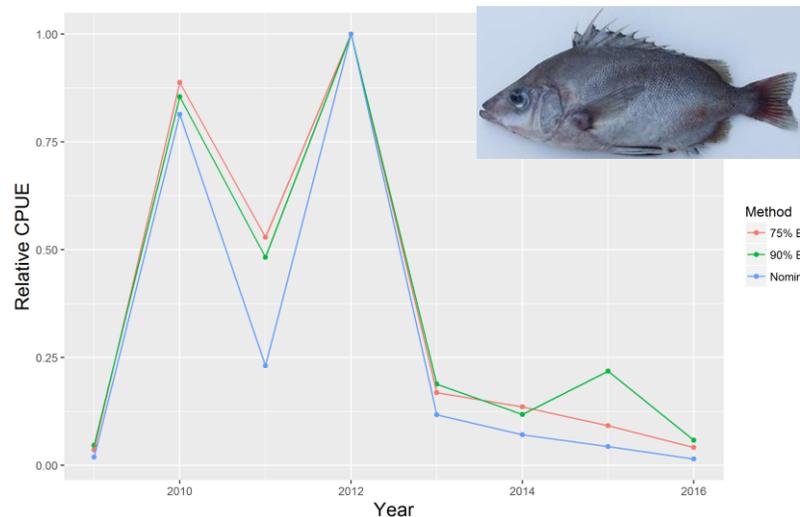


# Limited quantity/quality of data

- Limited high-resolution data (shot-by-shot)
  - Only available for recent years (2009~)
  - Uncertainty caused by misreporting by recent JPN trawlers (only total catch was corrected)
- Uncertain total catch in the past
  - No data available on vertical longline operated around 1980
- Length- or Age-composition is difficult to use
  - Determinate growth
  - Difficult to read otolith annual rings after settlement  
(Daily ring analysis is in progress)

# Target shifts in multispecies fisheries

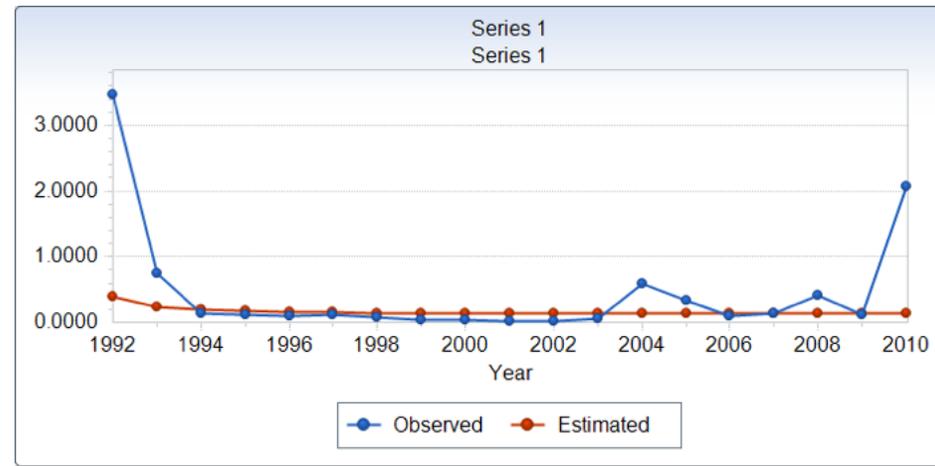
- Fishermen target armorhead when armorhead is abundant, but target alfonsino when armorhead is scarce
- **Target shift causes bias in CPUE trends**, especially in alternative stock (alfonsino) rather than priority stock (armorhead)
  - Demonstrated by directed CPUE method (Biseau 1998)



**Red:** Directed CPUE with 75% EL  
**Green:** Directed CPUE with 90% EL  
**Blue:** Nominal CPUE

# Past attempts for stock assessment

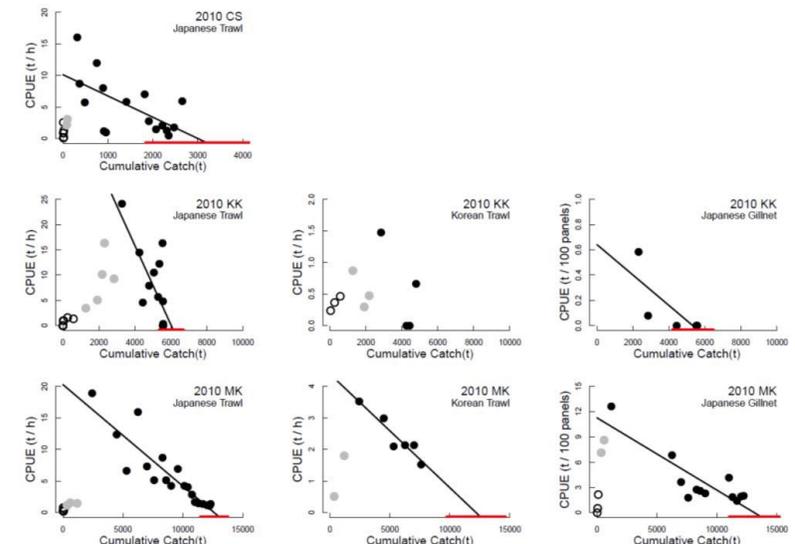
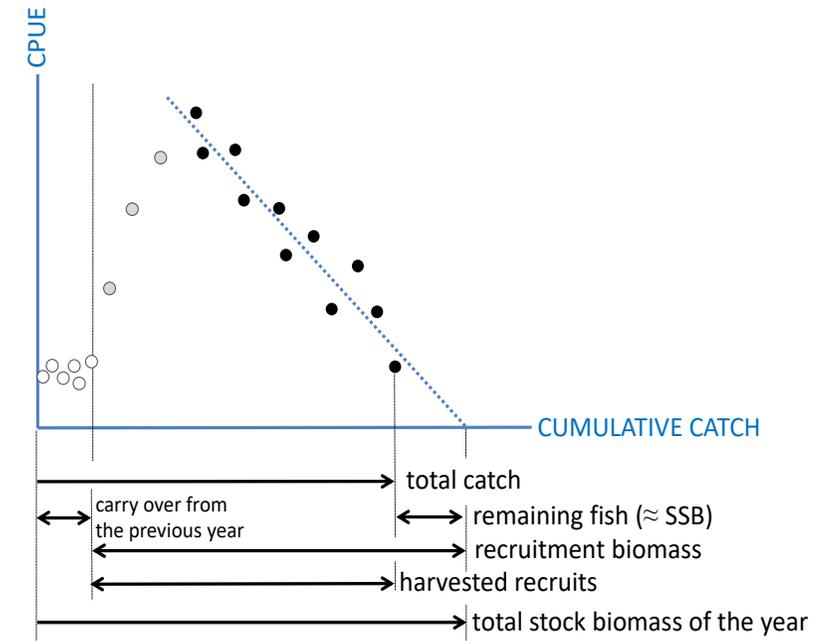
- Surplus production model by ASPIC (Yonezaki et al. 2012)
  - Bad fit
  - Episodic recruitment (which dominates CPUE pattern) cannot be predicted



- Assumptions of surplus production model do not fit with armorhead biology

# De Lury (depletion) method

- The amounts of recruitment and remained stock can be estimated
  - Especially when recruitment is strong
- Problems
  - Difficult when recruitment is weak
  - Not applicable to future projection
  - Affected by data uncertainty



# Current management measures

- “Adaptive Management” plan for armorhead implemented by NPFC
- In-season modification of encouraged catch limit
  - 700t when recruitment is weak
  - 12000t when recruitment is strong
- Recruitment levels estimated by “monitoring survey” by fishing vessels
  - Based on CPUE (index of abundance) and fatness (index of recruit)

# Concluding remarks

- Stock assessment for demersal fishes in the Emperor Seamount is hindered by ...
  - Unique life history and recruitment fluctuation
  - Limited data quality/quantity
  - Target shift
- Thus the stocks are managed through “adaptive” approach without quantitative assessment
- How can we reconcile stock assessment models with such a difficult situation and with “adaptive” approach?

# Acknowledgements/Conflict of interest

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