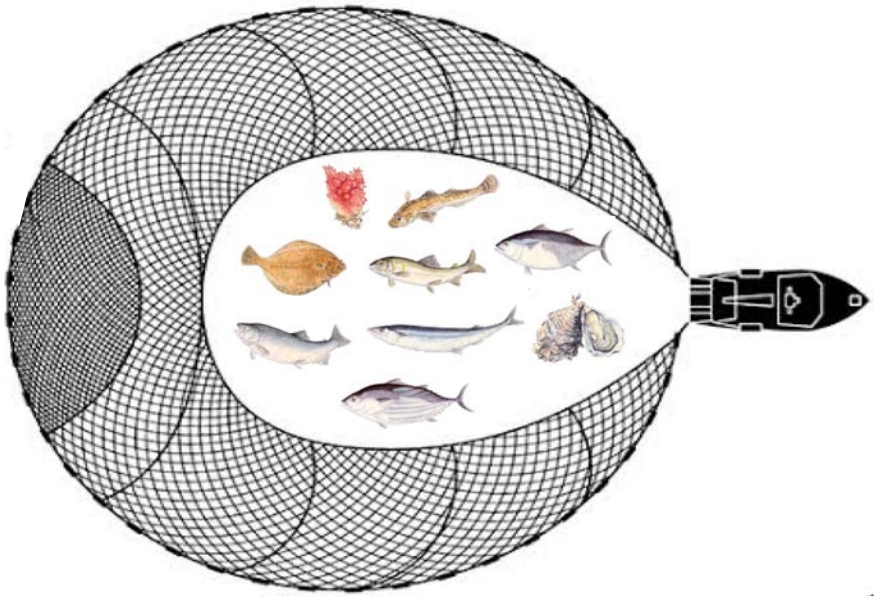
How fisheries portfolio diversification can enhance social-ecological resilience along the Northeastern Coast of Japan



PICES 2019 Annual Meeting

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Tomoaki Goto and
Gakushi Ishimura.

National Institute for Environmental Studies

FISHERY SYSTEMS SCIENCE LAB
AT MORIOKA, IWATE UNIVERSITY

岩手大学
IWATE UNIVERSITY

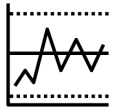
Portfolio Approach to Fisheries Management

- Origin from **"Modern Portfolio Theory"**, pioneered by Markowitz (1952)
  - **Stabilizing** financial returns by pooling individual **assets** together

- A **portfolio approach** to fisheries management can **improve the resilience** of a system and **help buffer** against:

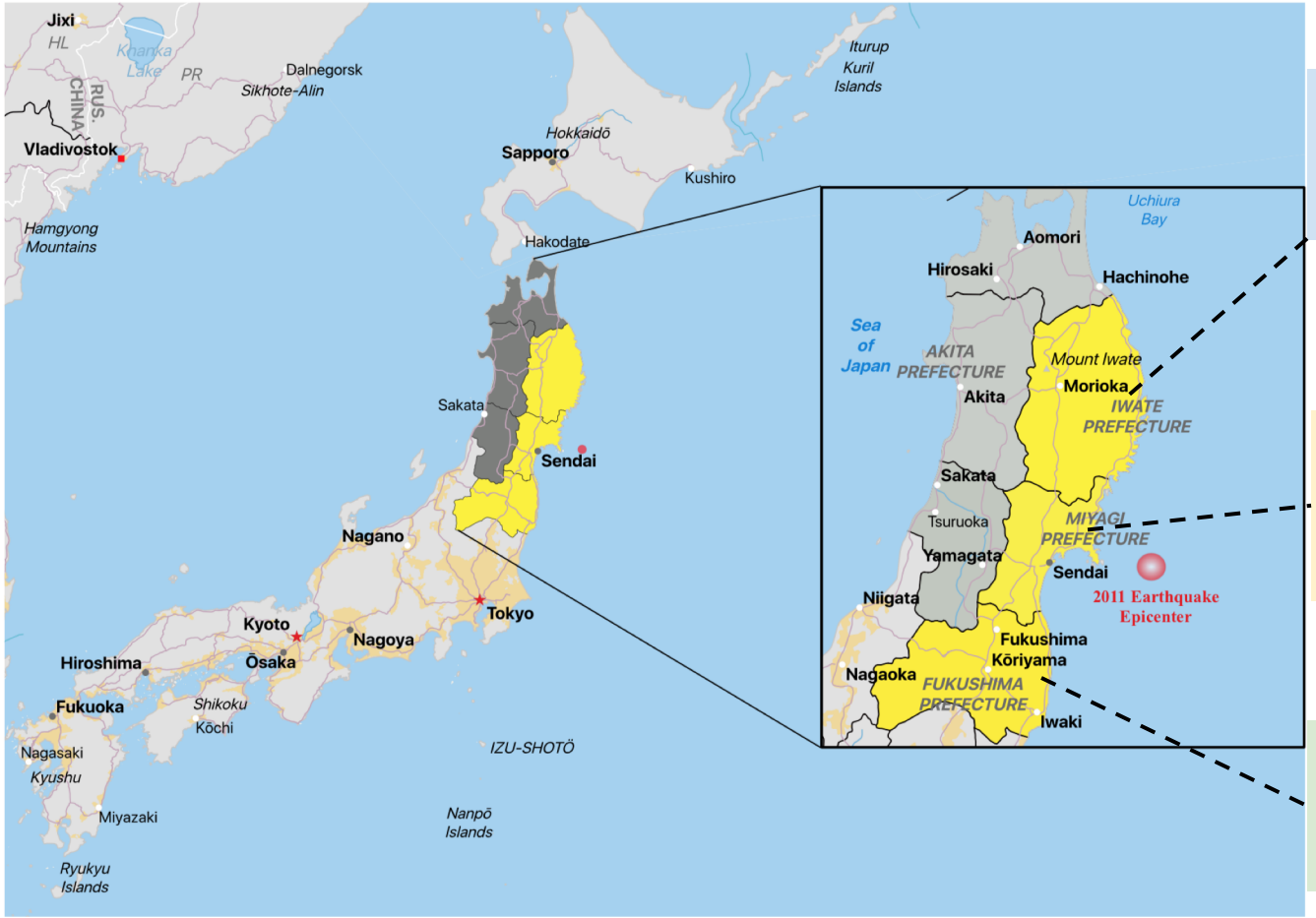
(1) Environmental uncertainty ▶ Climate change ▶ Species **alternation**, **migration**

(2) Economic volatility (prices, markets, consumer behavior…)



- Why **Japan?** Productive fishing grounds, quality data, muti-species fisheries (…)

Scope – Iwate, Miyagi and Fukushima



岩手
(Iwate)

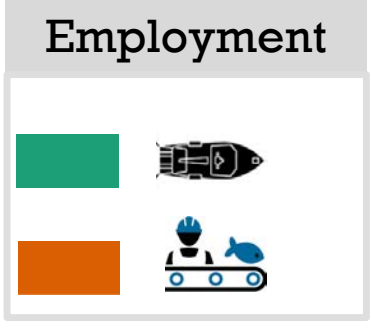
宮城
(Miyagi)

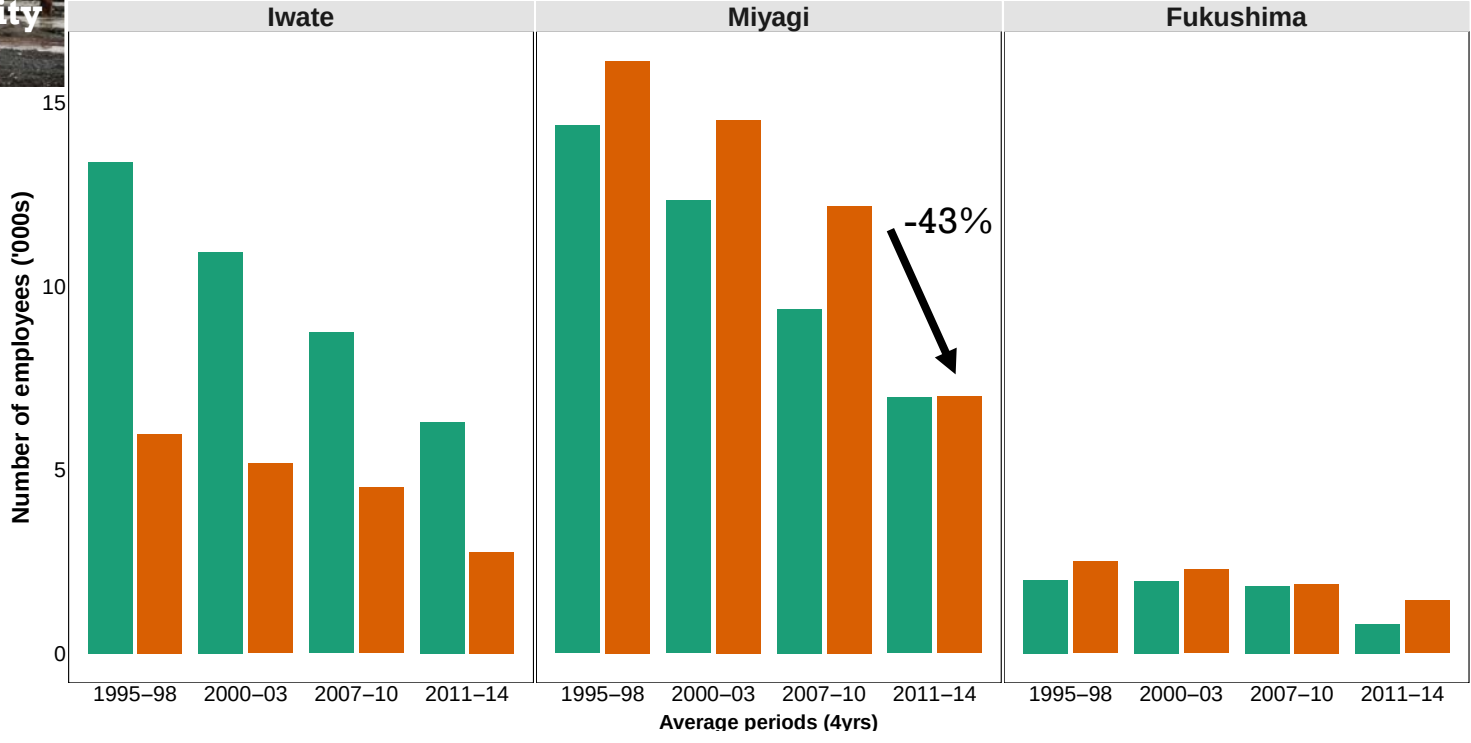
福島
(Fukushima)

2011 Great East Japan Disaster – Socioeconomics (1)

Credit: Toshifumi Kitamura

- Unemployment rate ▲ **60%** ,
- **260** small fishing harbors destroyed,
- **Iwate** lost **14,000** fishing boats, **Miyagi's** fleet ▼ 42%.

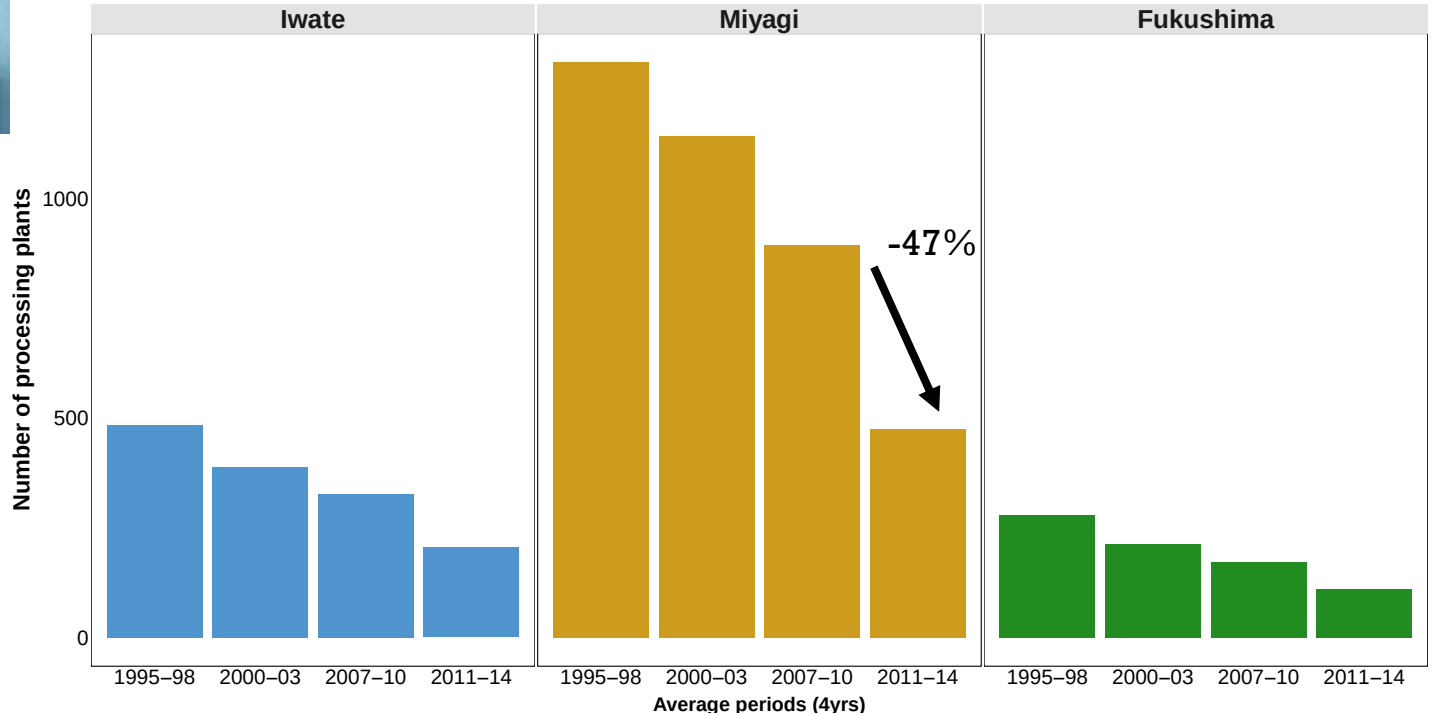




2011 Great East Japan Disaster – Socioeconomics (2)

- Raw **inputs** are getting **smaller** and more **scarce**,
- **Physical capital** has been severely damaged,
- Current trend towards **innovation** & **adaptation**.

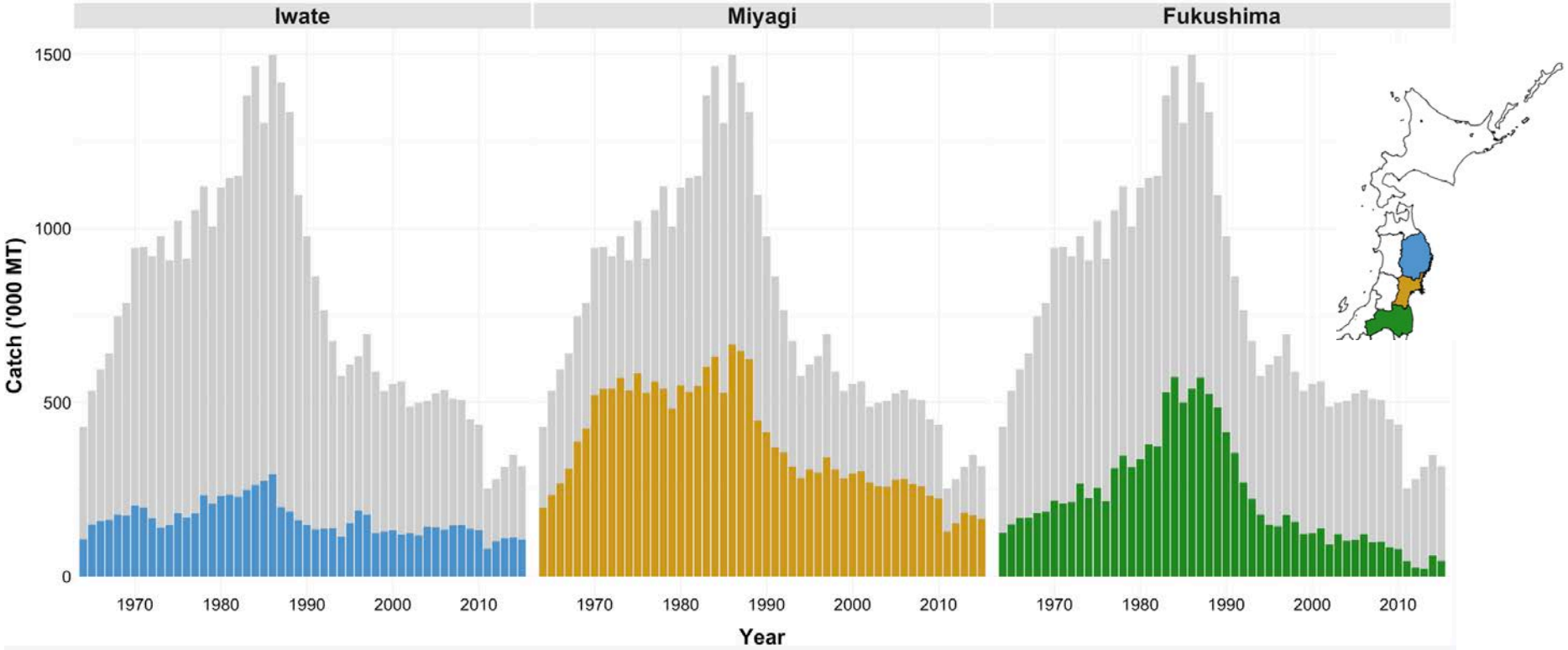
Infrastructure
(# plants)



Total Catch (1964-2015)

Compiled Data

- ❑ **70** commercially exploited species,
- ❑ **~ 84%** of landings value along the coast.



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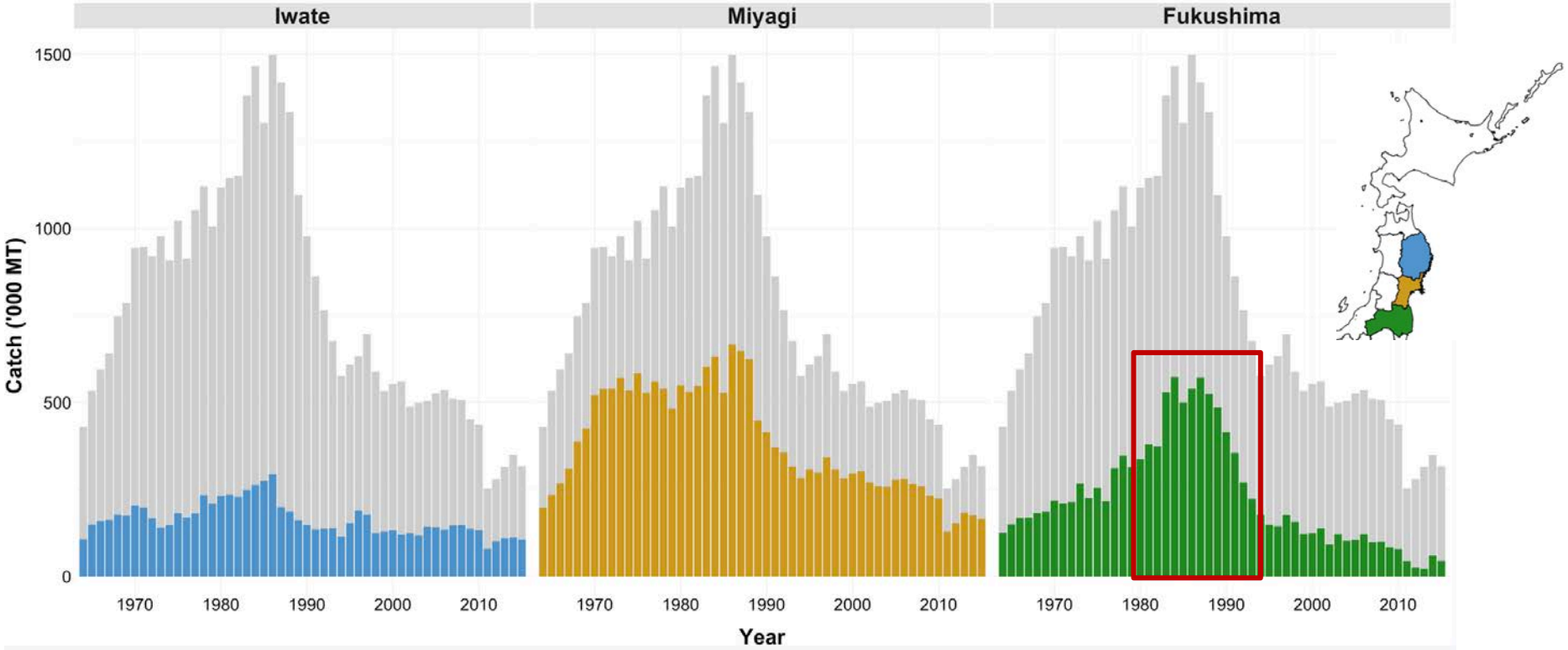
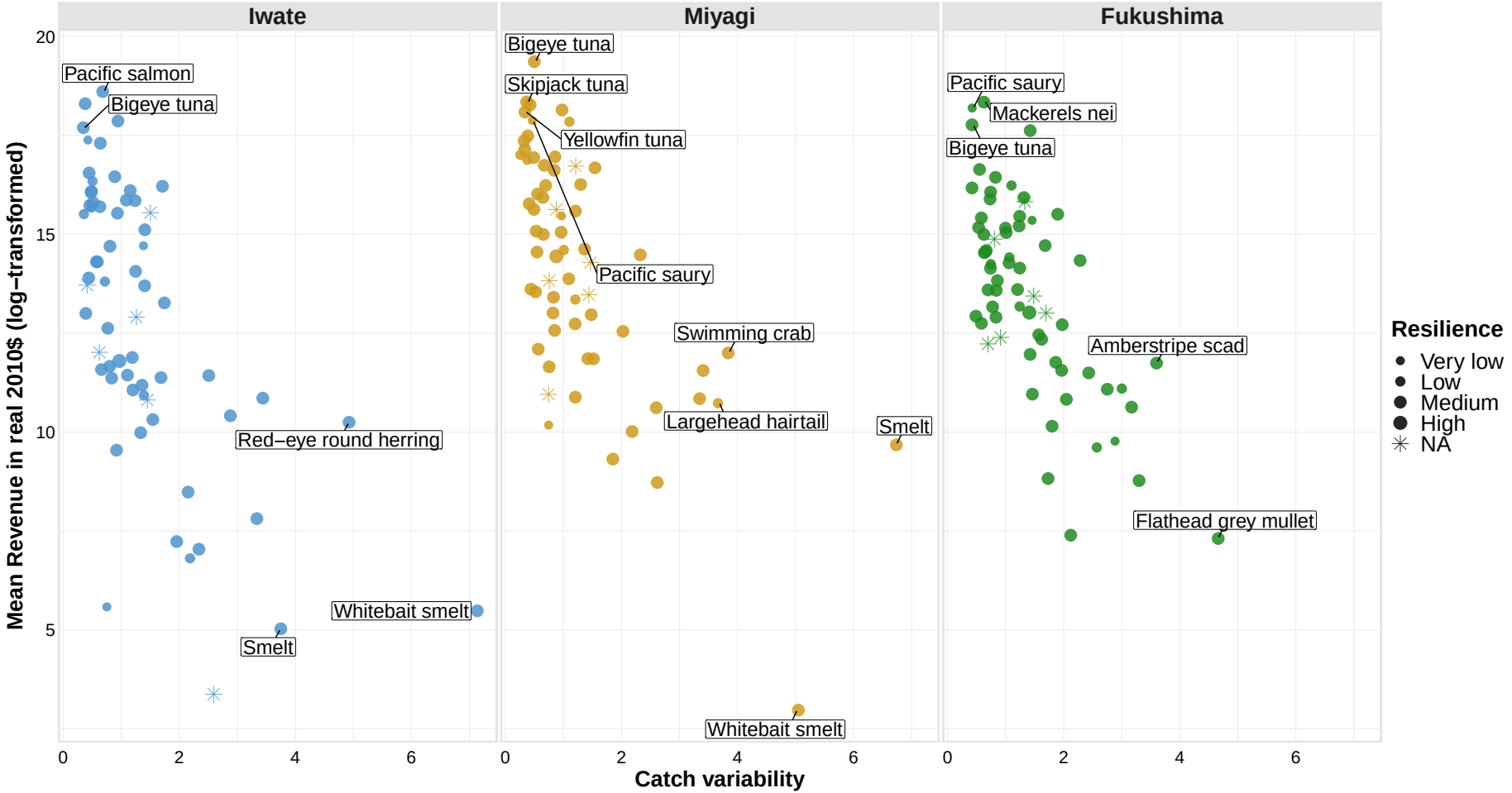


Sardine regime (1980s-1990s)

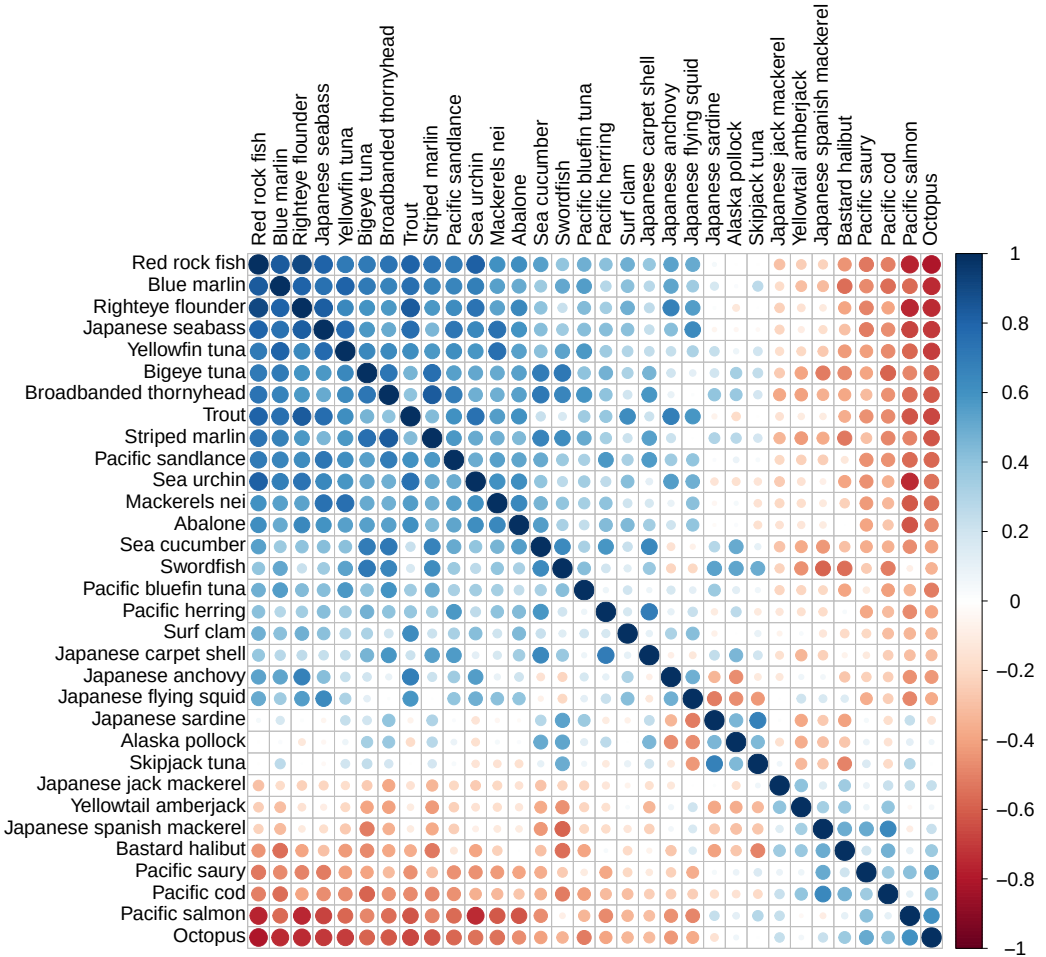
Prefectures' catch

(Sardinops melanostictus)

Return-Risk Fisheries Portfolios

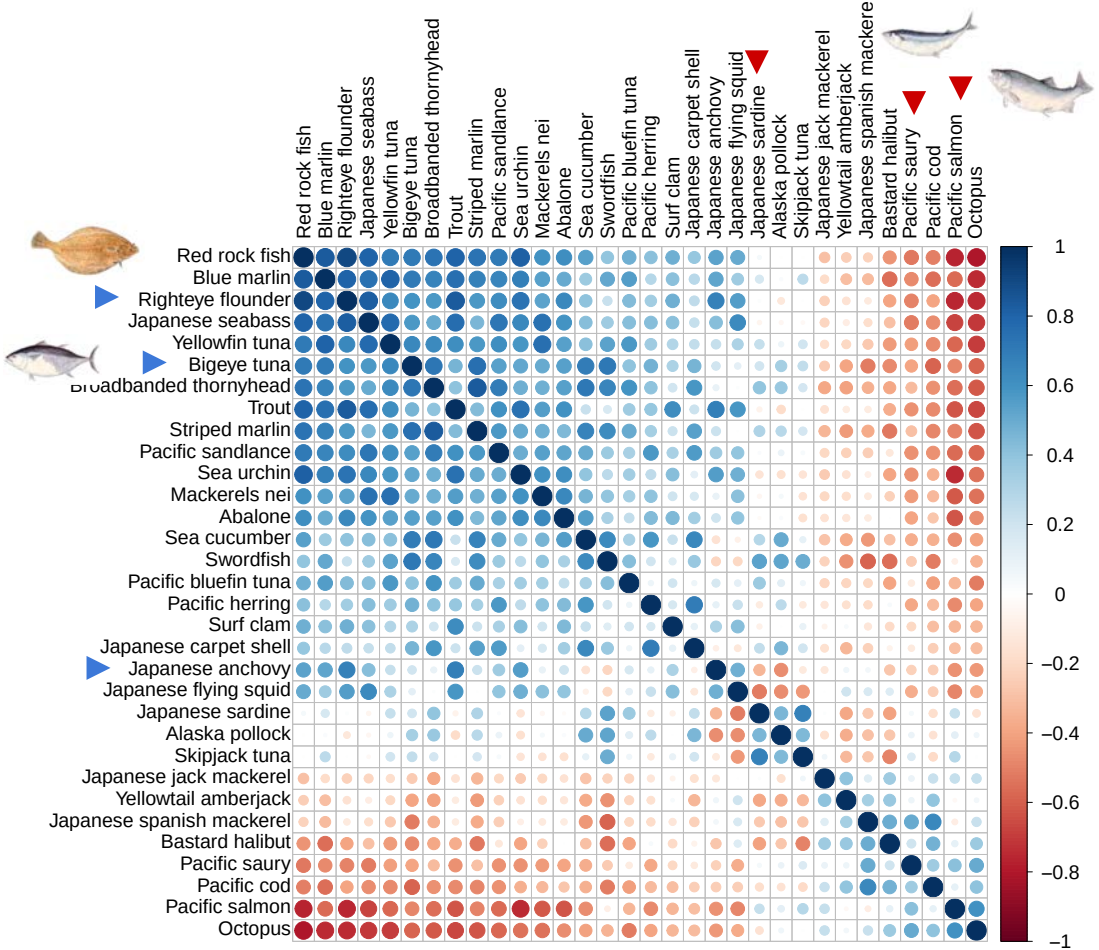


Species Covariances Matrix



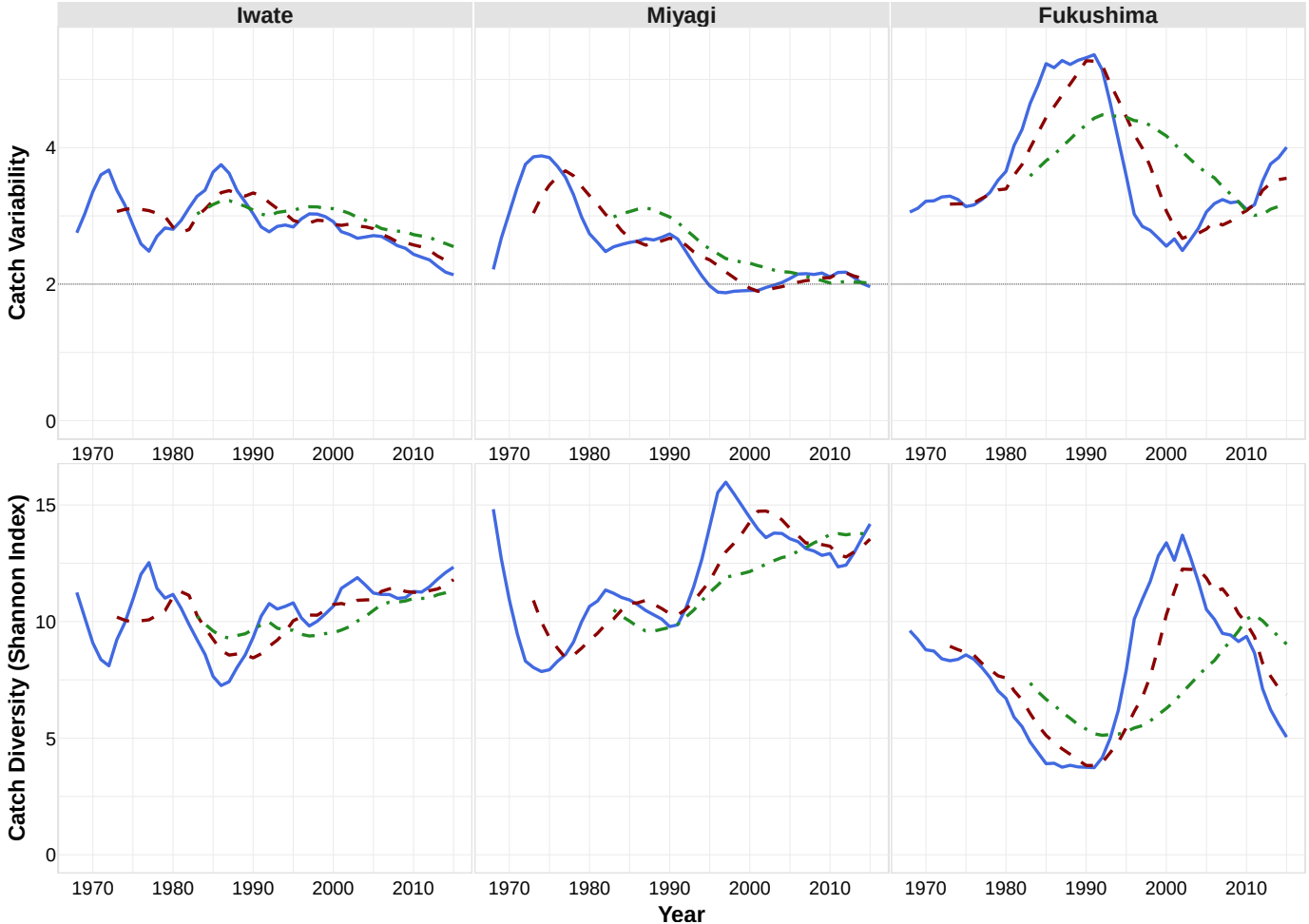
Iwate

Species Covariance Matrix



Iwate

Risk vs. Diversity – Moving Averages

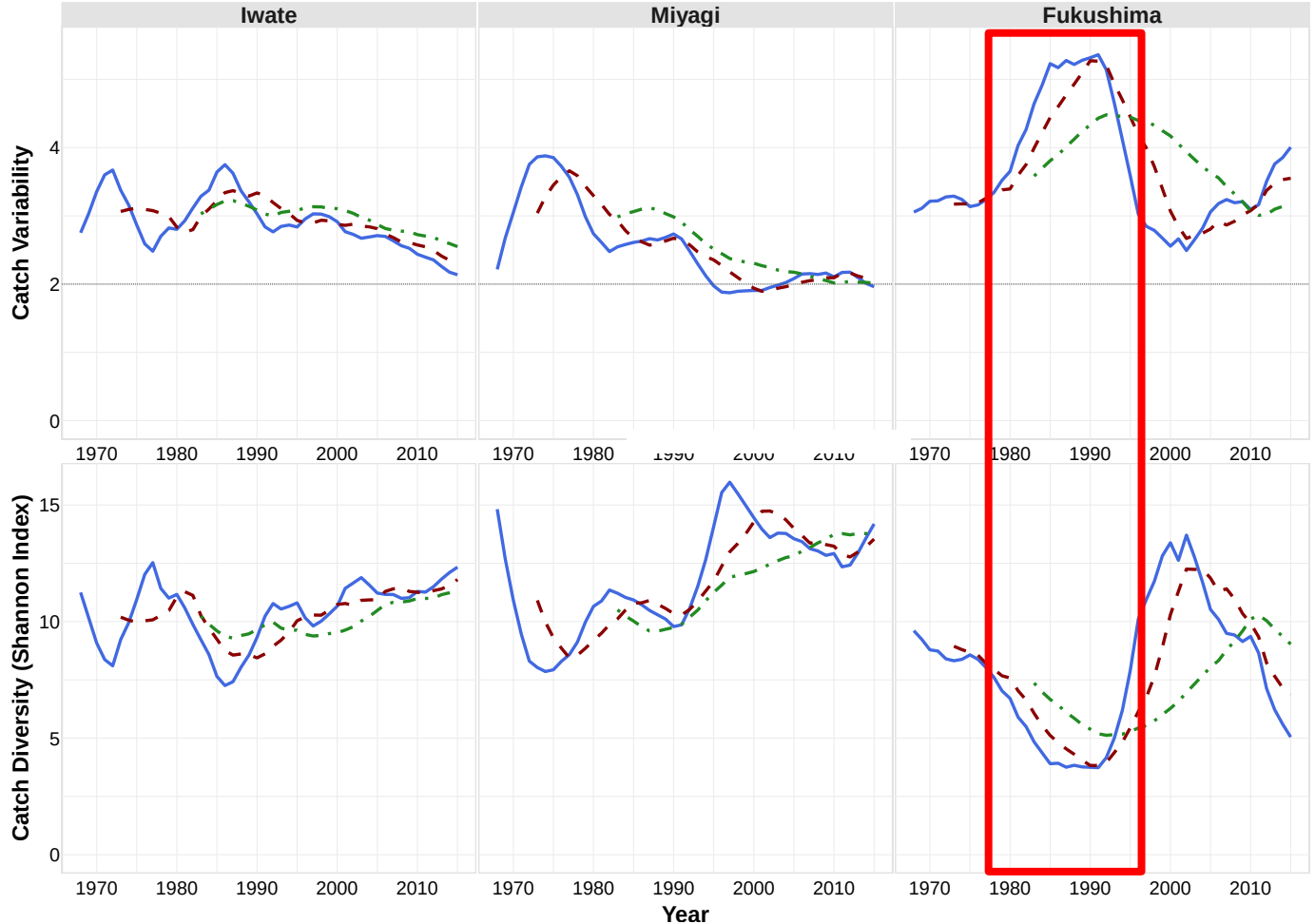


5 years

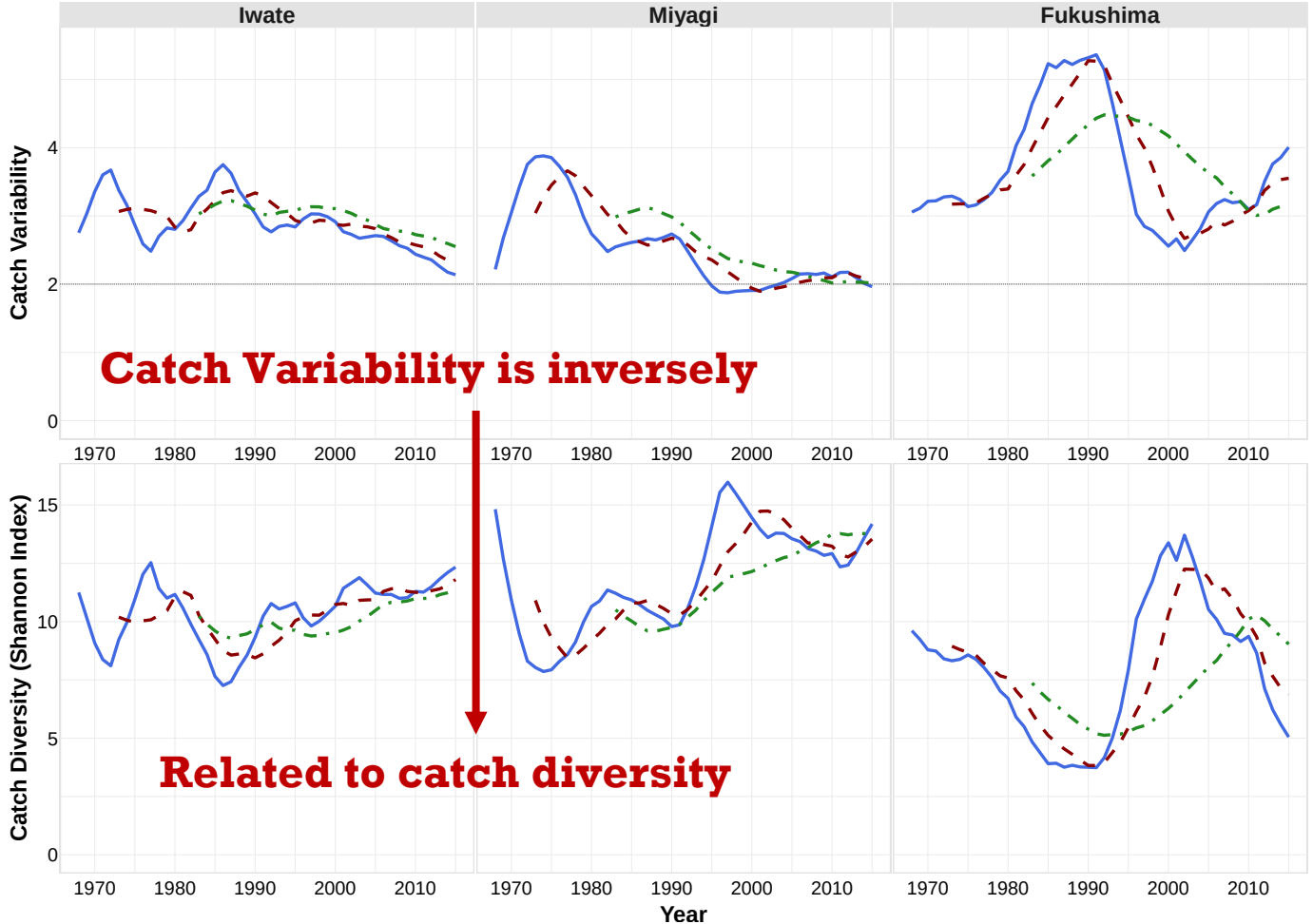
10 years

20 years

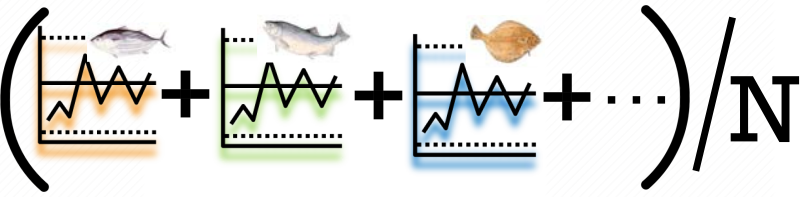
Risk vs. Diversity – Moving Averages

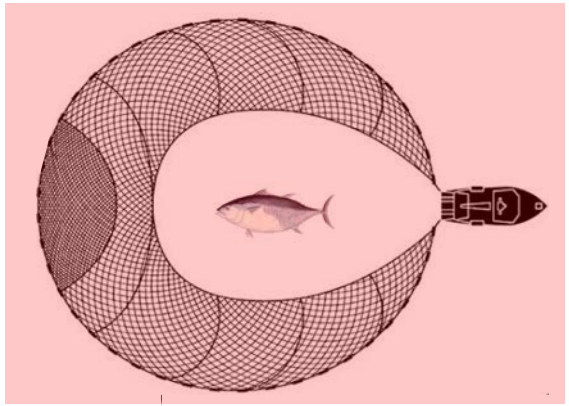


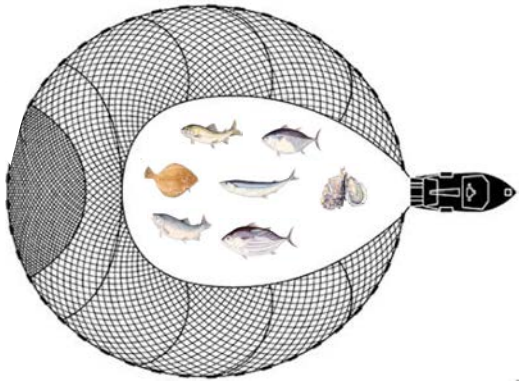
Risk vs. Diversity – Moving Averages

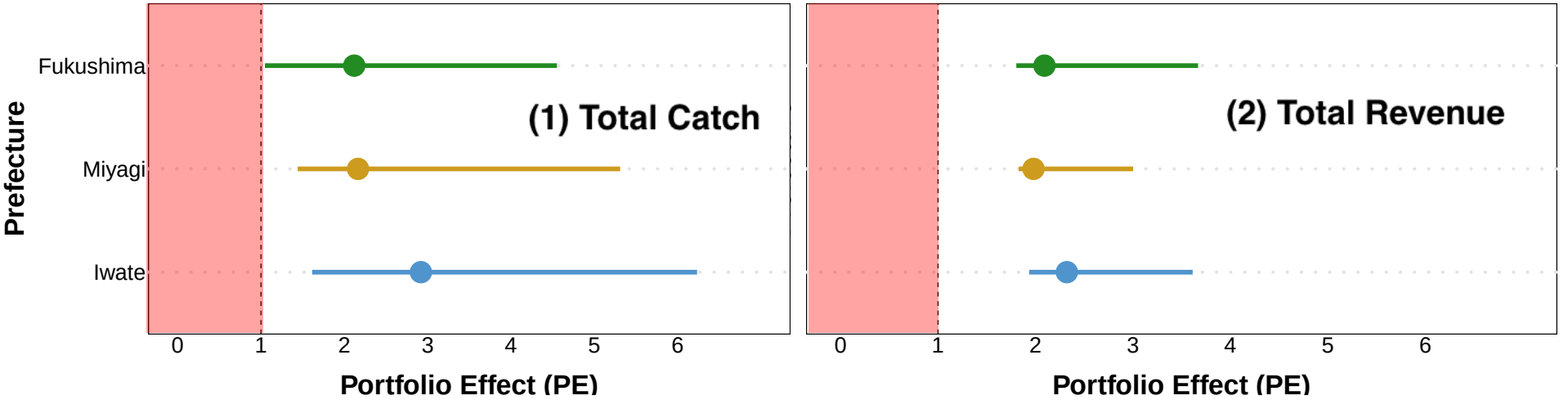


Portfolio Effect – Stabilization?



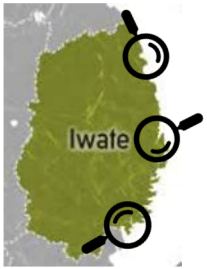




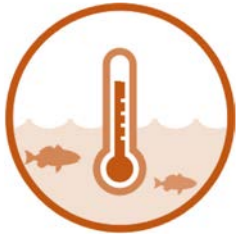


Looking Forward – Next Steps

- Compile and analyze catch + revenue data at the **community** and **vessel** levels *(available for Iwate)*;



- Investigate other **diversification strategies**,
- How does each individual species **react** to environmental variability such as **climate change**?



- Measuring **other benefits**

Social welfare

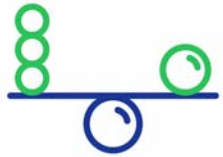
Ecosystem & human health

Seasonality

Existence value

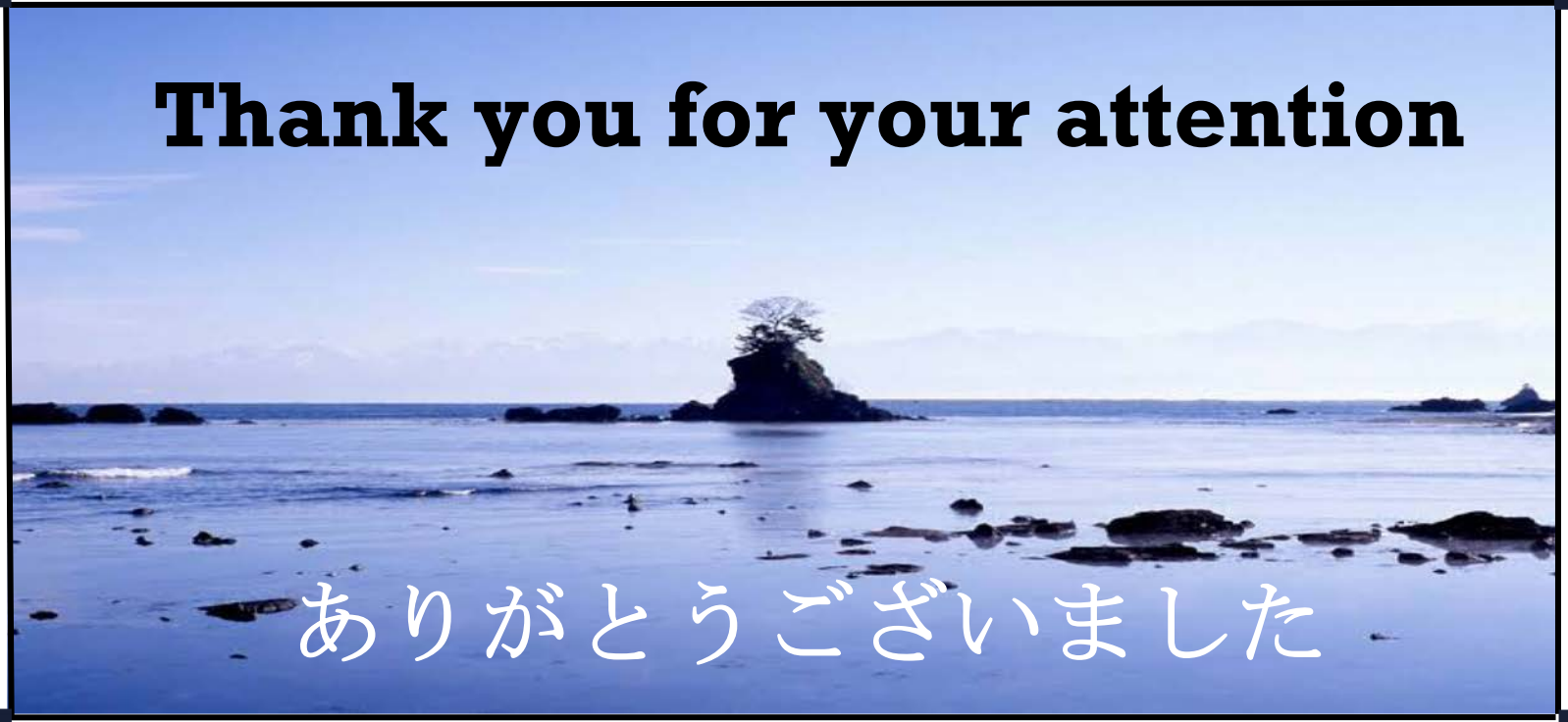
Key Takeaways

1. Portfolio analysis shows catch diversification brings **stability** to fisheries production and associated revenues through time,



2. A portfolio approach to fisheries management in Northeastern Japan can streamline post-2011 **recovery process**,

3. Thinking in portfolio terms can help **preserve biodiversity** and **support the livelihoods** of coastal communities in Japan.



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