

# Stock-Specific Ocean Distribution and Migration of Chum Salmon in the Bering Sea and North Pacific Ocean

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# PURPOSE

- ✓ Determine the origin of chum salmon caught in the Bering Sea and North Pacific Ocean by genetic and otolith marks
- ✓ Determine the marine distribution and biomass of chum salmon by stocks
- ✓ Estimate the seasonal migration of Japanese chum salmon

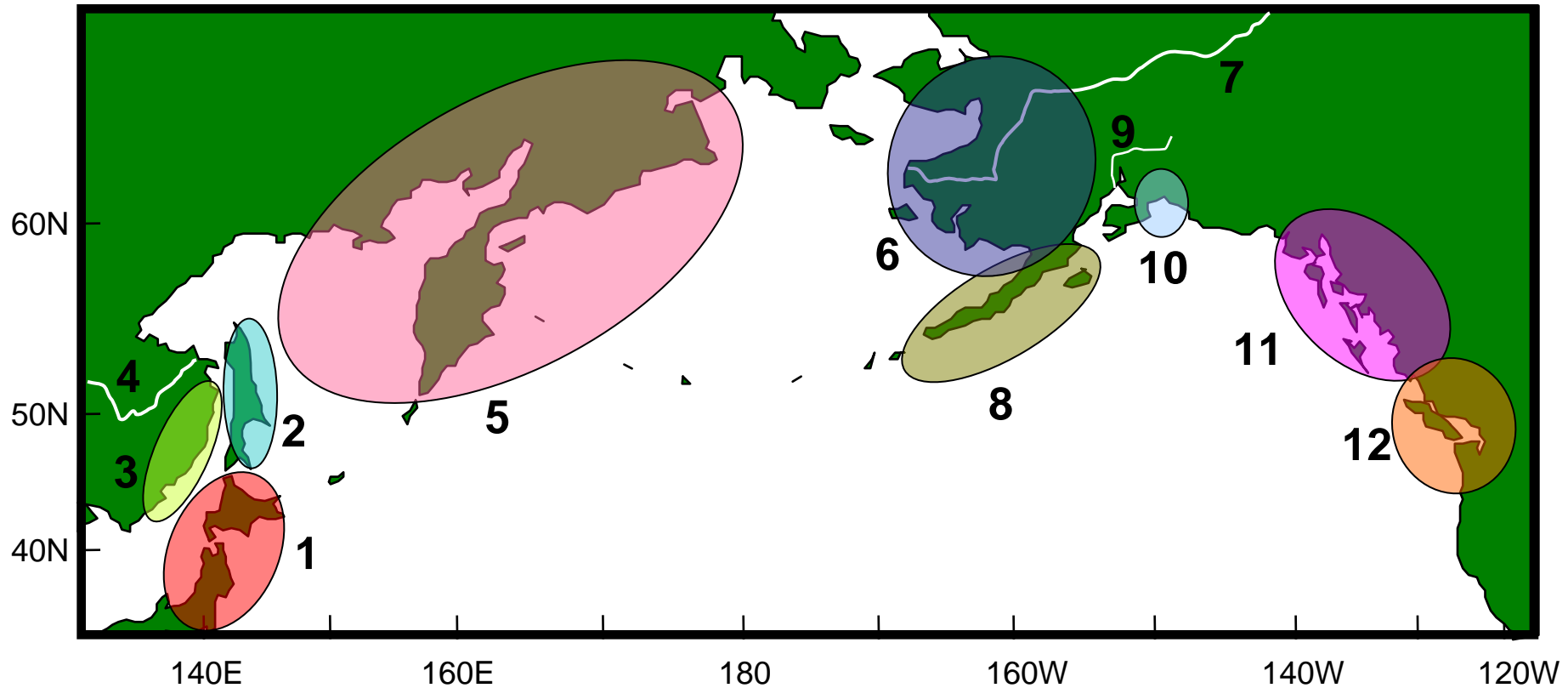


# METHODS

- ✓ Fish were caught by 1-h trawl (5 knots) at 63 stations in the Bering Sea and North Pacific Ocean during summer (June & July) and early fall (August & September) of 2003.
- ✓ Tissue samples were collected from chum salmon ( $n=3,982$ ), and run for 20 allozyme loci to estimate the stock composition of mixtures.
- ✓ Otoliths were collected from chum salmon ( $n=4,488$ ), and examined for mark pattern to determine the hatchery origin.



# Reporting Regions of Chum Salmon for Genetic Stock Identification (GSI) in Mixture Fisheries



## ASIA (44 stocks)

1. Japan (29 stocks)
2. Sakhalin (3 stocks)
3. Premorye (1 stock)
4. Amur (1 stock)
5. Northern Russia (10 stocks)

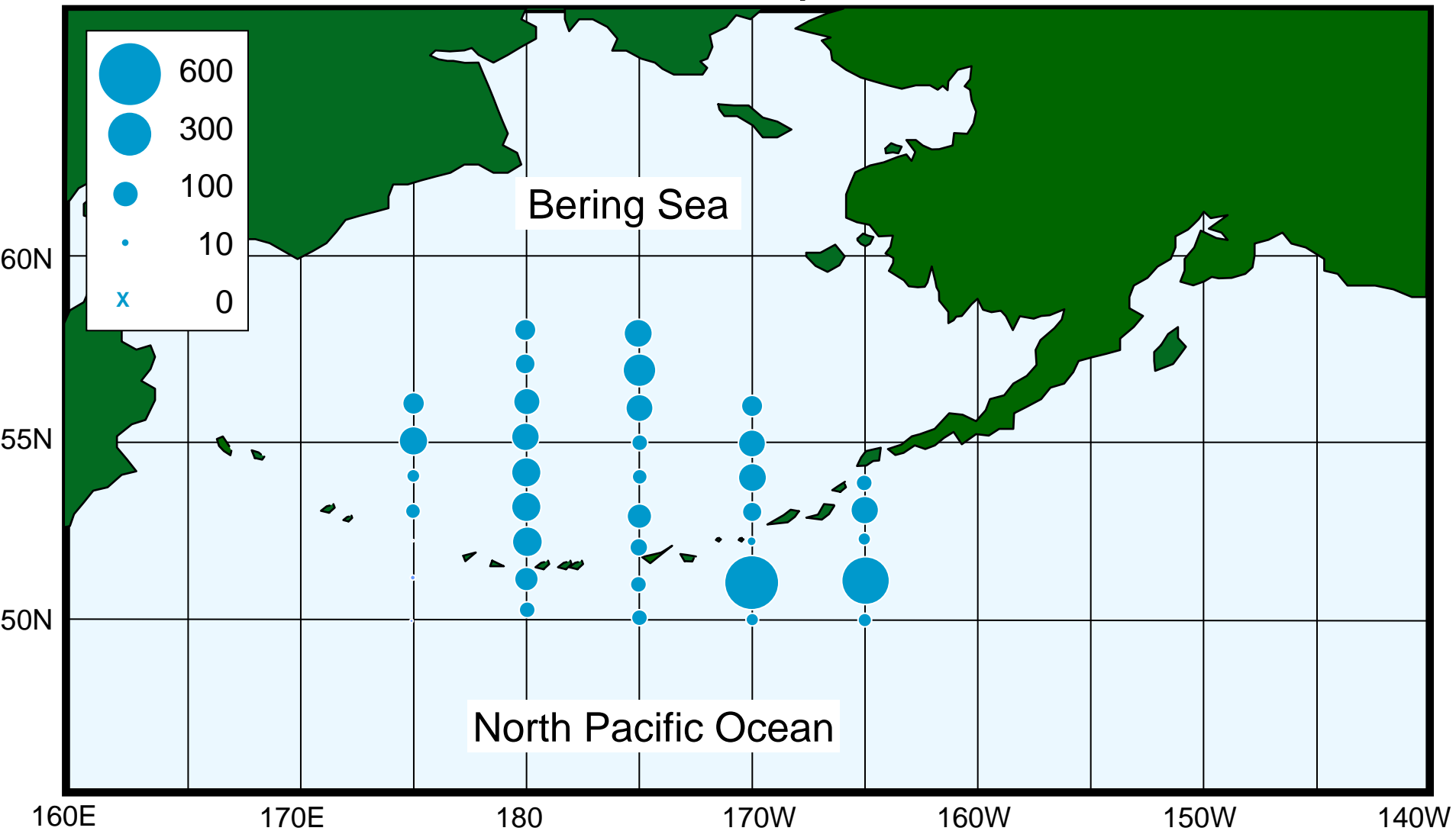
## NORTH AMERICA (84 stocks)

6. NW Alaska summer (16 stocks)
7. Fall Yukon (7 stocks)
8. Alaska Peninsula/Kodiak (40 stocks)
9. Susitna (1 stock)
10. Prince William Sound (4 stocks)
11. SE Alaska/North BC (8 stocks)
12. South BC/Washington (8 stocks)

# CPUE Distribution of Chum Salmon

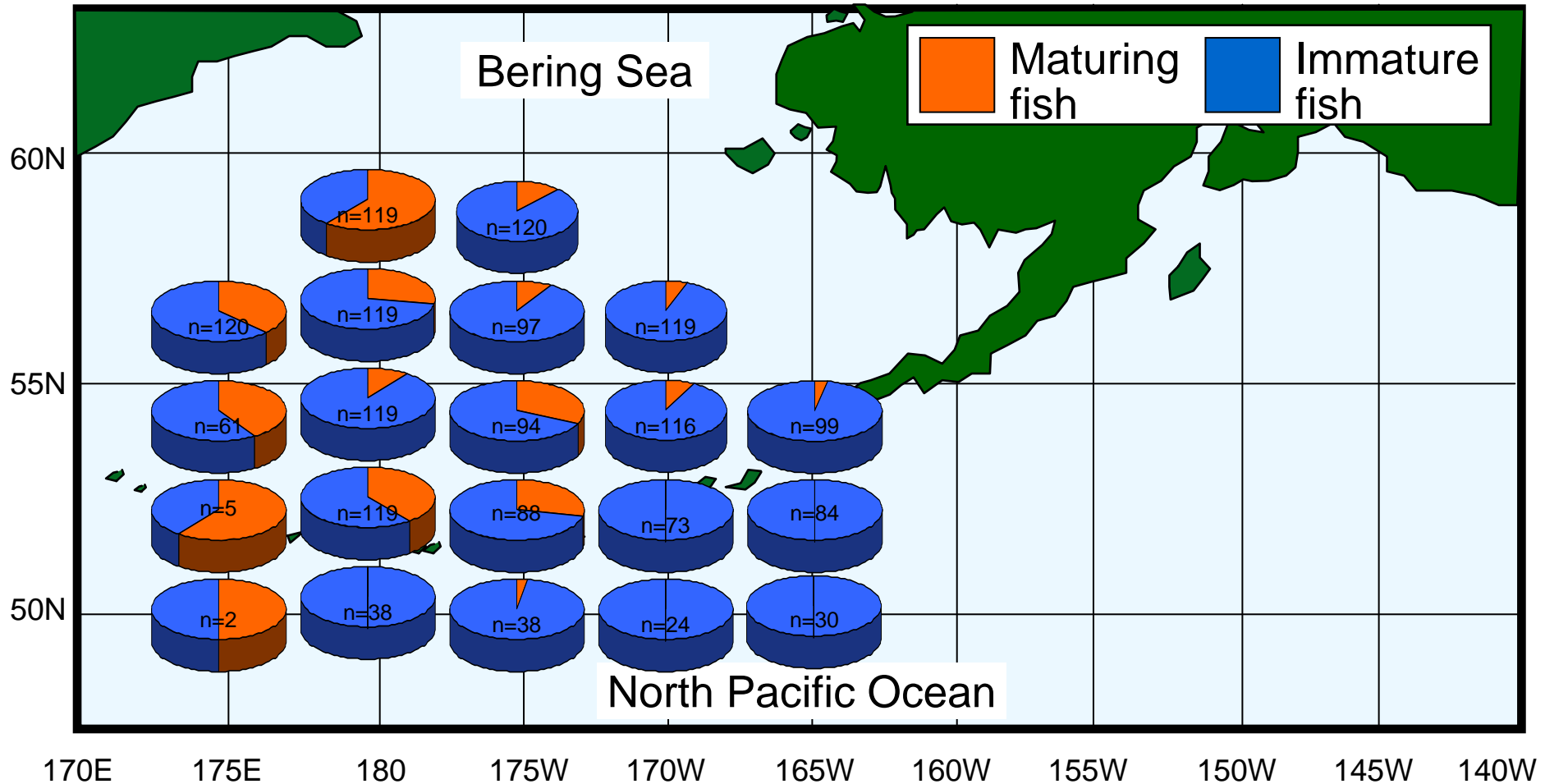
June/July 2003

CPUE = number of catches per 1 h trawl



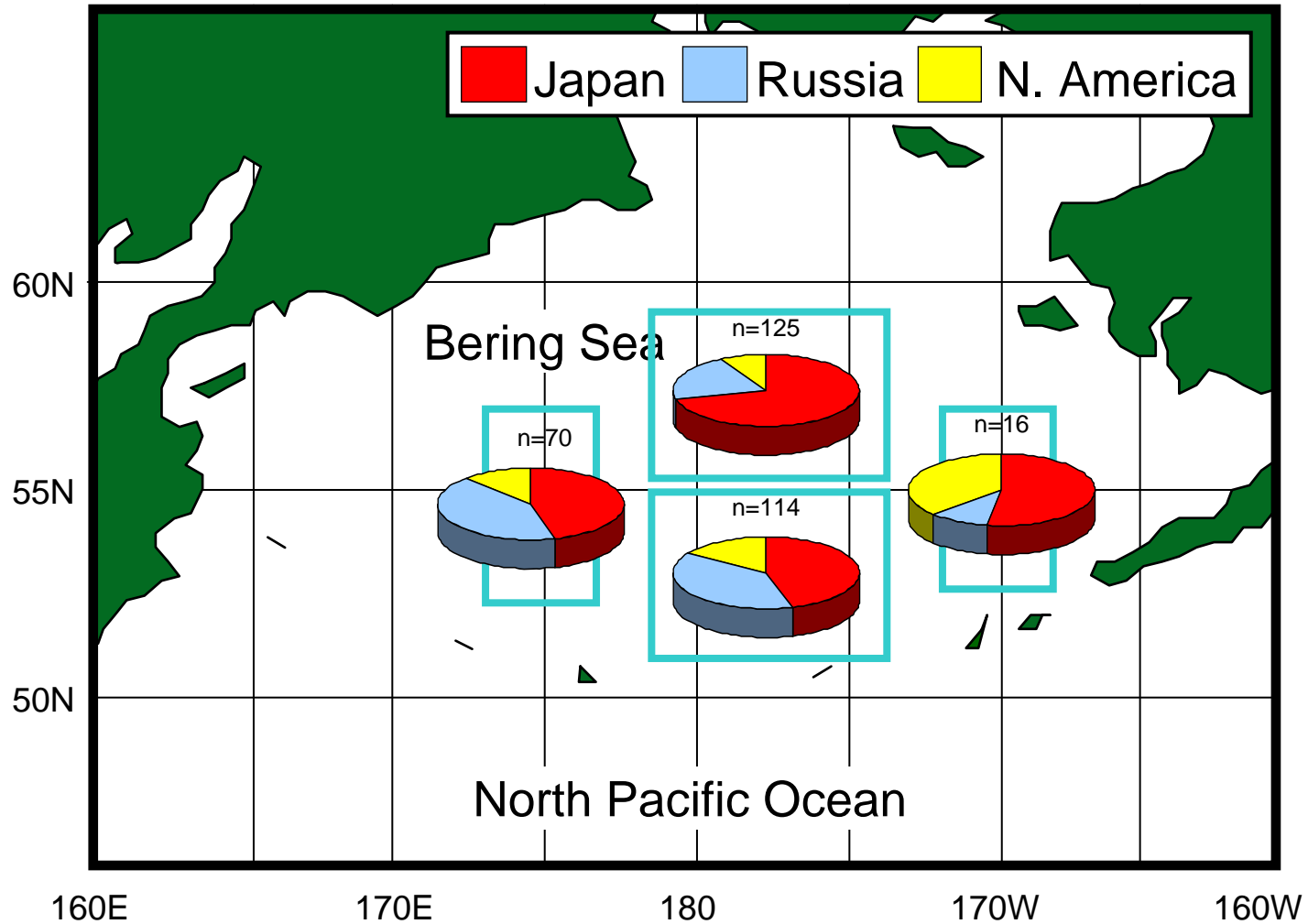
# Percent Composition of Maturing and Immature Chum Salmon

## June/July 2003



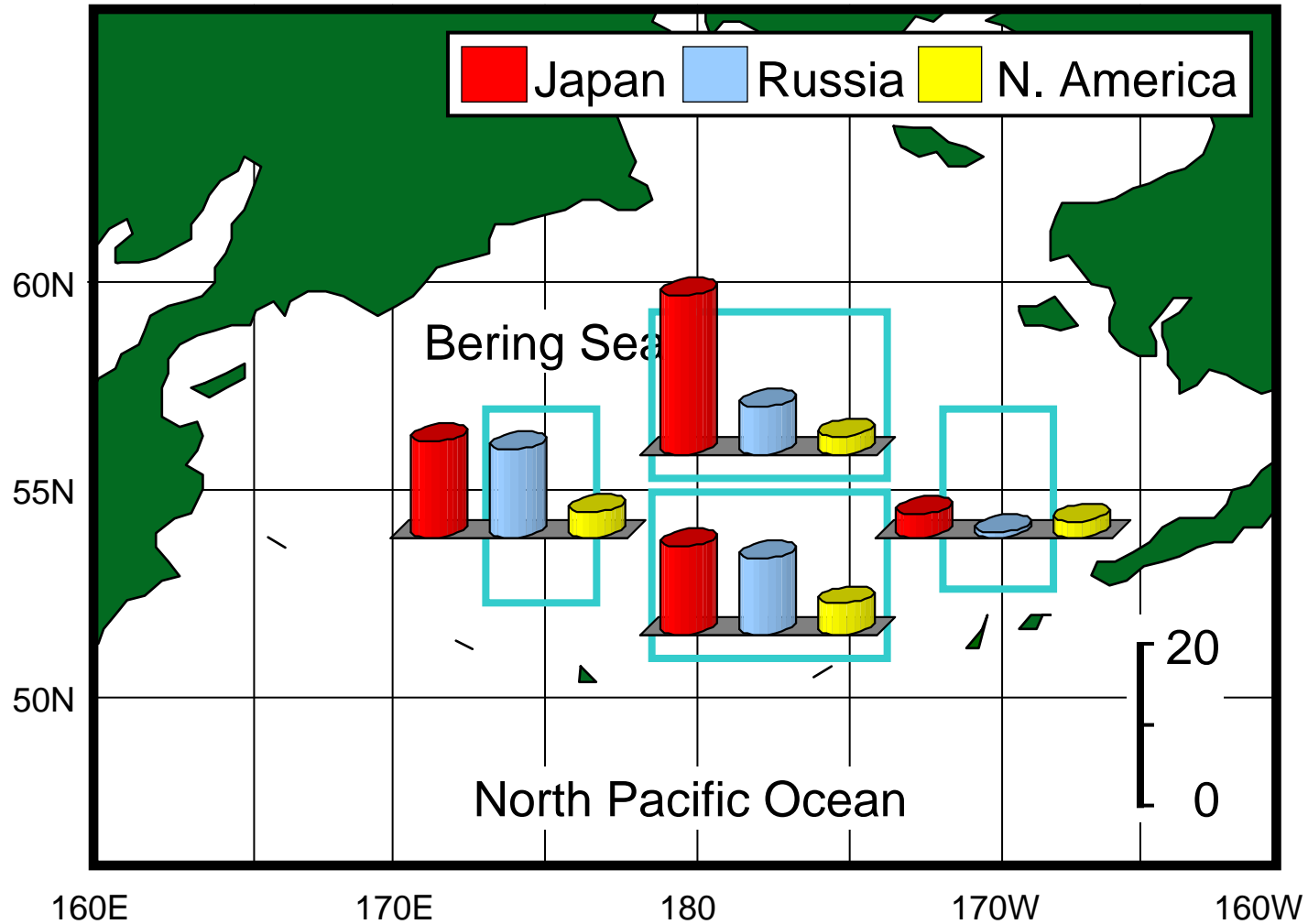
# Stock Composition of **Maturing** Chum Salmon estimated by GSI

## June/July 2003



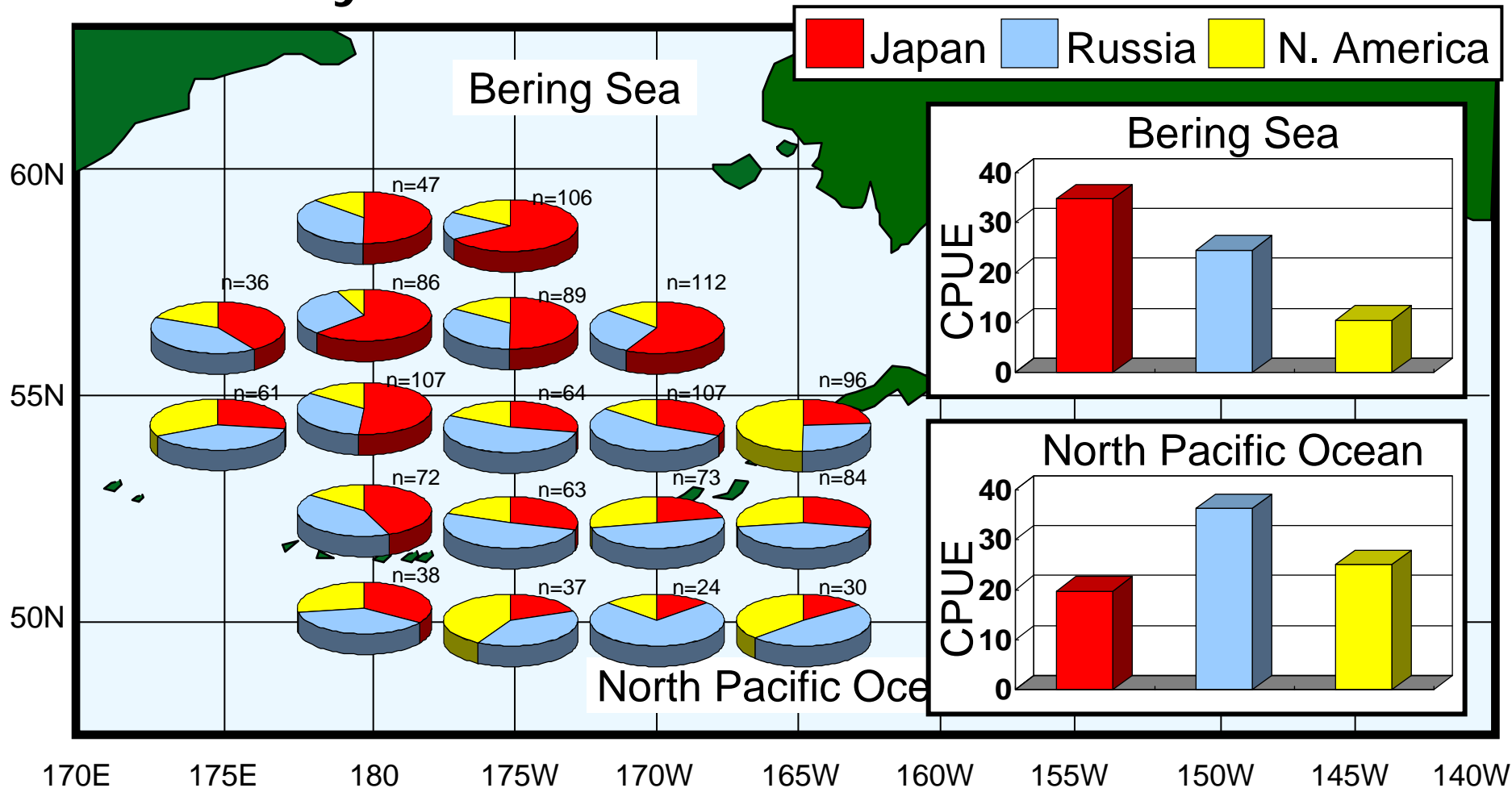
# GSI -estimated CPUE of Maturing Chum Salmon by Stocks

## June/July 2003



# Stock Composition of **Immature** Chum Salmon estimated by GSI

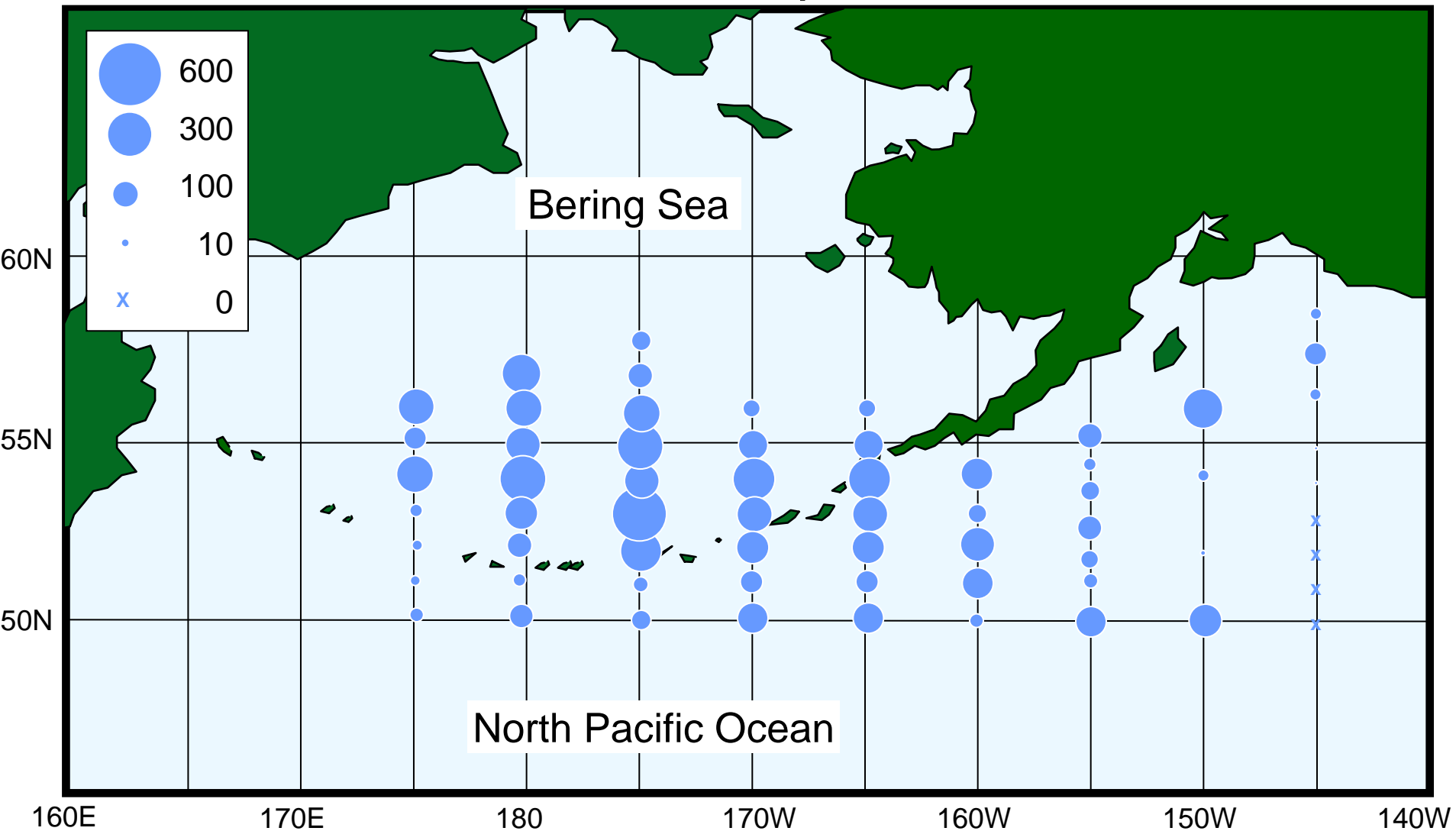
## June/July 2003



# CPUE Distribution of Chum Salmon

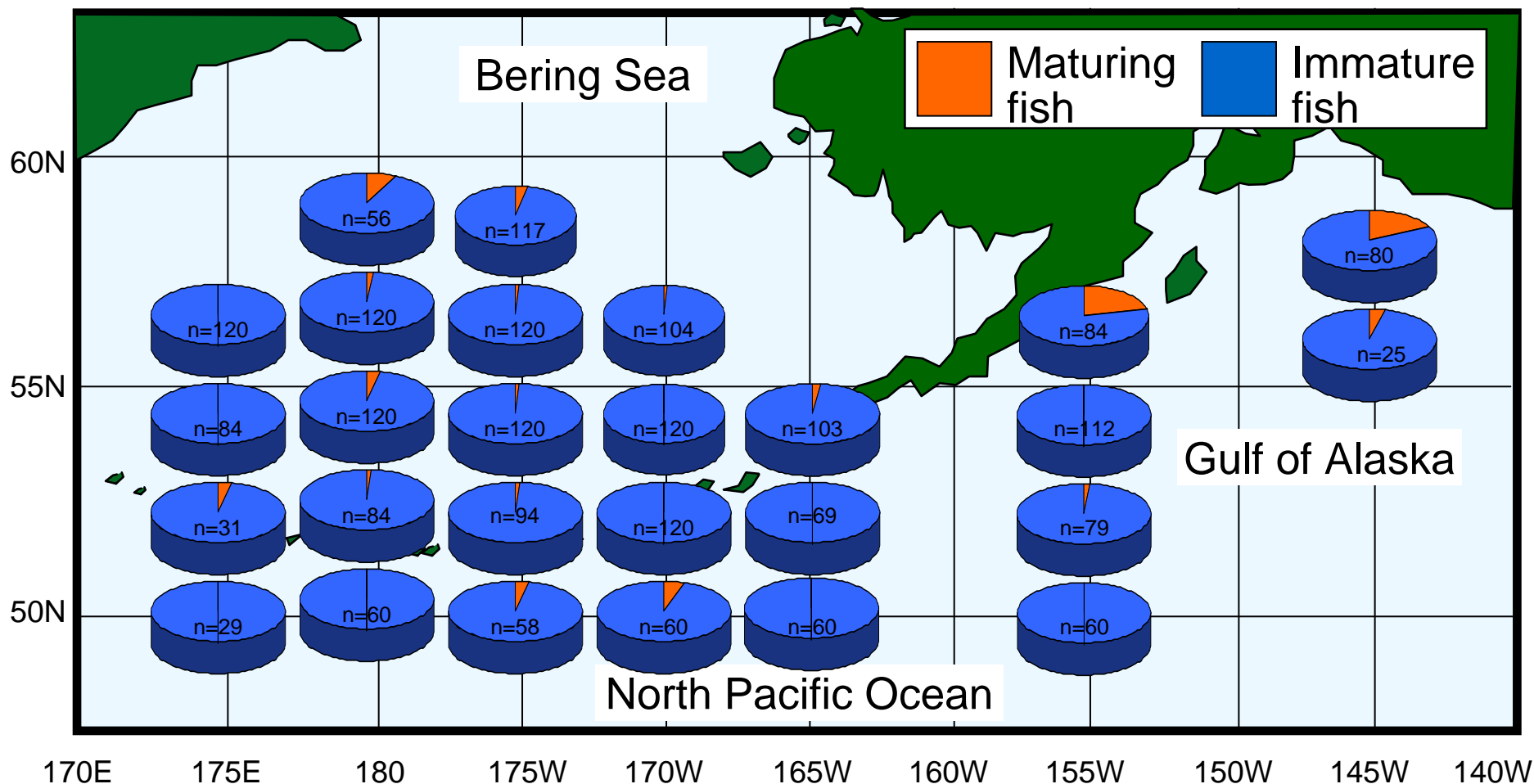
August/September 2003

CPUE = number of catches per 1 h trawl



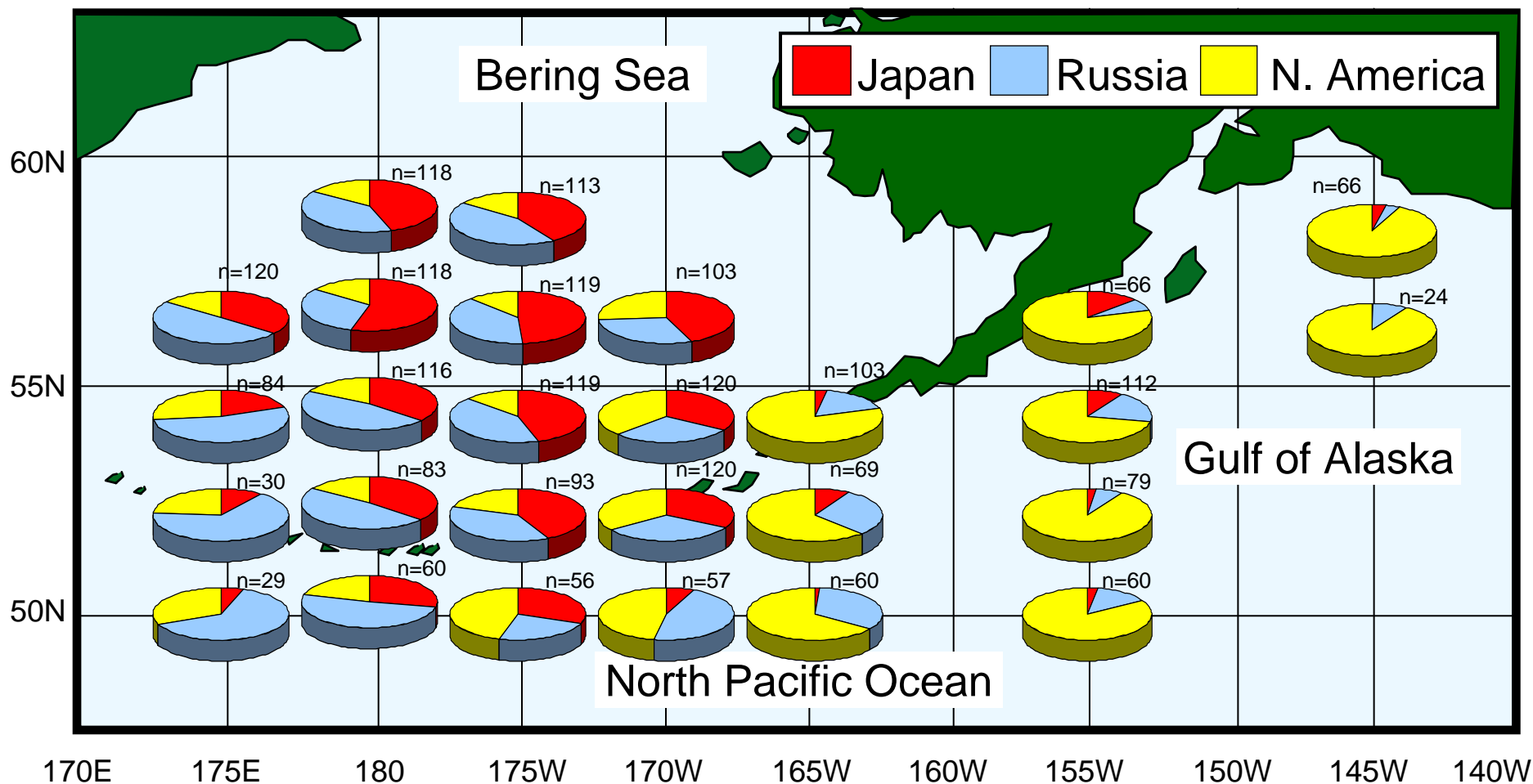
# Percent Composition of Maturing and Immature Chum Salmon

## August/September 2003



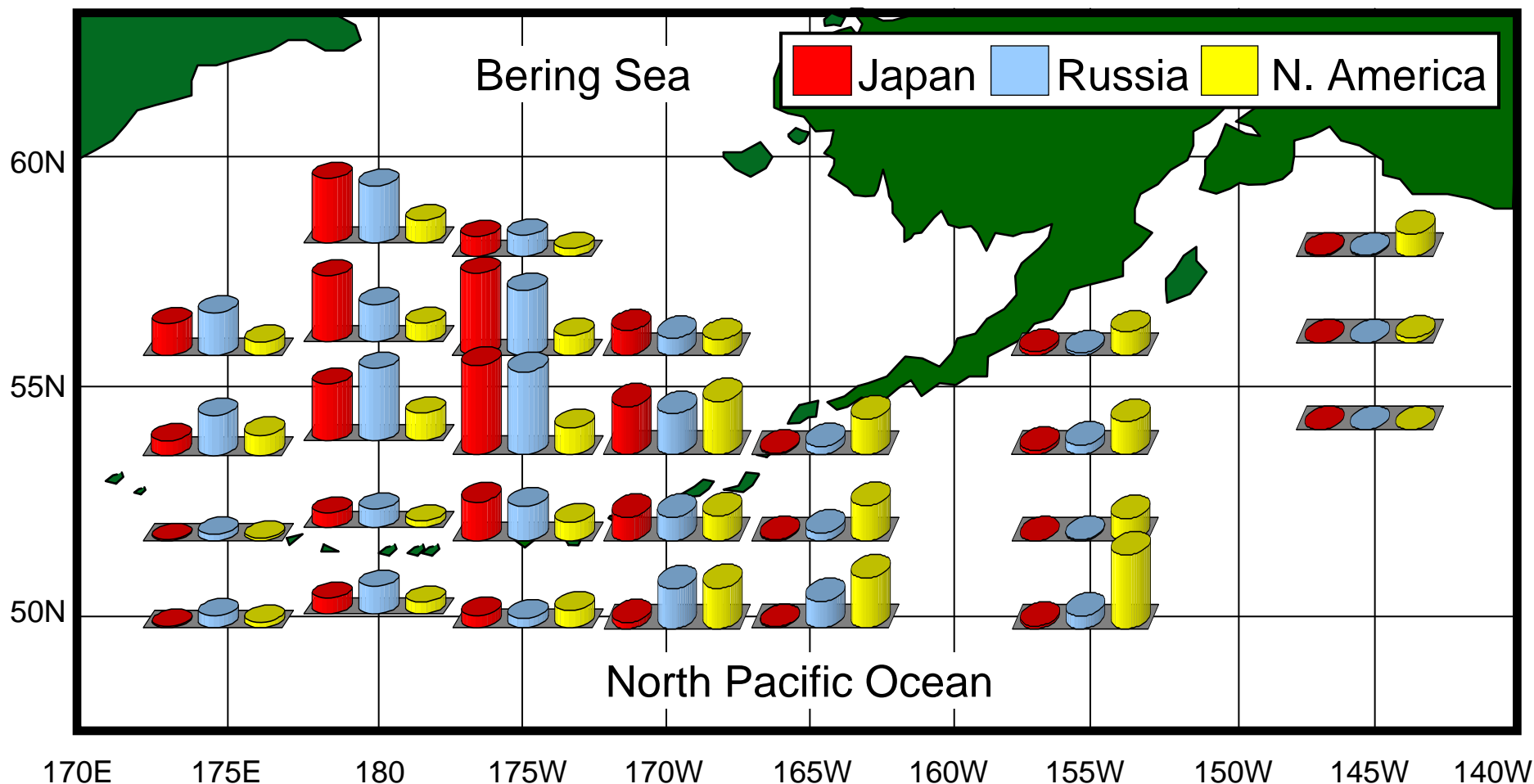
# Stock Composition of Immature Chum Salmon estimated by GSI

August/September 2003

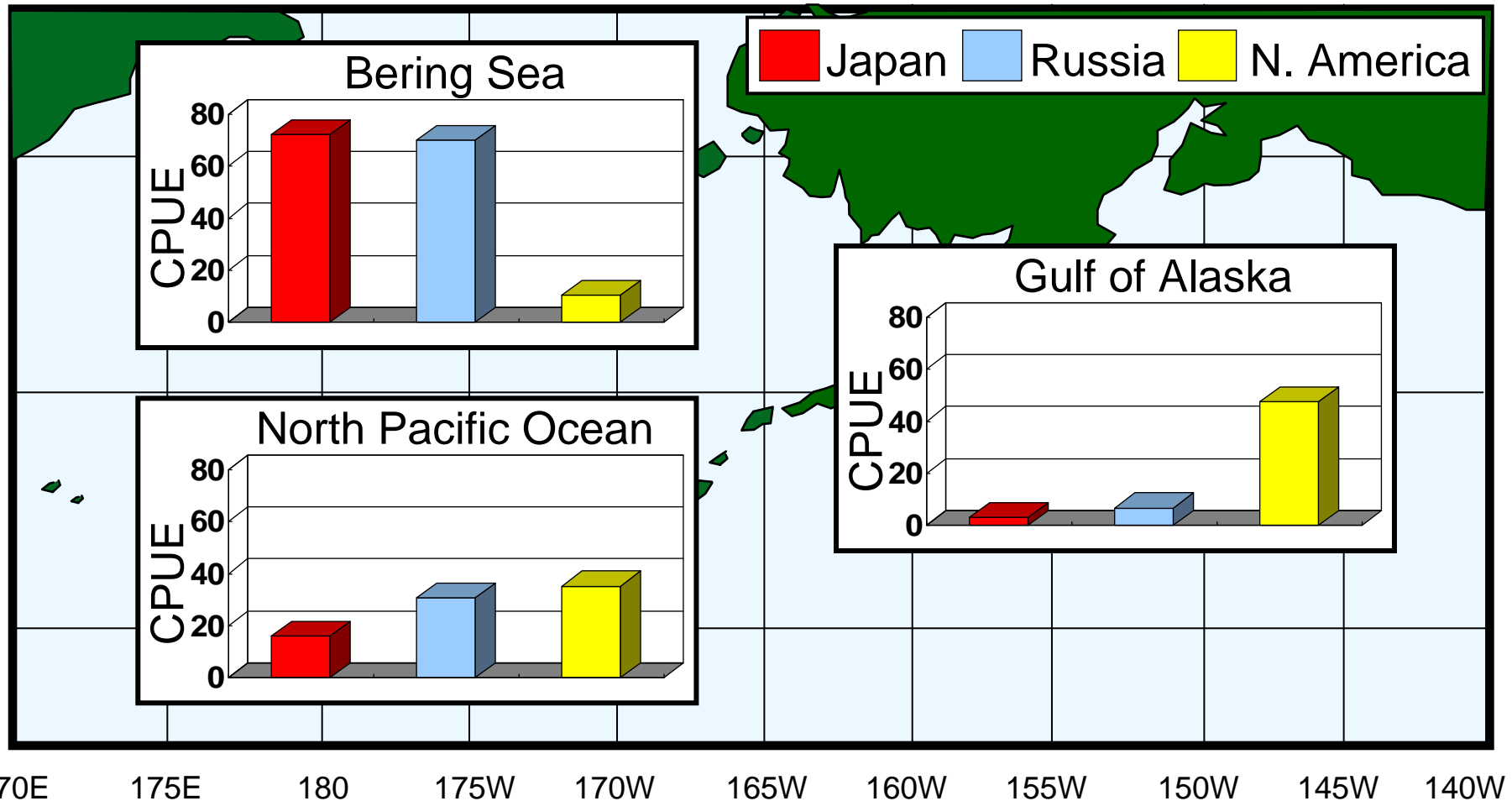


# GSI -estimated CPUE Distribution of Chum Salmon Stocks, August/September 2003

CPUE = number of catches per 1 h trawl

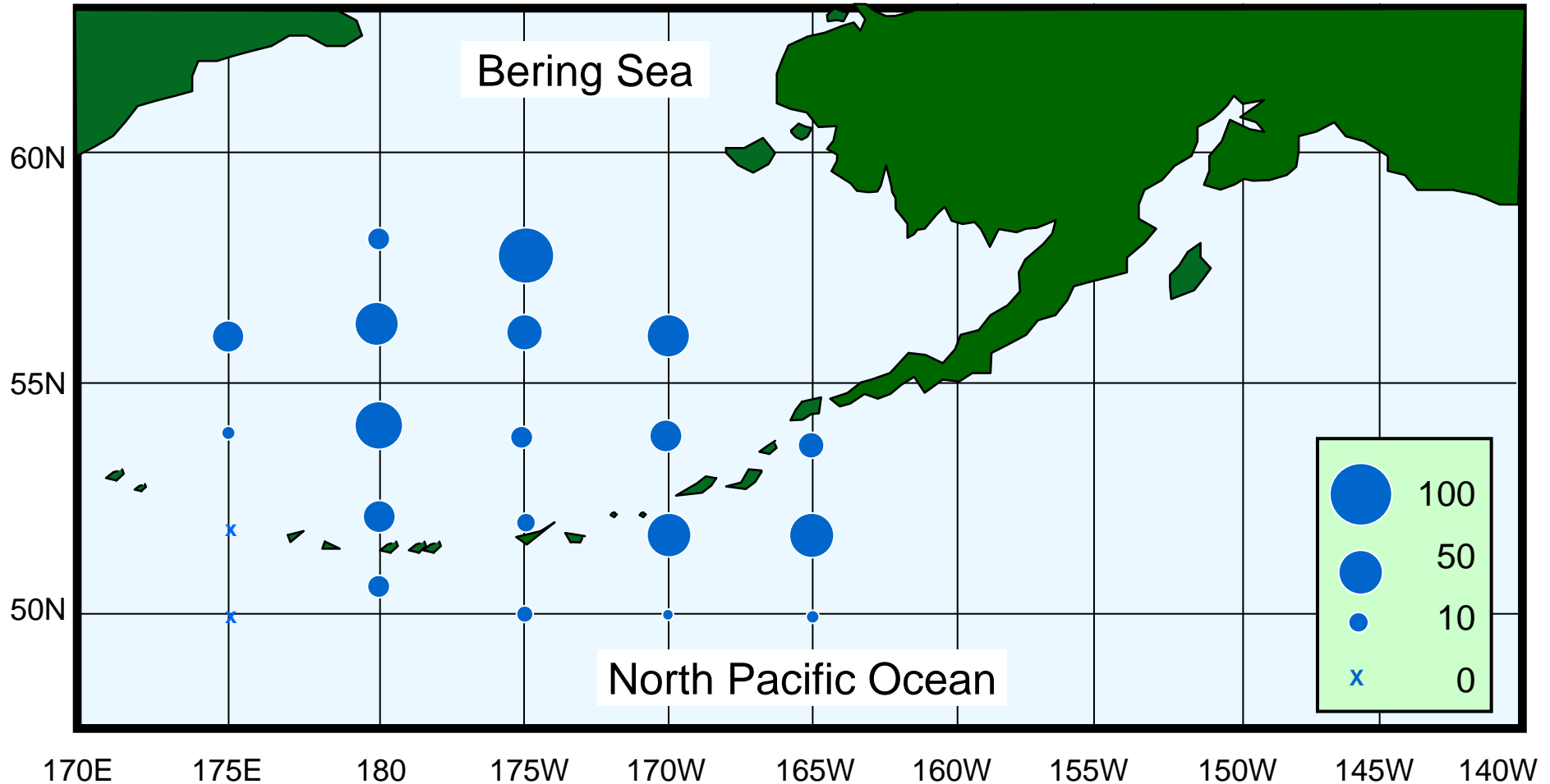


# Mean CPUE of Immature Chum Salmon estimated by GSI August/September 2003



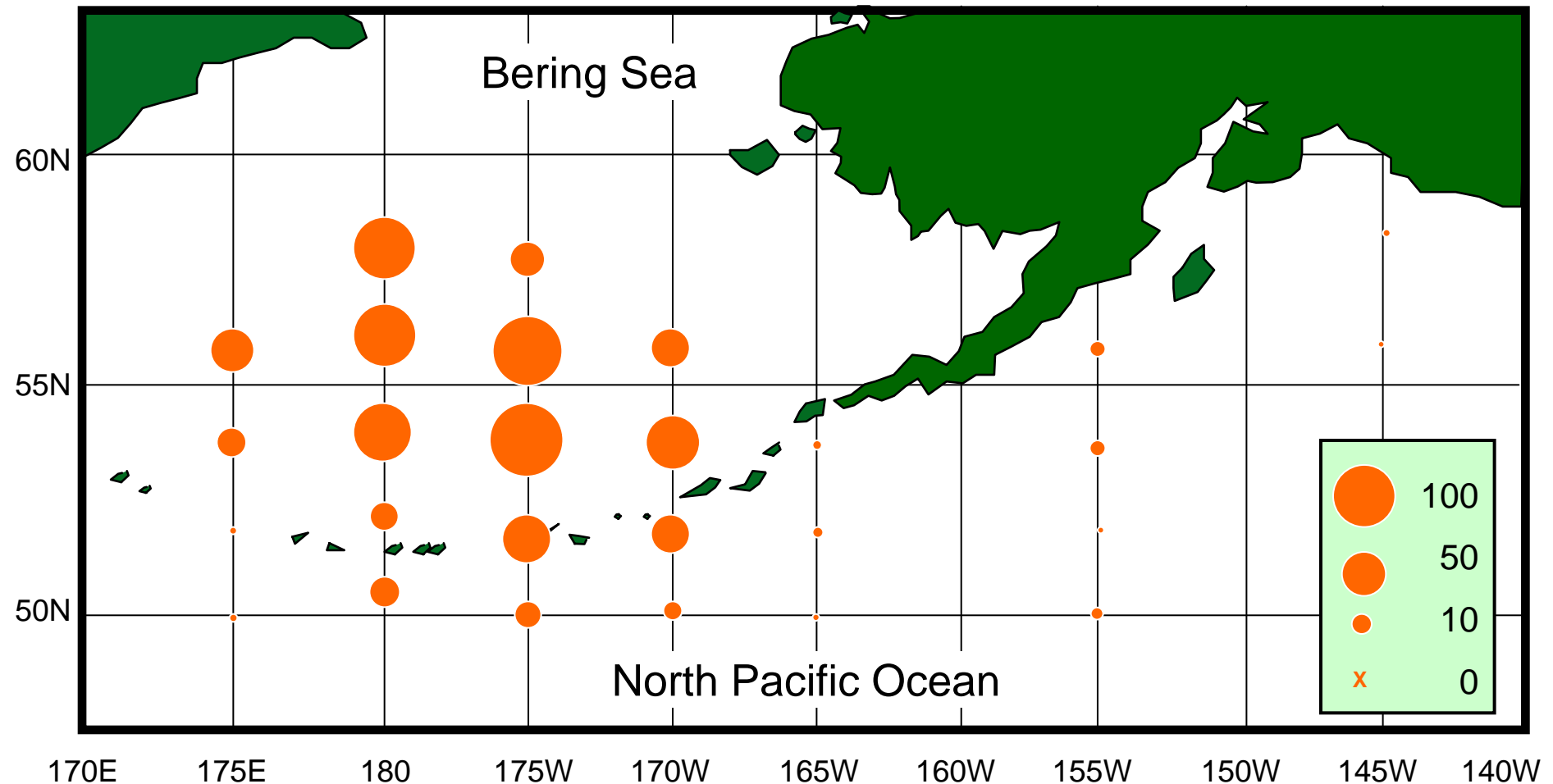
# GSI -estimated CPUE Distribution of Immature Chum Salmon: **Japan**

## **June/July 2003**



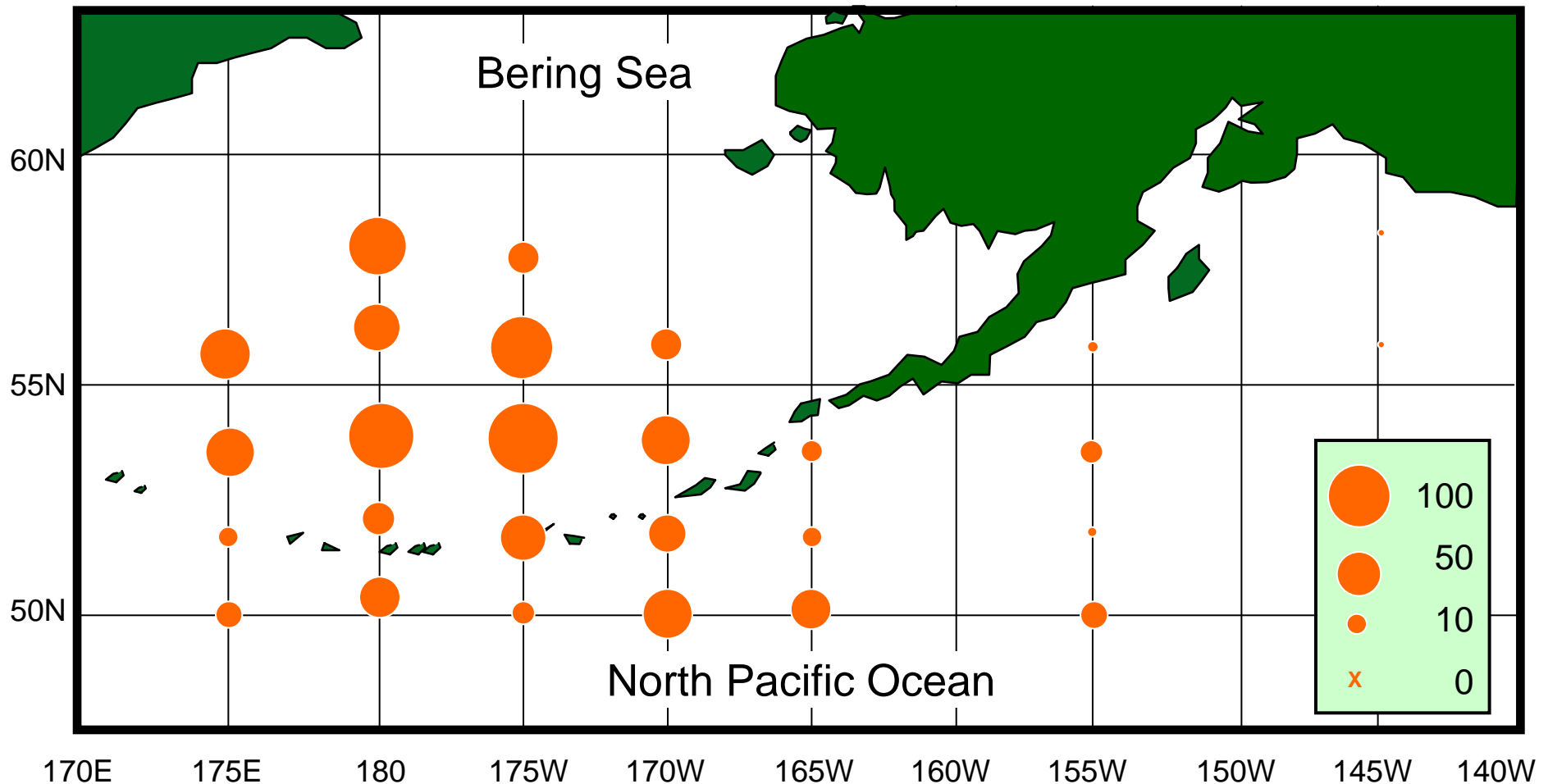
# GSI -estimated CPUE Distribution of Immature Chum Salmon Stock: **Japan**

## **August/September 2003**

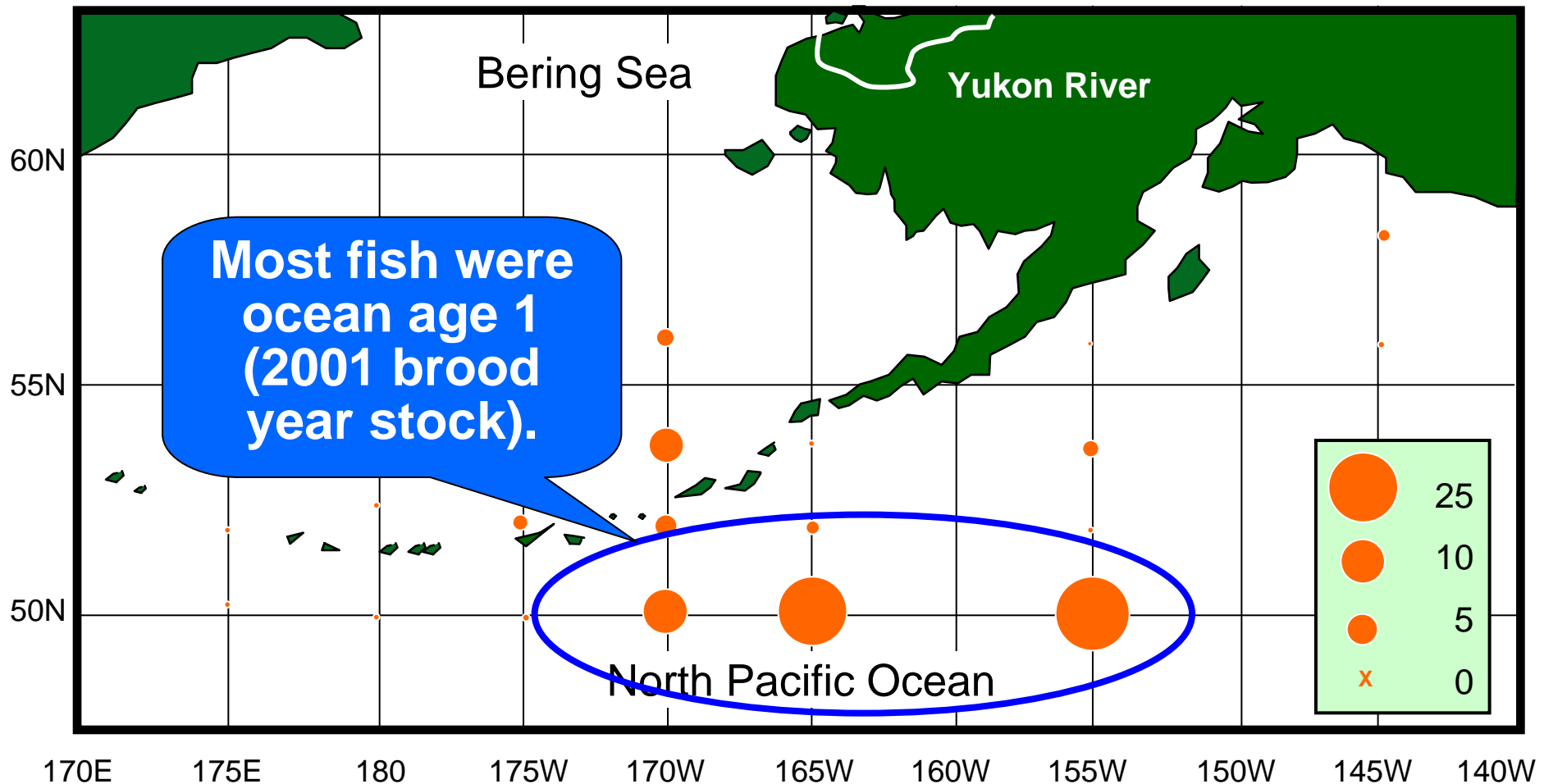


# GSI -estimated CPUE Distribution of Immature Chum Salmon Stock: **Russia**

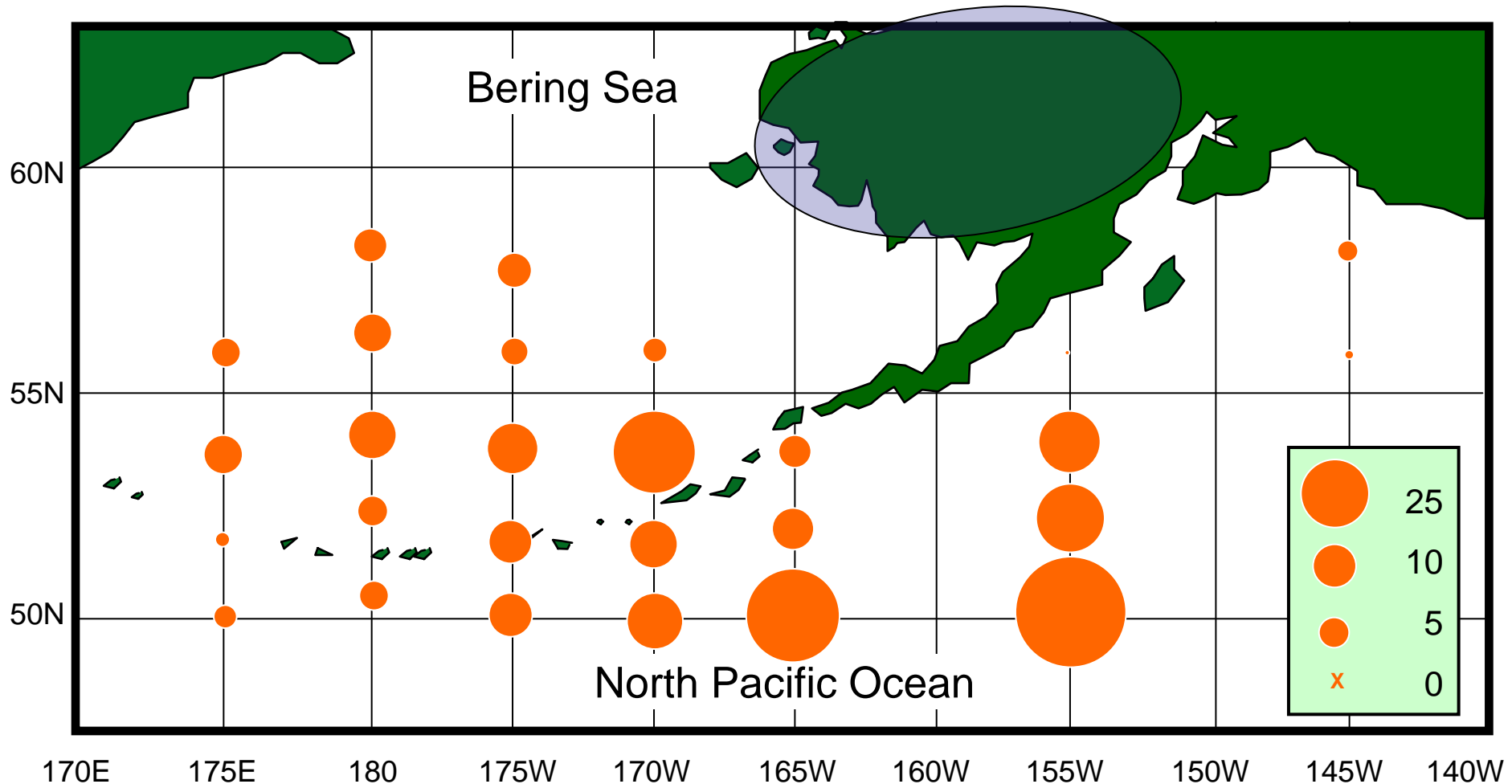
## August/September 2003



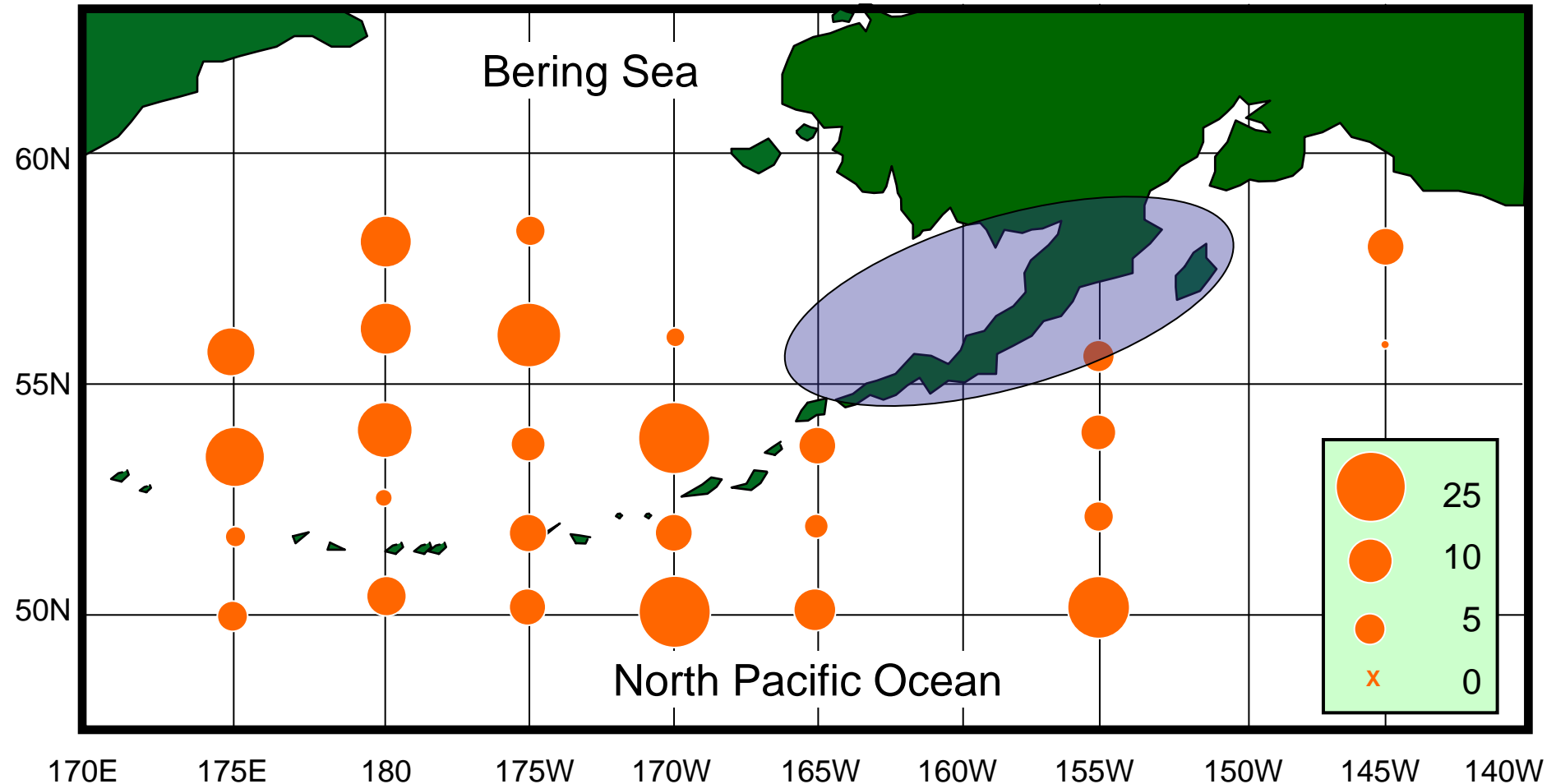
# GSI -estimated CPUE Distribution of Immature Chum Salmon Stock: **Fall Yukon** August/September 2003



# GSI -estimated CPUE Distribution of Immature Chum Salmon Stock: Northwest Alaska Summer August/September 2003

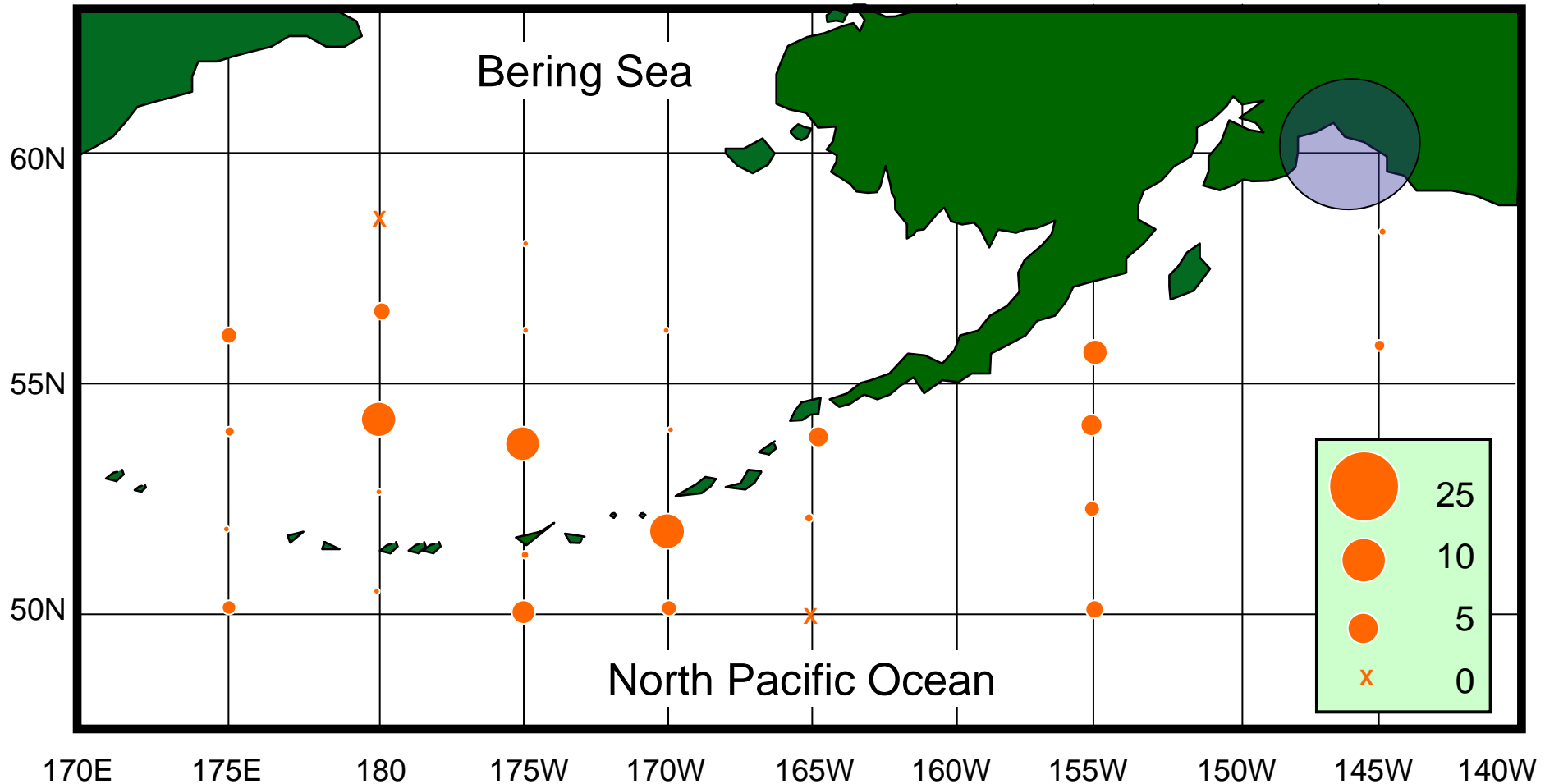


# GSI -estimated CPUE Distribution of Immature Chum Salmon Stock: **Alaska Pen. & Kodiak I.** August/September 2003

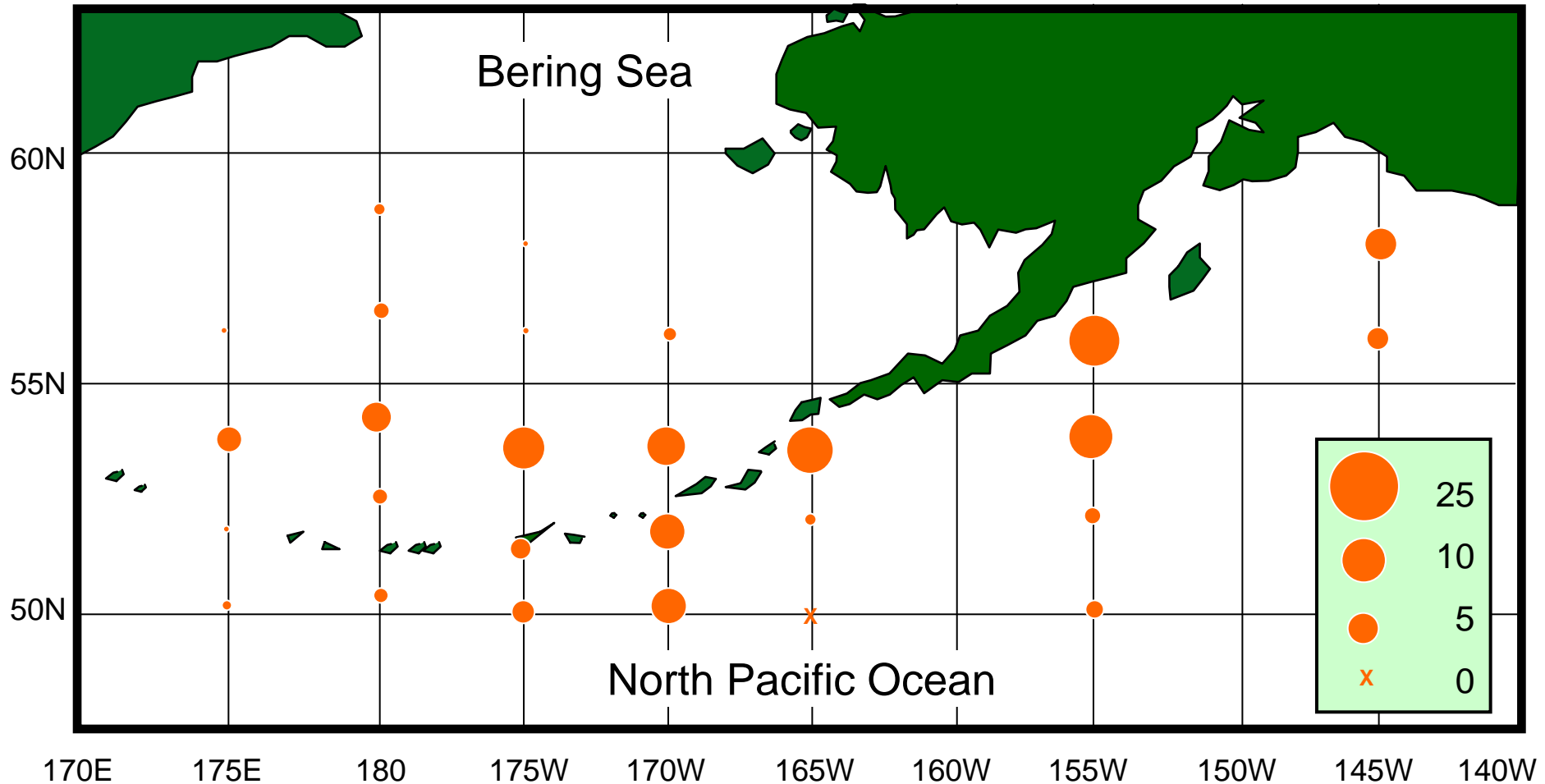


# GSI -estimated CPUE Distribution of Immature Chum Salmon Stock: Prince William Sound (PWS)

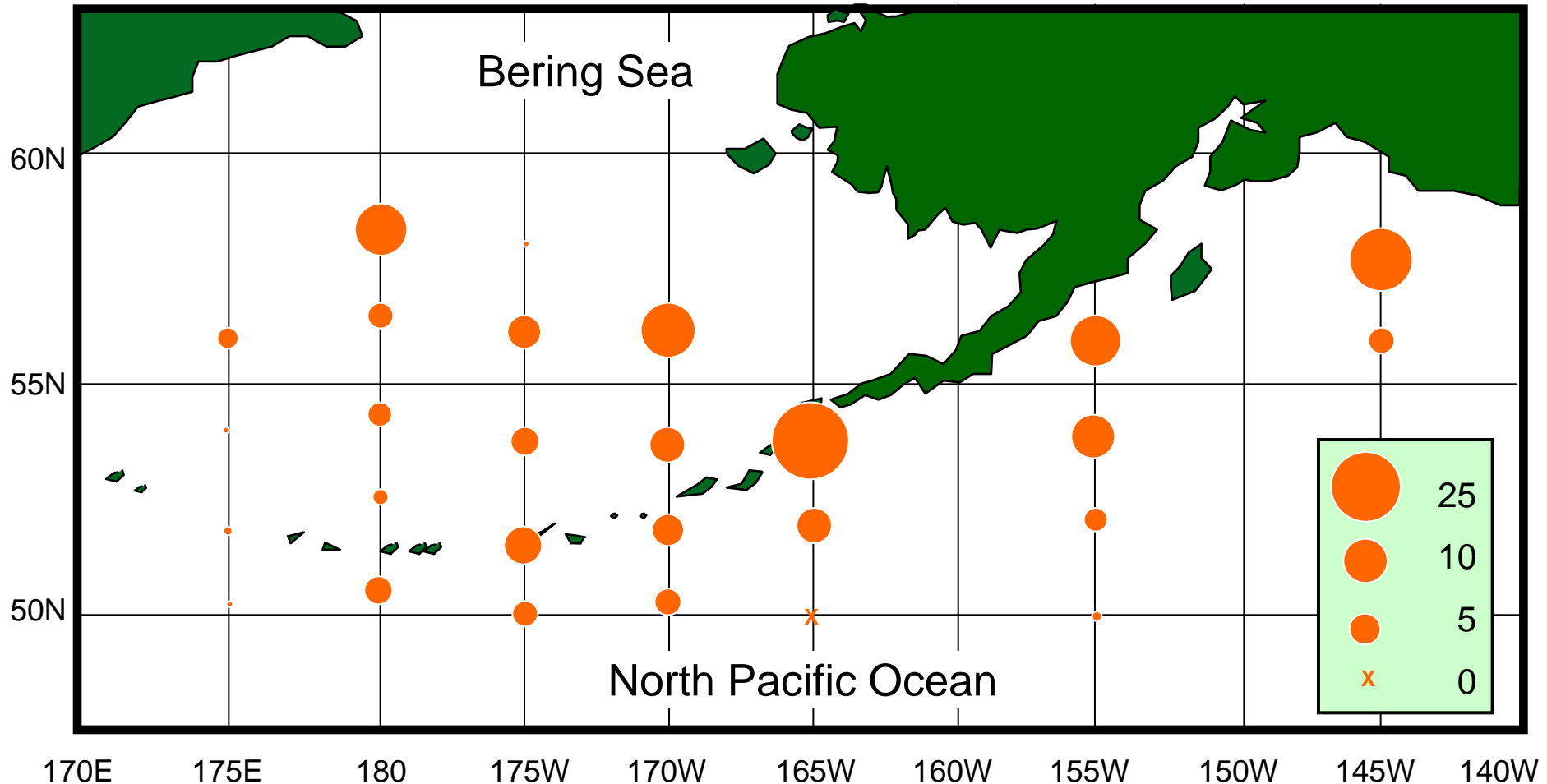
## August/September 2003



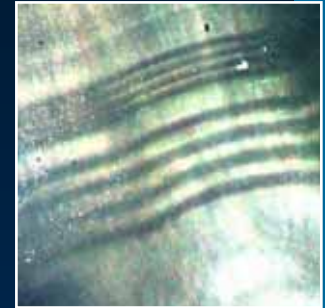
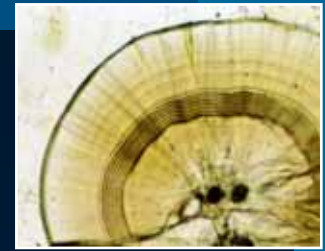
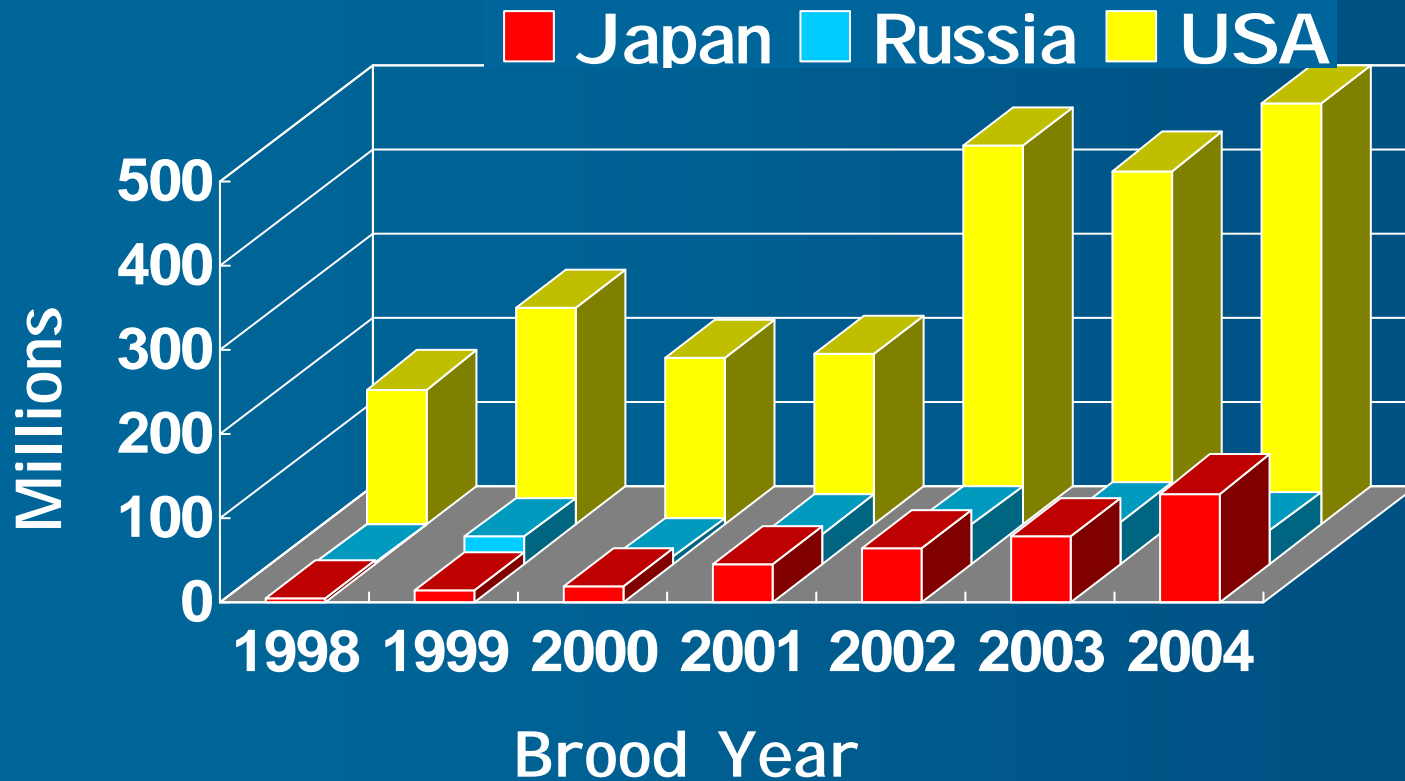
# GSI -estimated CPUE Distribution of Immature Chum Salmon Stock: Southeast Alaska & North BC August/September 2003



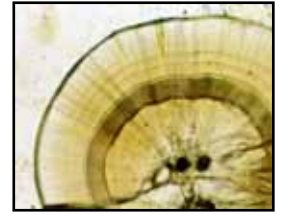
# GSI -estimated CPUE Distribution of Immature Chum Salmon Stock: **South BC & Washington** August/September 2003



# Number of otolith-marked chum salmon fry released from hatcheries

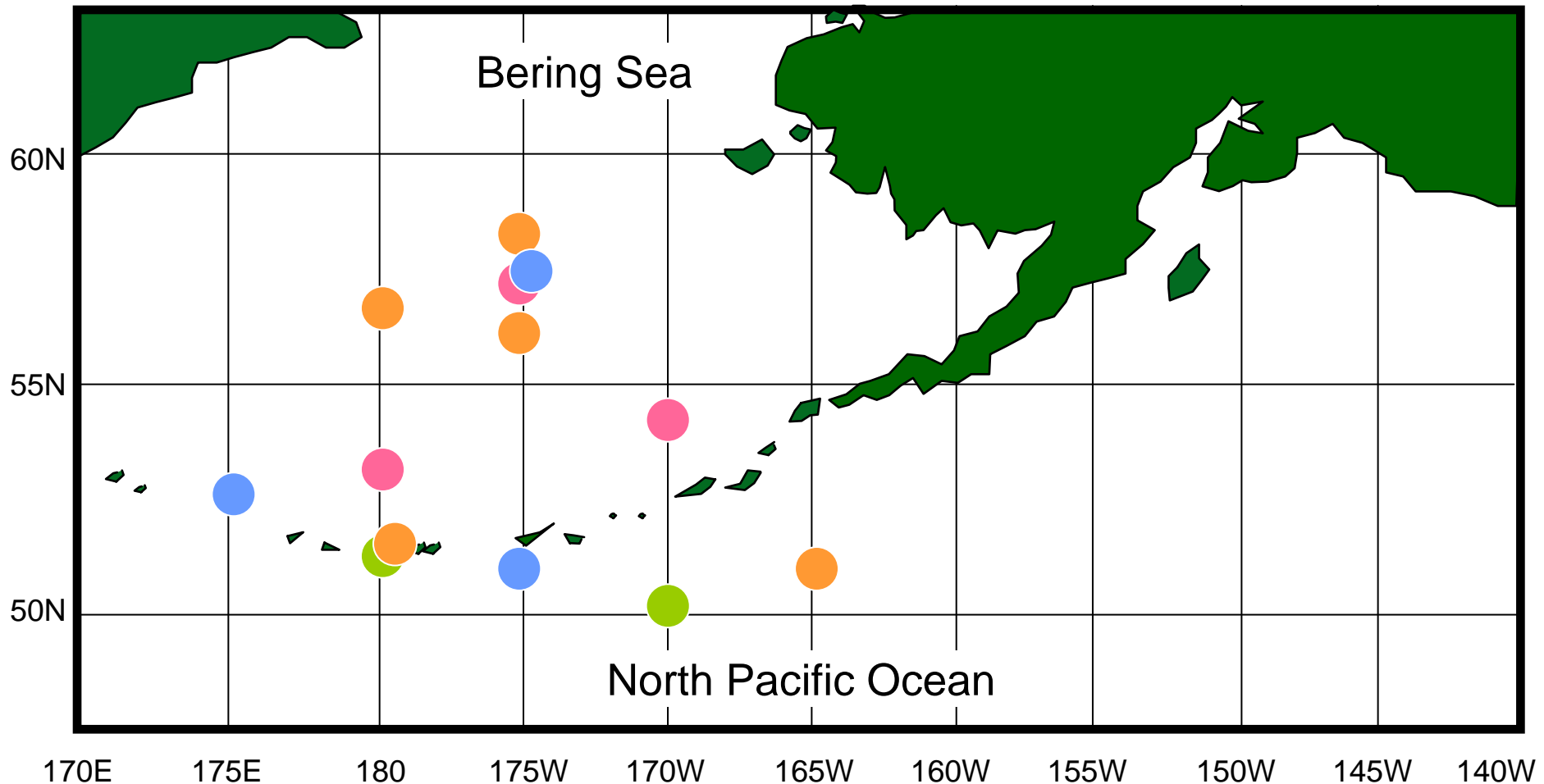


# Distribution of Otolith-marked Immature Chum Salmon June/July 2003

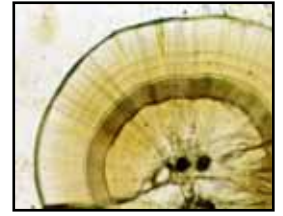


HOKKAIDO

● Chitose ● Shizunai ● Ichani ● Tokushibetsu

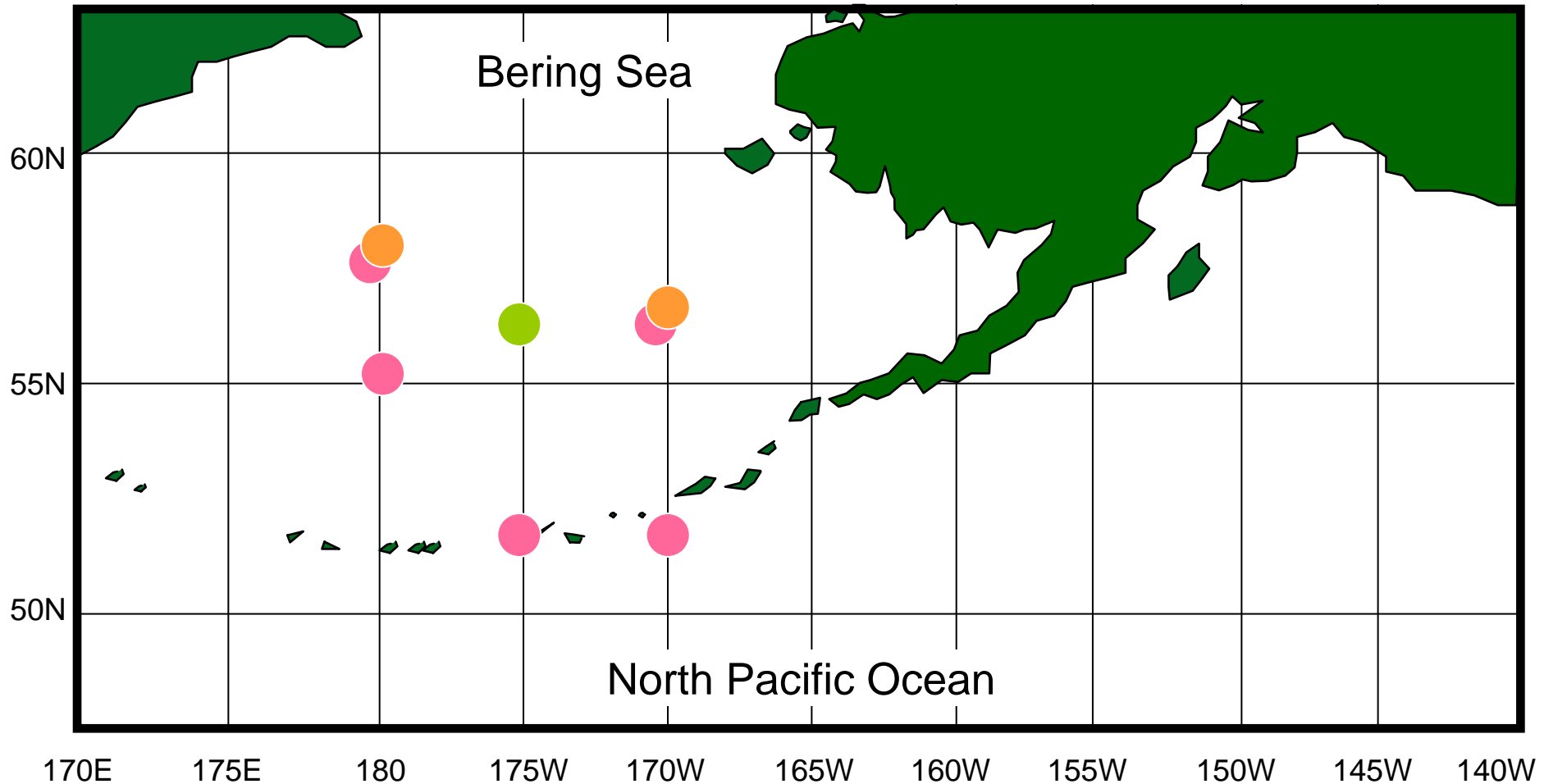


# Distribution of Otolith-marked Immature Chum Salmon August/September 2003



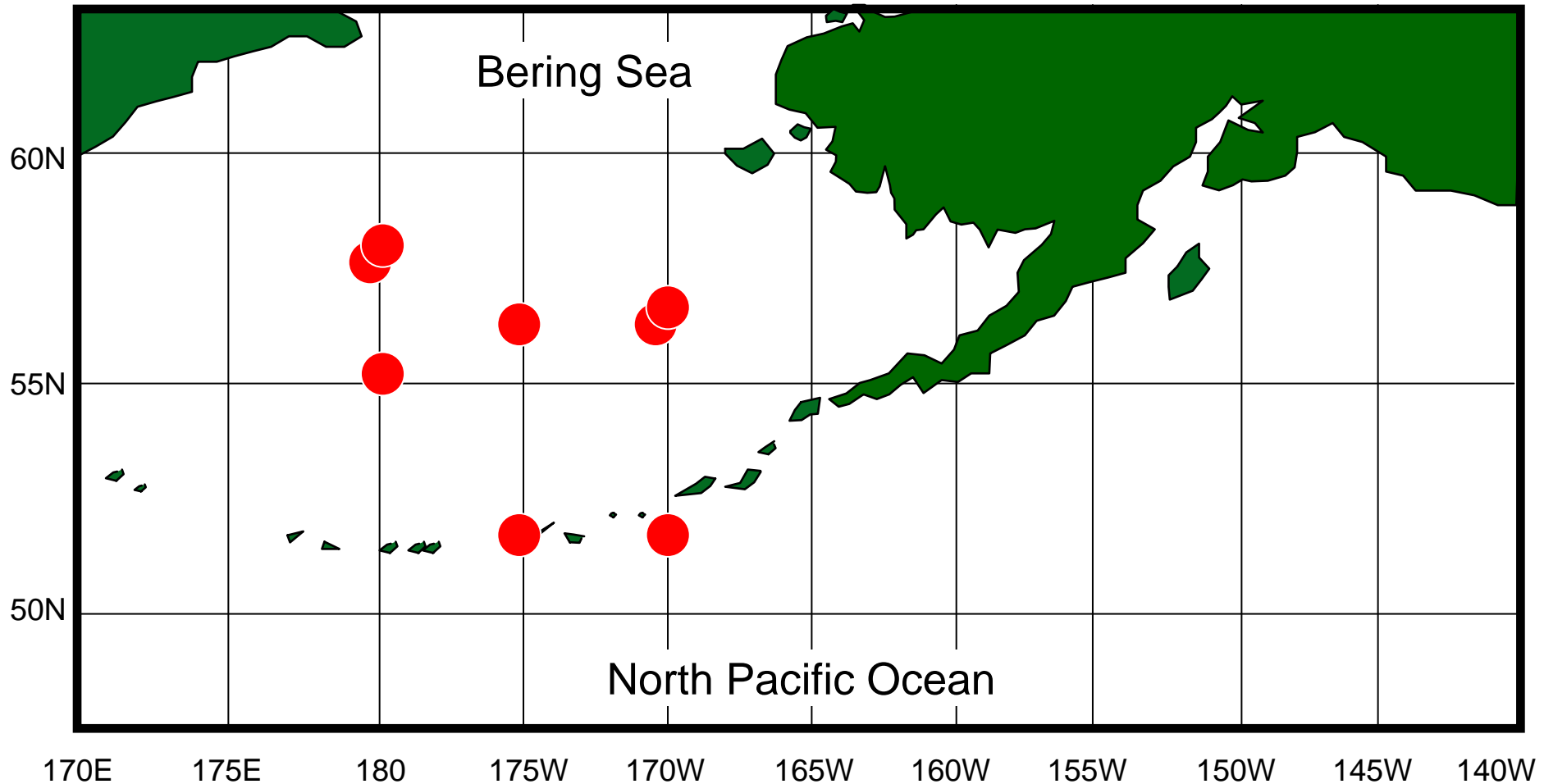
## HOKKAIDO

● Chitose ● Shizunai ● Ichani ● Tokushibetsu



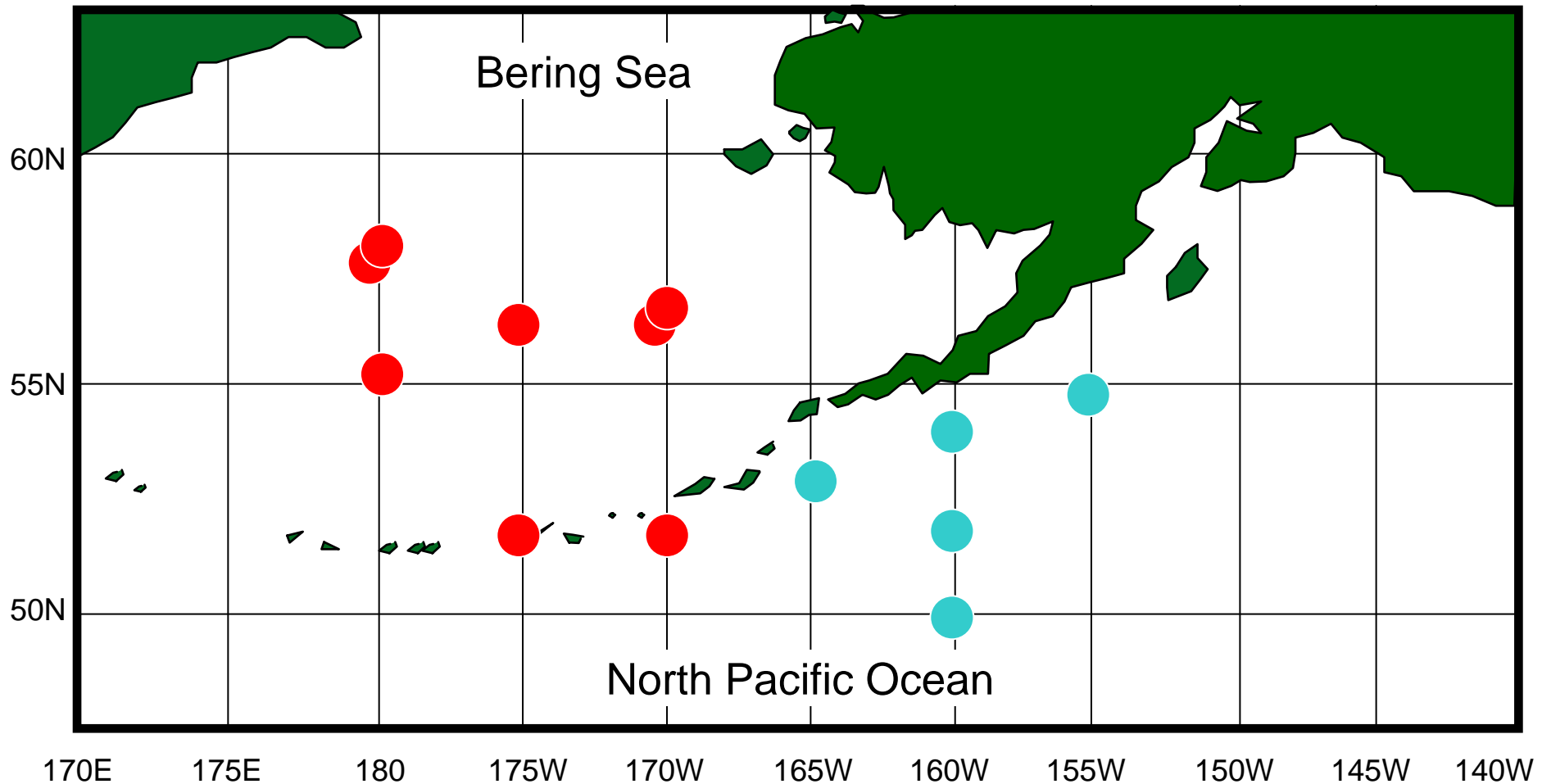
# Distribution of Otolith-marked Immature Chum Salmon August/September 2003

● Japan



# Distribution of Otolith-marked Immature Chum Salmon August/September 2003

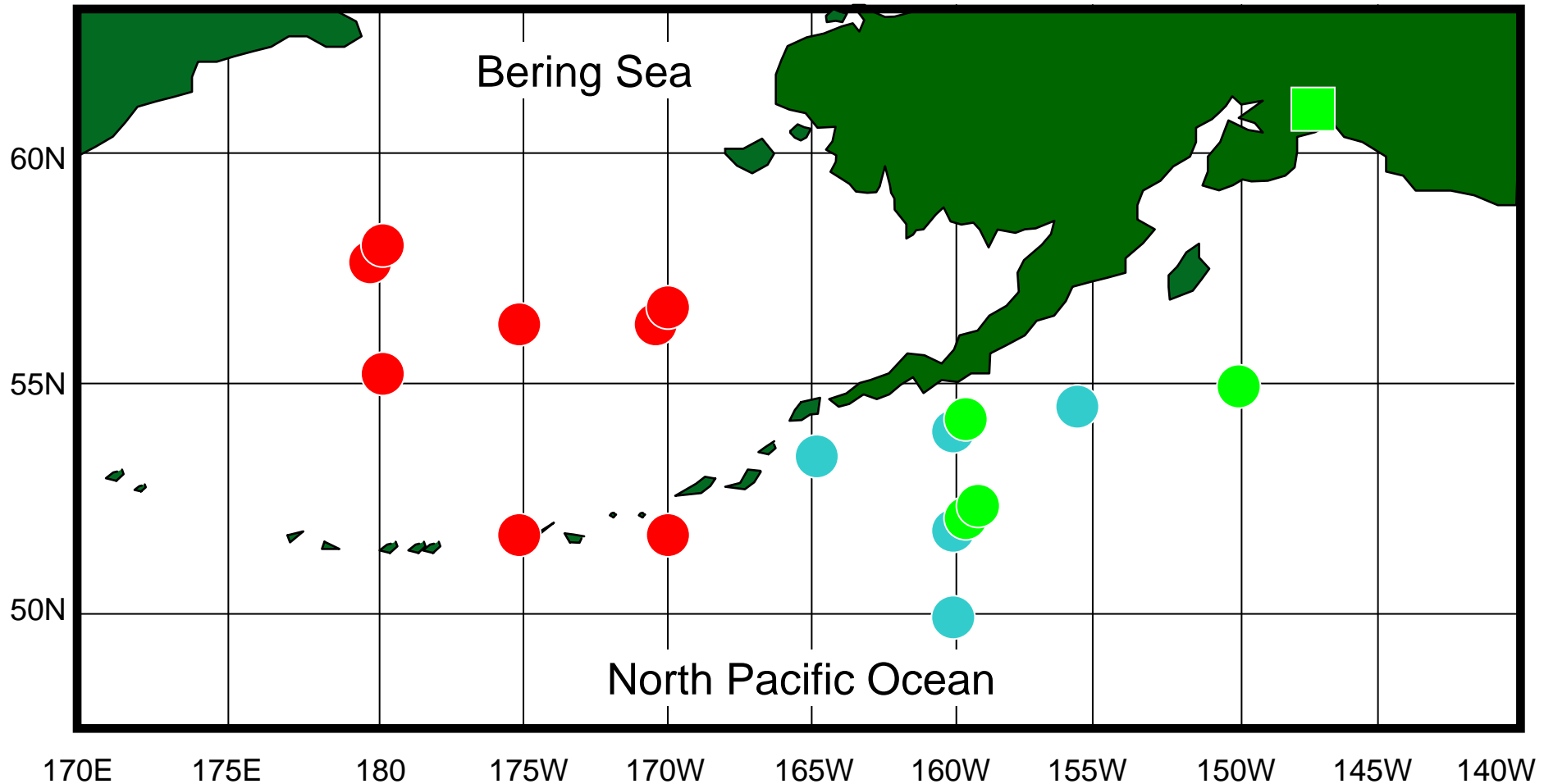
● Japan ● Russia



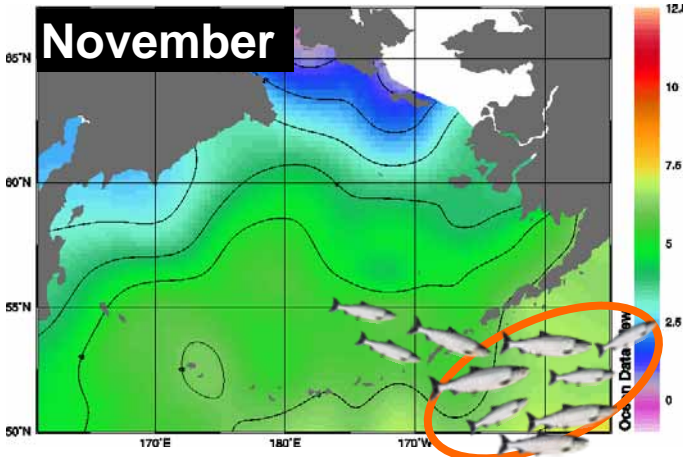
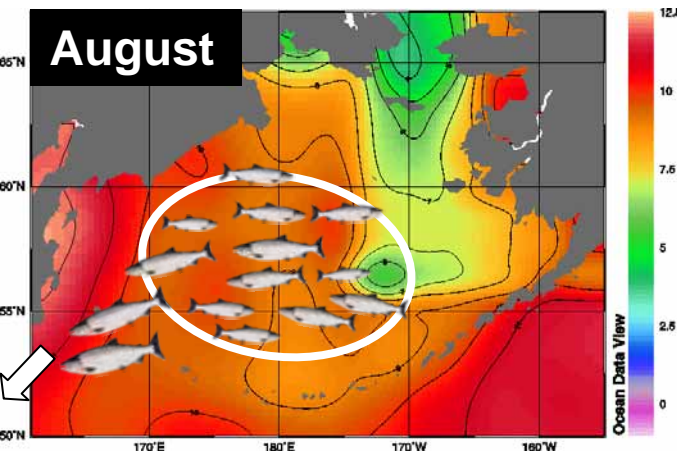
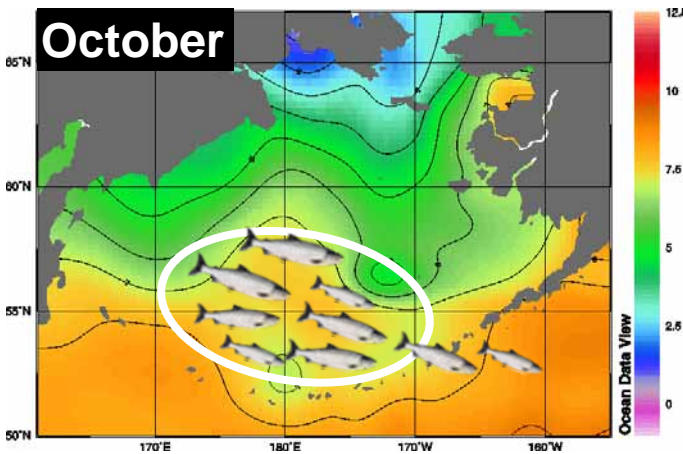
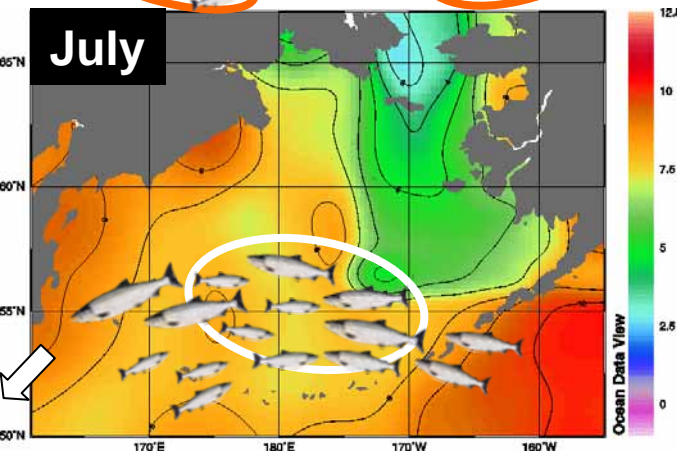
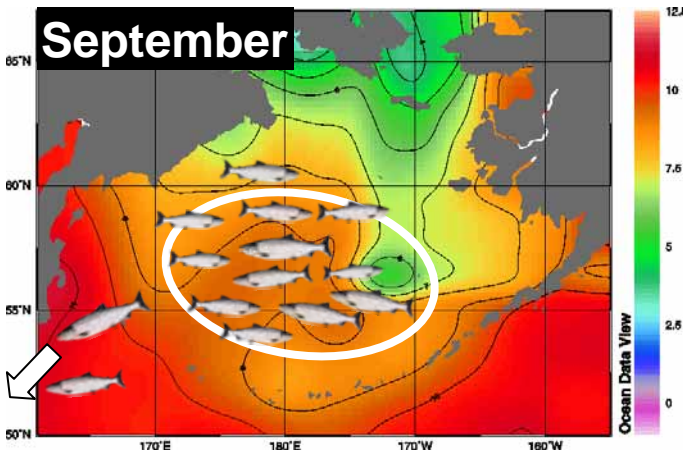
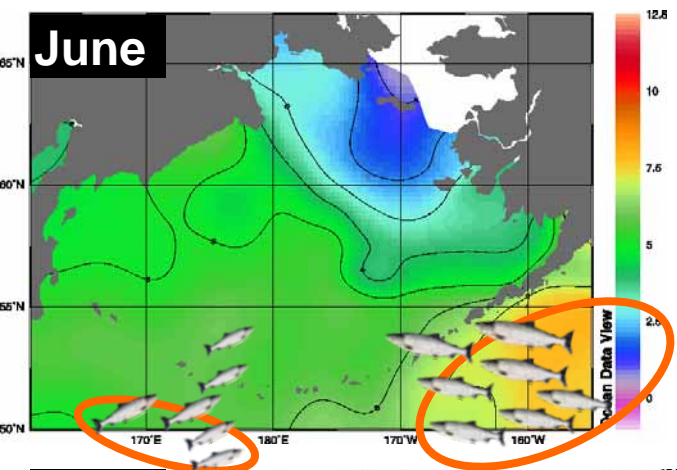
# Distribution of Otolith-marked Immature Chum Salmon August/September 2003

PWS

● Japan ● Russia ● W.H. Noerenberg







## Estimated migration pattern of Japanese chum salmon in the Bering Sea and North Pacific Ocean with sea surface temperature

After overwintering, young salmon in the western North Pacific Ocean and immature and maturing salmon in the Gulf of Alaska migrate into the Bering Sea during June and July. Maturing fish migrate for the natal river in Japan through the Bering Sea, while immature fish stay for feeding. In late October or November when the water temperature decreases in the Bering Sea, immature fish move southeast to the Gulf of Alaska for further wintering. They migrate between summer feeding grounds in the Bering Sea and winter habitat in the Gulf of Alaska until they return to spawn through the shortest migration route.

# SUMMARY

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- ✓ The ocean distribution of chum salmon is apparently different among regional stocks.
- ✓ Asian chum salmon feed mainly in the Bering Sea during summer, while the Gulf of Alaska is an important feeding habitat for most North American stocks.
- ✓ The ocean distribution patterns may be affected by abundance of prey organisms, ocean conditions (water temperature, current etc.), timing and location of spawning, and winter habitat.



# Acknowledgements

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**Thanks!!**

