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# Trans-Pacific "synchrony" in multidecadal changes of habitat patterns for *Ommastrephes bartramii* and *Dosidicus gigas*

**Wei Yu**, Jian Wen, Xinjun Chen, Yi Gong, Bilin Liu

College of Marine Sciences, Shanghai Ocean University

Email: wyu@shou.edu.cn

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# Outline

1. Introduction
2. Methods
3. Results
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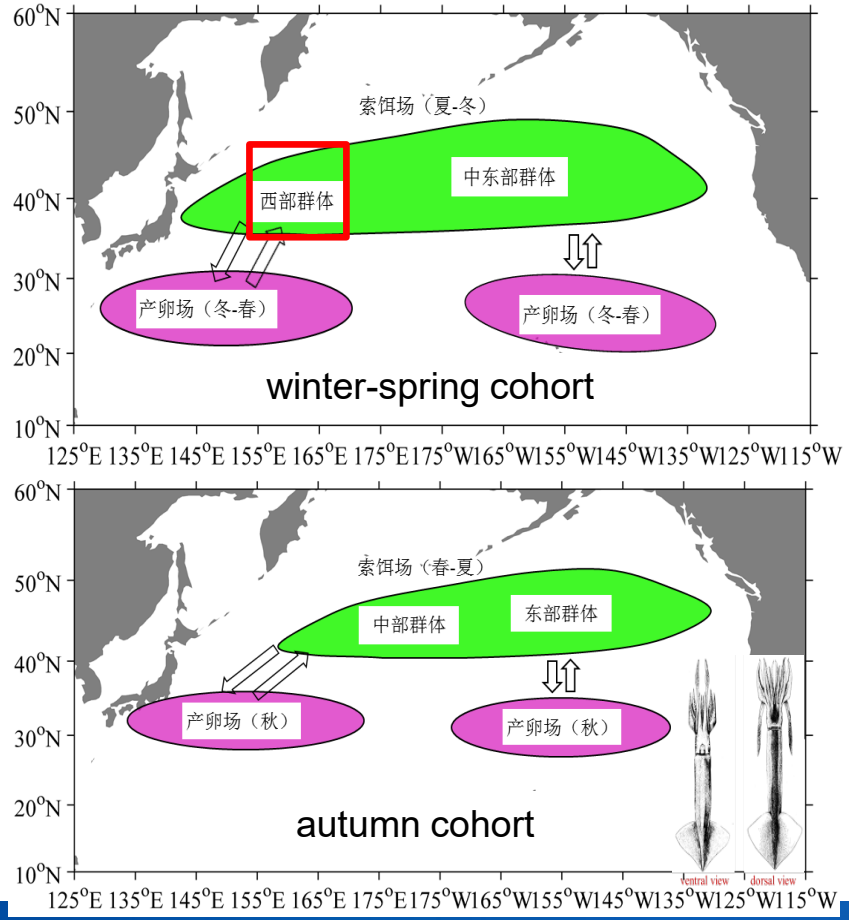
# Introduction



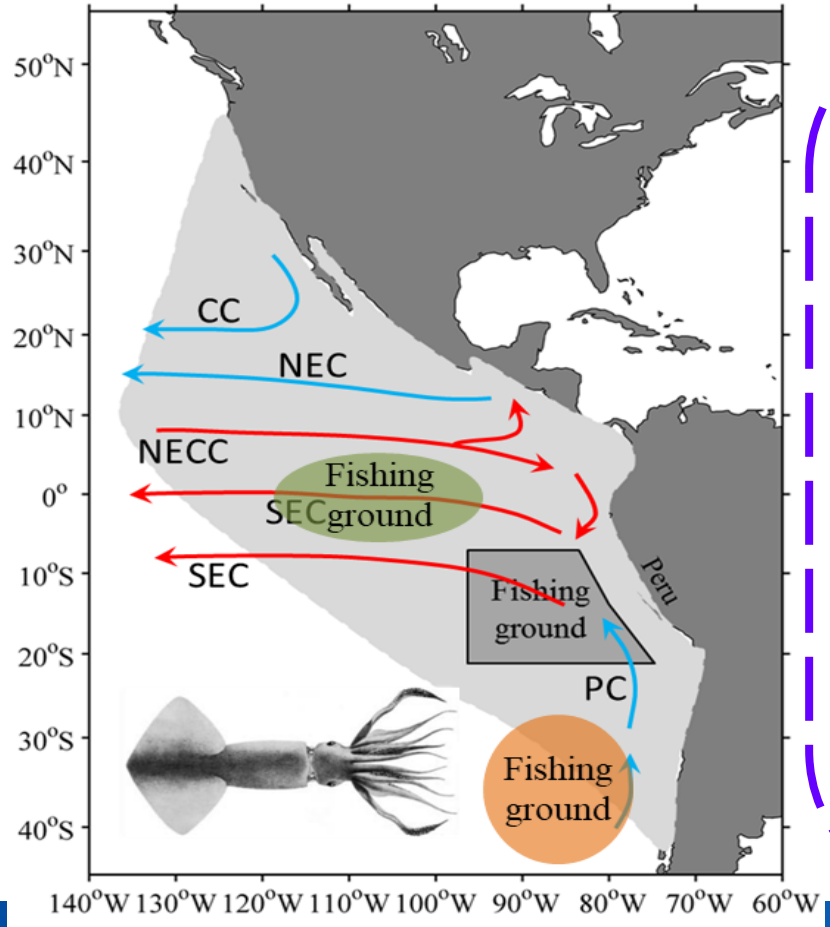

## *Ommastrephes bartramii*

- Two cohorts (winter-spring cohort and autumn cohort)
- Seasonal migration pattern and widely distribution
- A cannibalism species with fast growth
- Economically important
- 1 year lifespan
- subject to complicated environmental changes (PDO, Kuroshio and Oyashio, SST, SSHA, etc. )

## *Chinese squid-jigging fishery*

- Started in 1993;
- Targeted winter-spring cohort;
- Fishing ground: 35°-50°N and 150°-175°E;

# Introduction



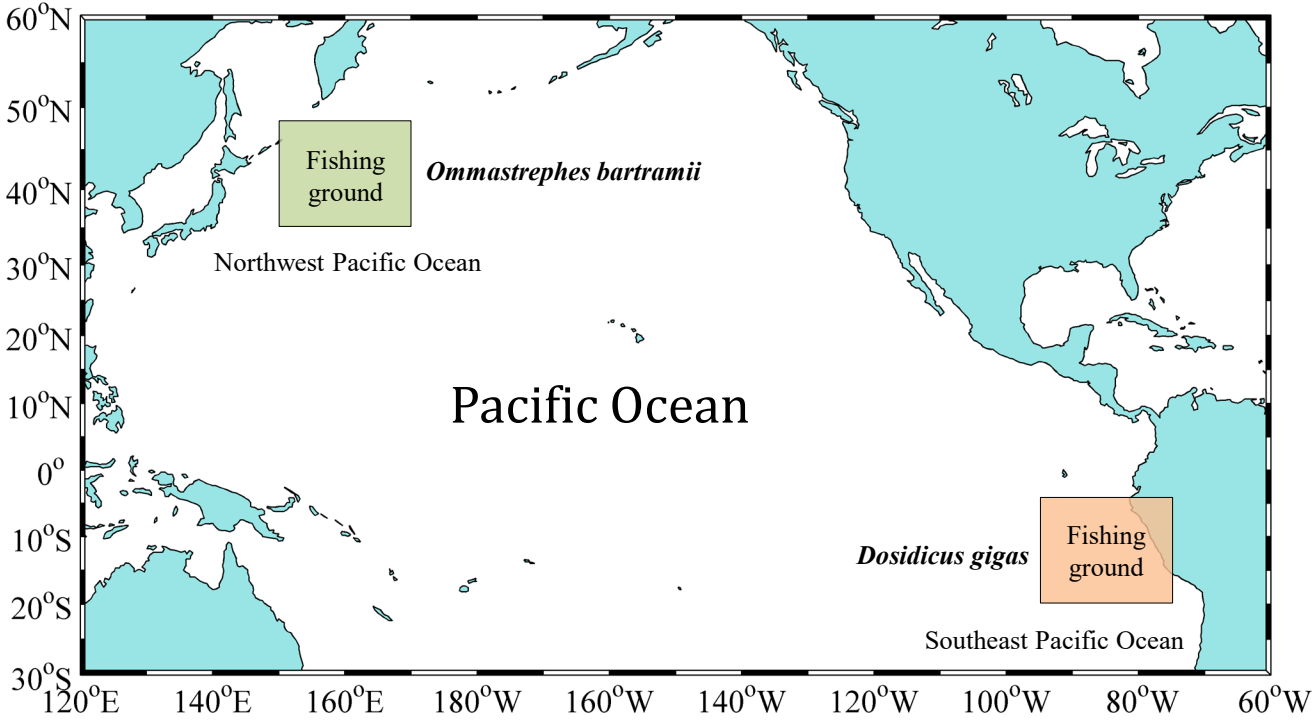

## *Dosidicus gigas*

- Different geographical stocks;
- Widely distribution;
- A cannibalism species with fast growth;
- High catch and economically important;
- 1 year short lifespan;

## Chinese squid-jigging fishery

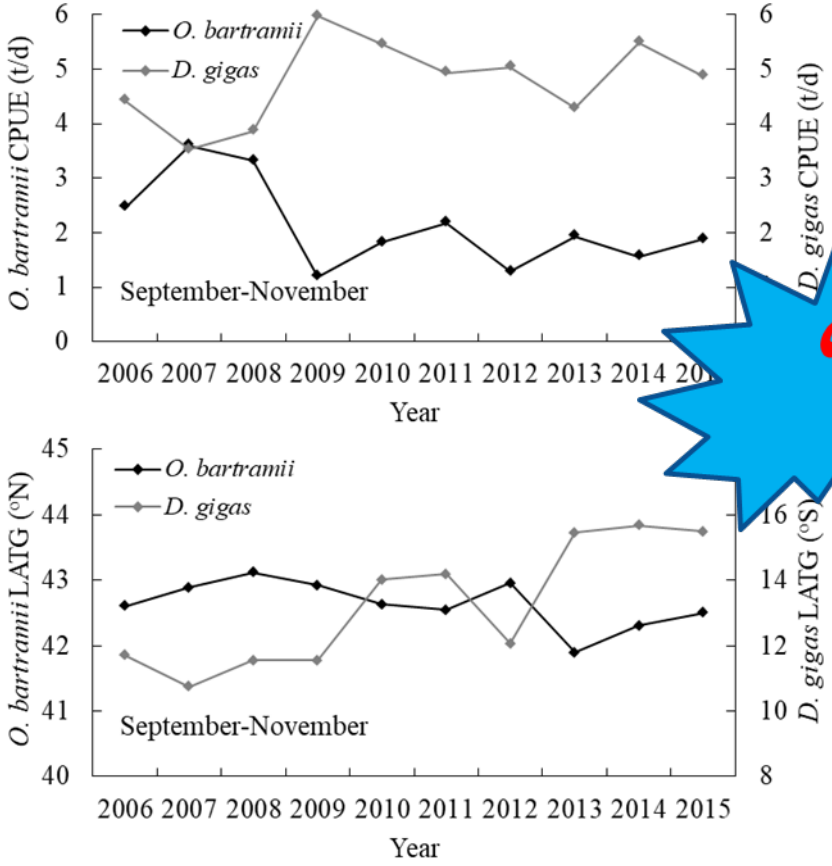
- Started in 2001;
- Important fishing ground : Peru, Chile, Equator;
- Fluctuant catches, number of fishing boats and CPUE;

# Introduction




Fishing ground of neon flying squid in the Northwest Pacific Ocean and jumbo flying squid in the Southeast Pacific Ocean

# Introduction

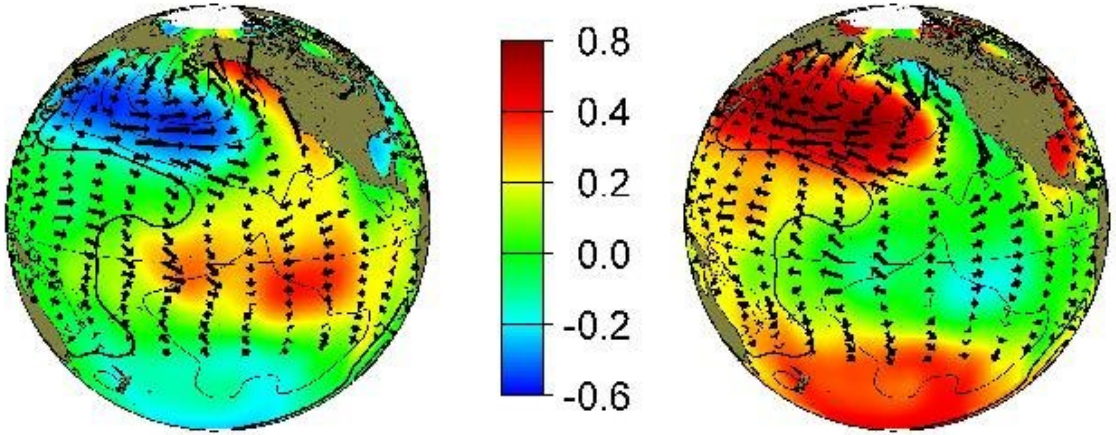


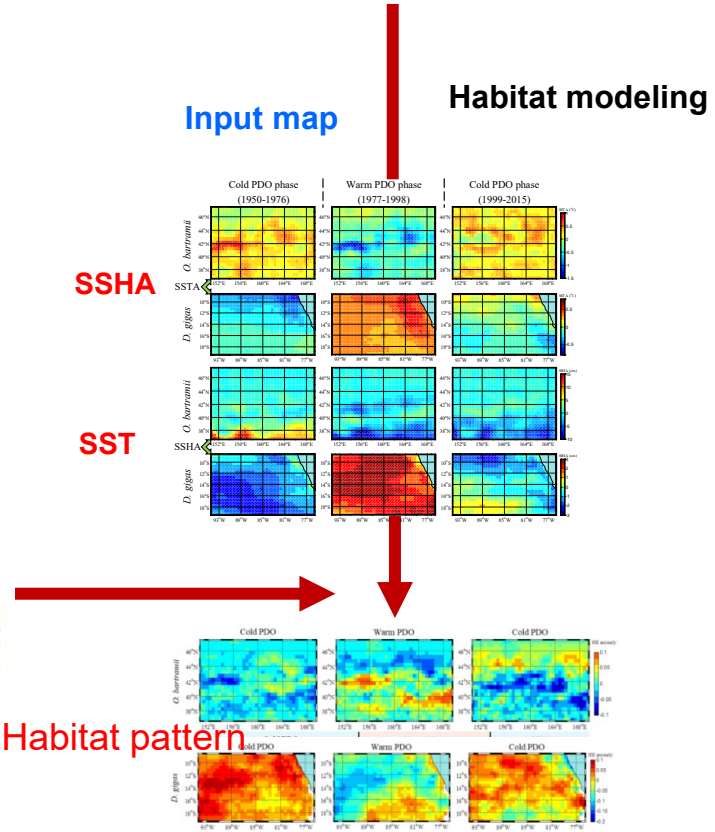

Comparison of CPUE and LATG between neon flying squid in the Northwest Pacific Ocean and jumbo flying squid in the Southeast Pacific Ocean from September to November during 2006-2015

An interesting phenomenon has been observed for *O. bartramii* and *D. gigas* through Chinese squid fisheries. Catch per unit effort (CPUE) from September to November for the two squids showed opposite variability pattern, but the latitudinal gravity center of fishing ground showed similar variability pattern

# Methods

Neon squid and jumbo squid habitats subject to complicated climatic and environmental changes (PDO, SST, SSHA, etc. ), we hypothesized variability in abundance and distribution was correlated with the PDO-related habitat changes for the two squids.



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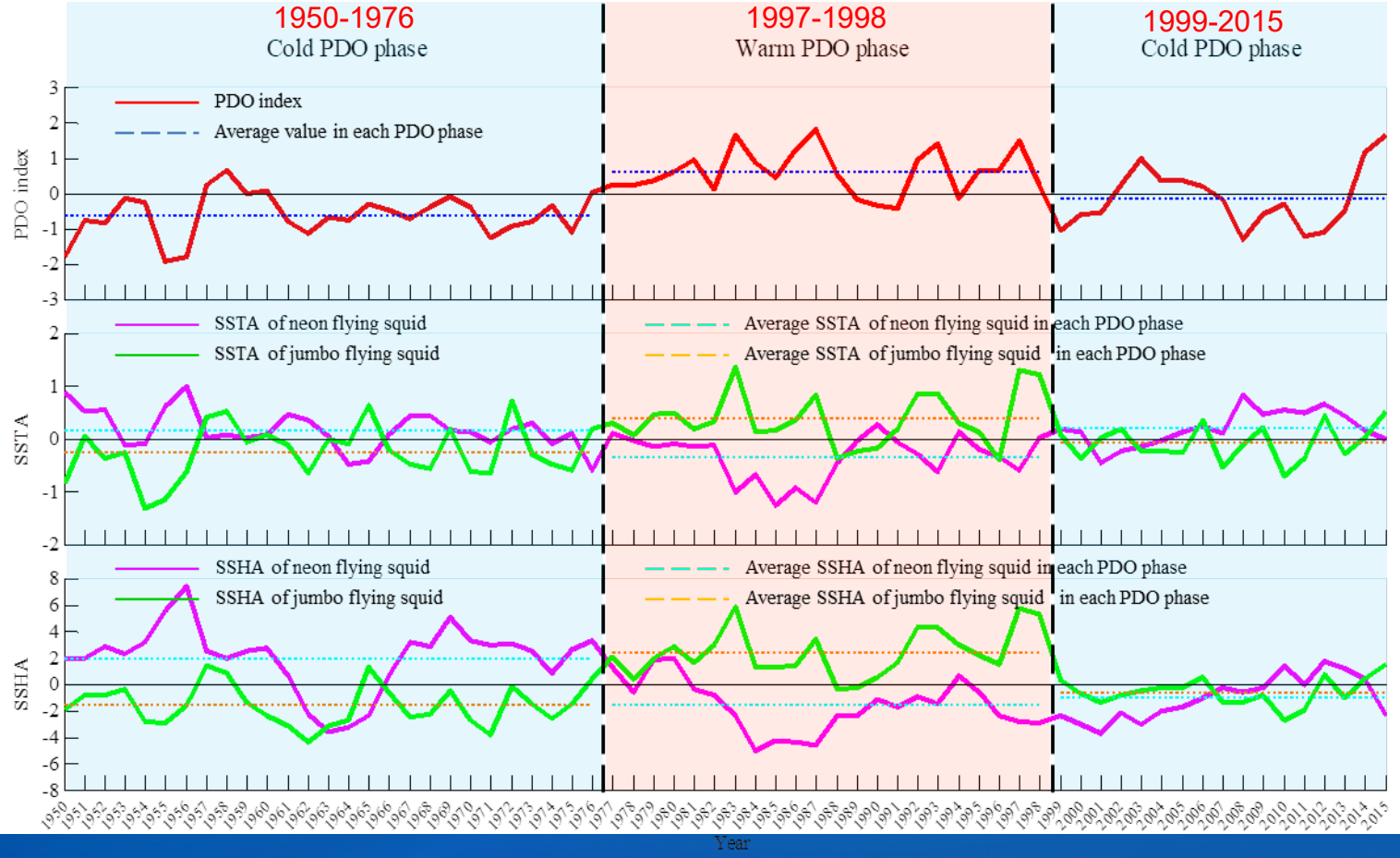
# Results



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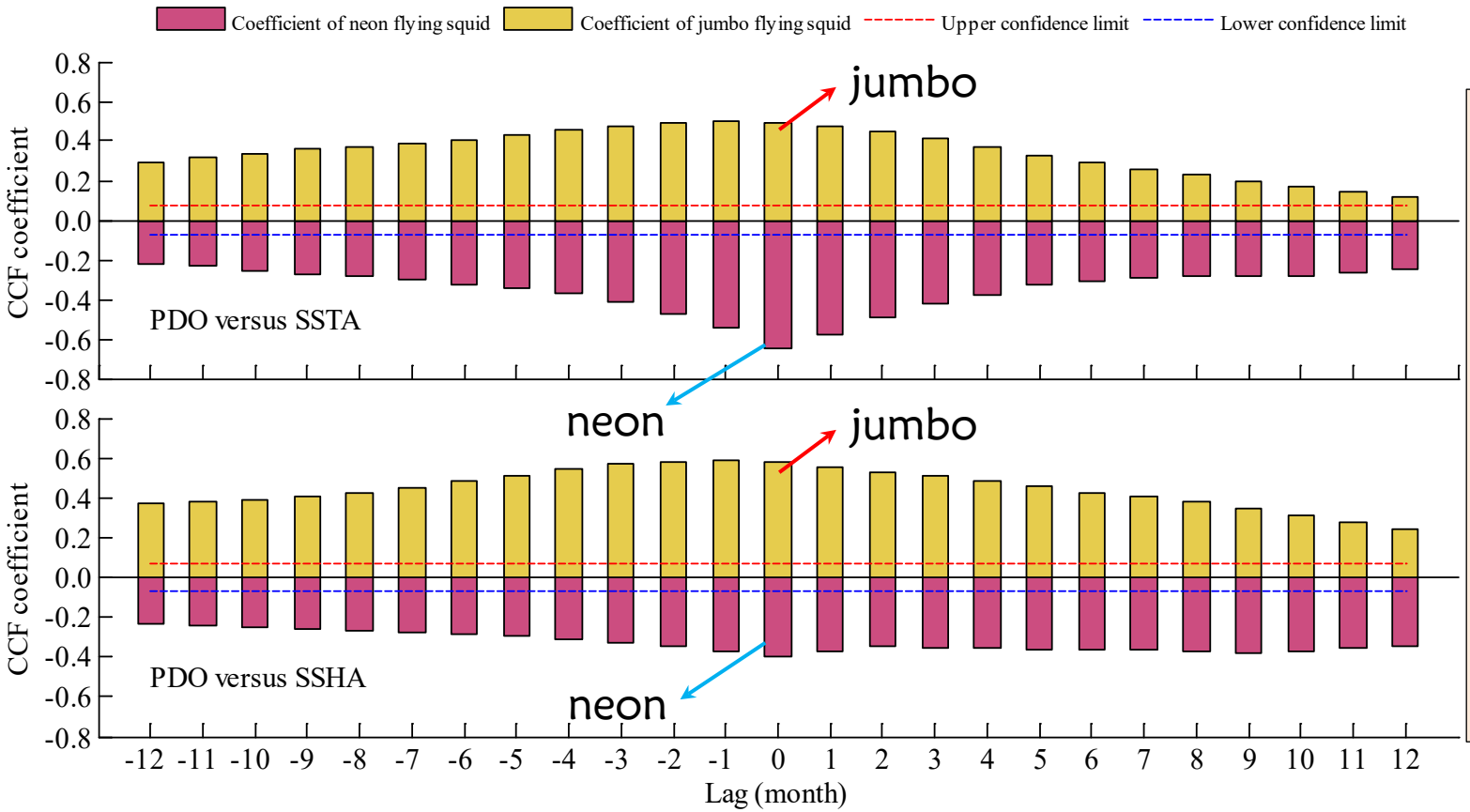
# Results



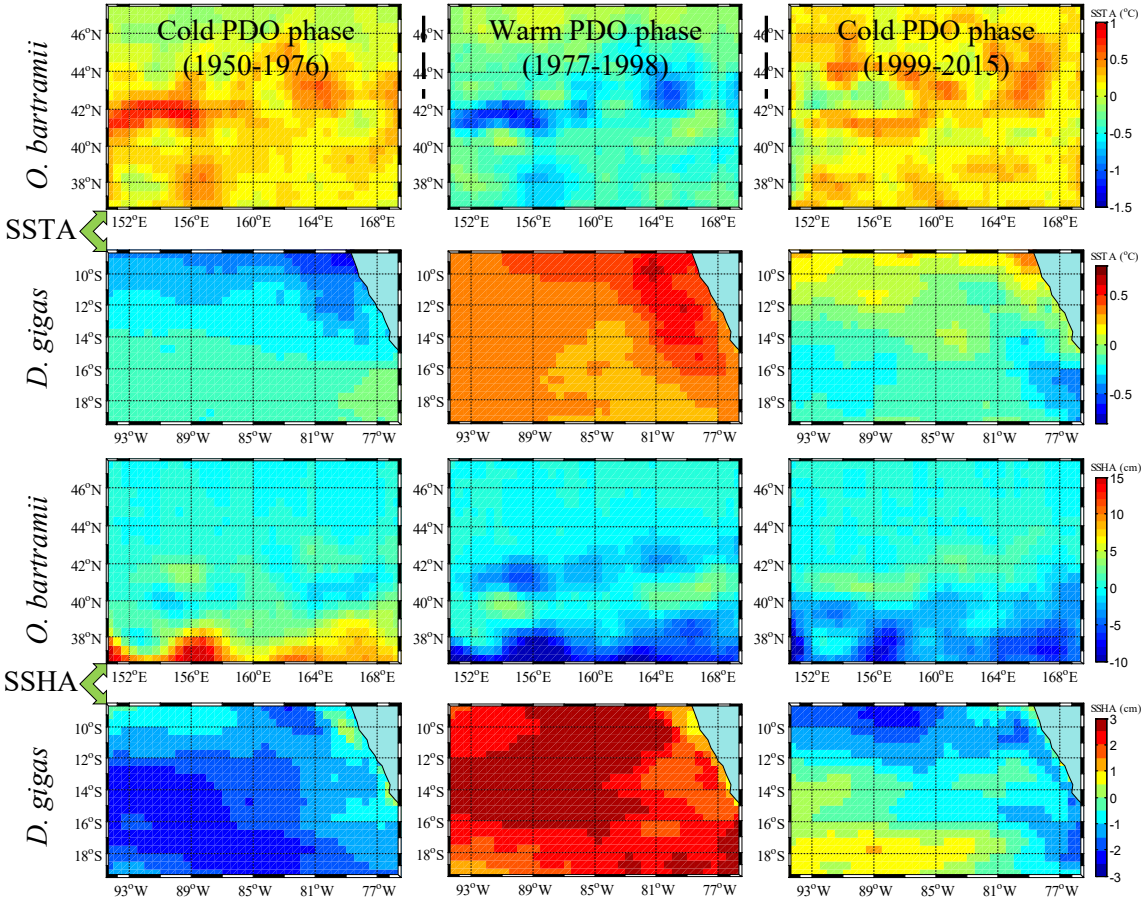

## Warm PDO

| | |
|---|---|
| jumbo | High SST, high SSHA |
| neon | Low SST, low SSHA |

## Cold PDO

| | |
|---|---|
| jumbo | Low SST, low SST |
| neon | High SST, high SSHA |

# Results




## Warm PDO

jumbo — High SST, high SSHA

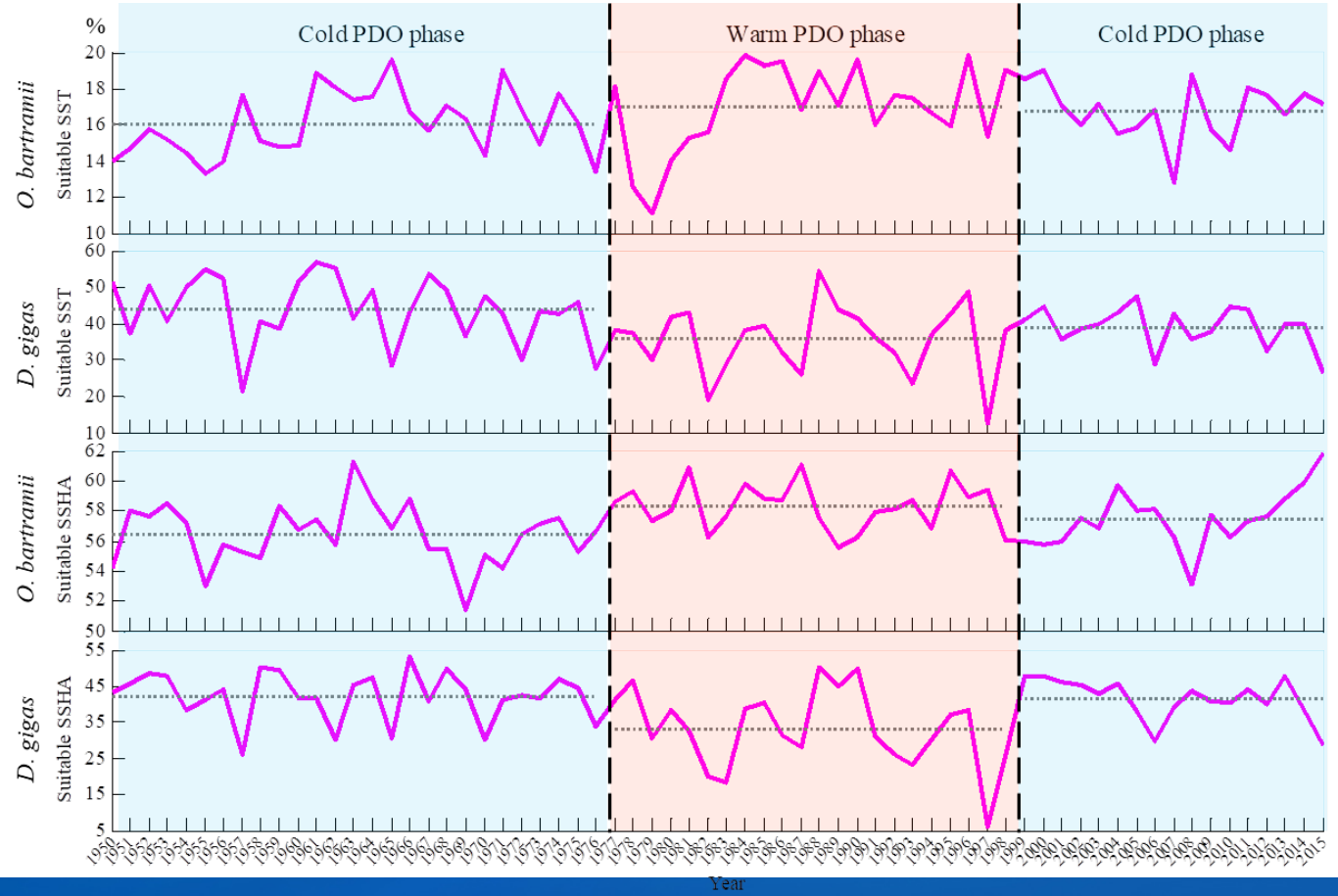
neon — Low SST, low SSHA

## Cold PDO

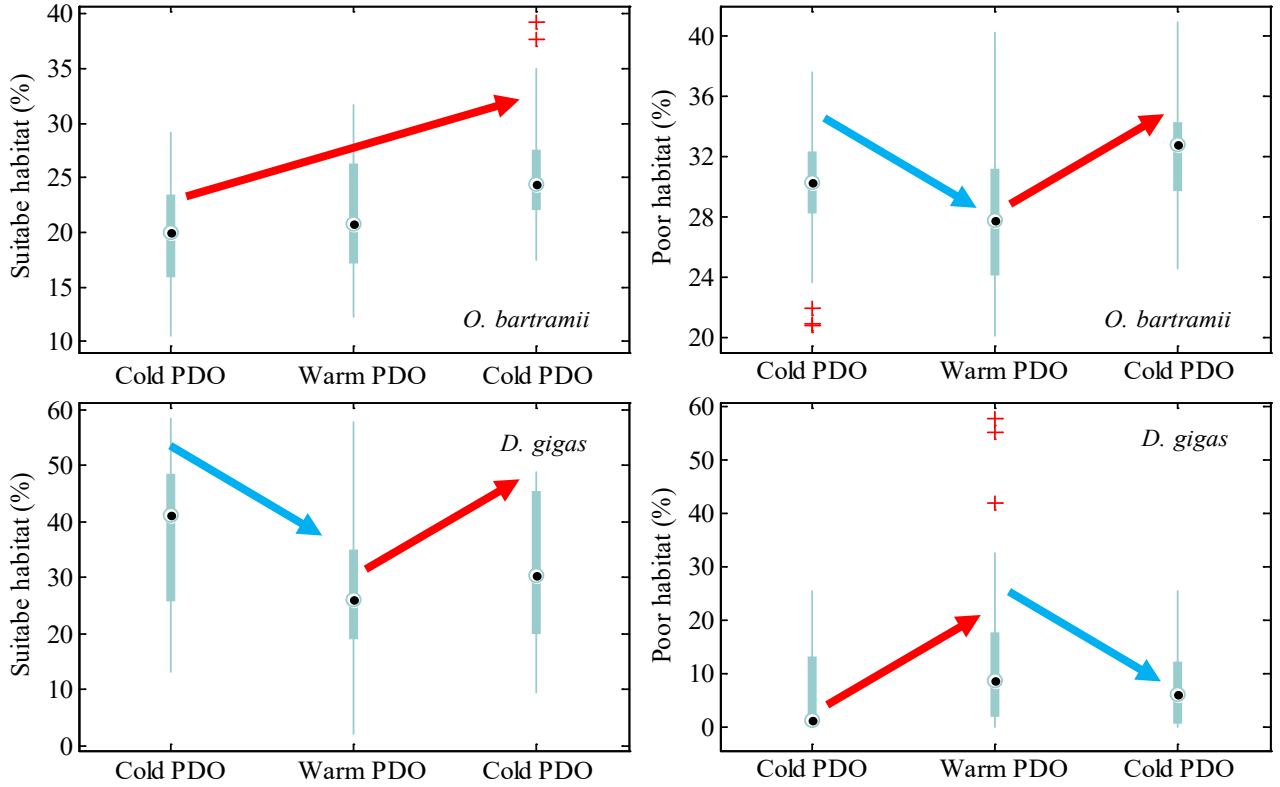
jumbo — Low SST, low SST

neon — High SST, high SSHA

# Results

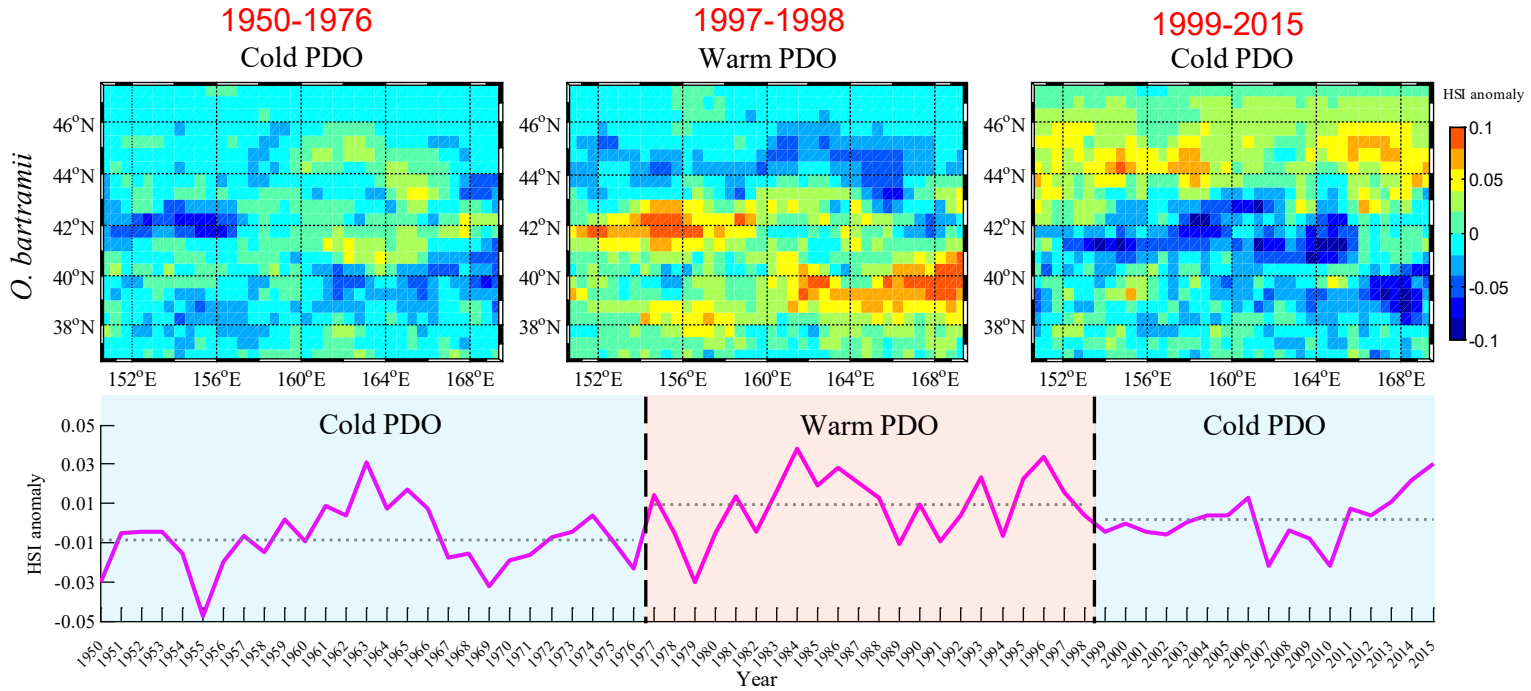

Cold PDO phase
Warm PDO phase
Cold PDO phase
%
O. bartramii
Suitable SST
D. gigas
Suitable SST
O. bartramii
Suitable SSHA
D. gigas
Suitable SSHA
Year

# Results



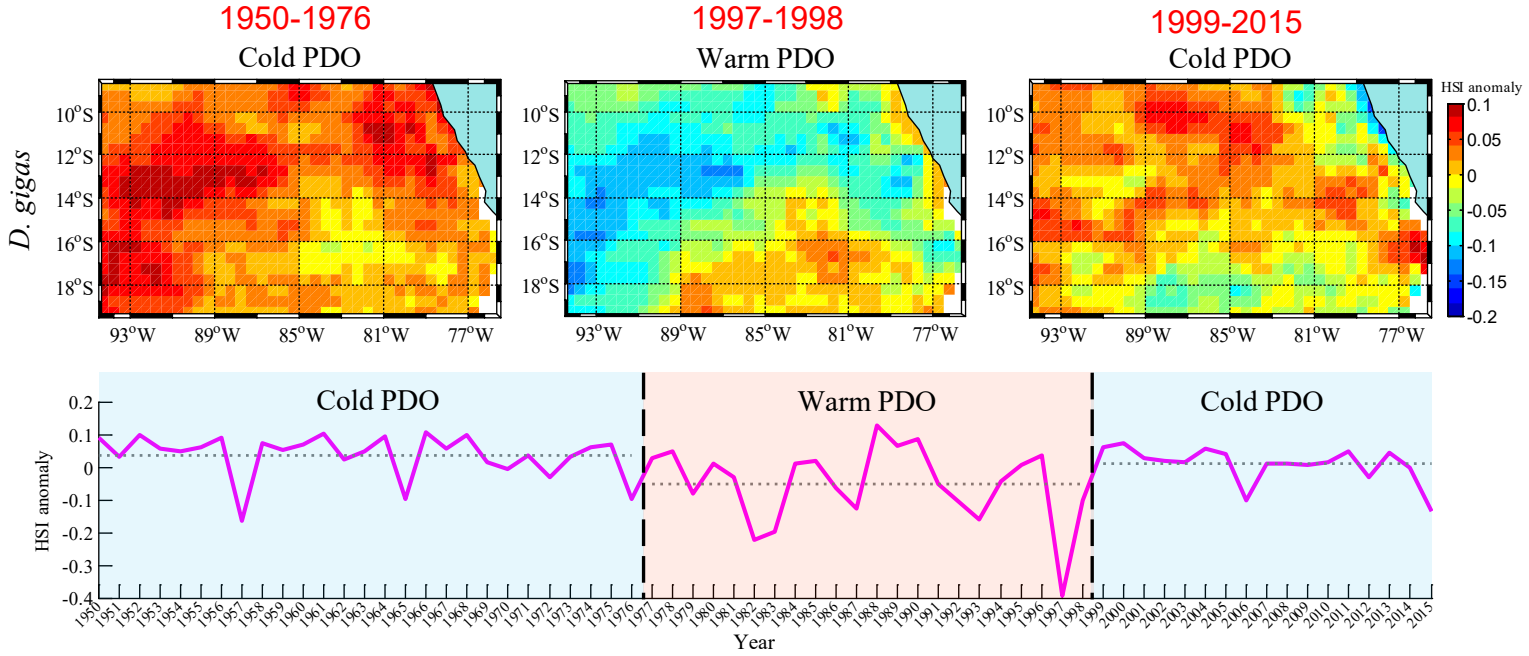

Percentage of suitable and poor habitats for *Ommastrephes bartramii* and *Dosidicus gigas*, respectively, during different cold and warm PDO phase

# Results




Spatial distribution of habitat suitability index (HSI) anomaly during the cold Pacific Decadal Oscillation (PDO) phase over 1950-1976, the warm PDO phase over 1977-1998, and the cold PDO phase over 1999-2015 and interannual-to-decadal variability in HSI anomaly from 1950 to 2015 for *Ommastrephes bartramii*.

# Results

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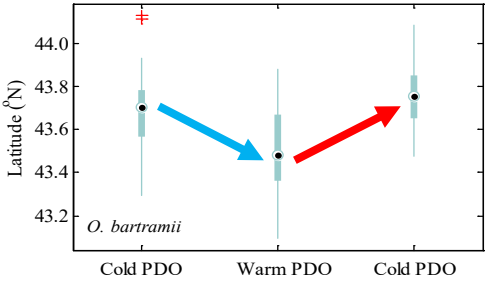
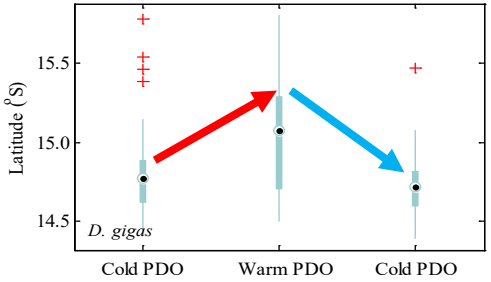
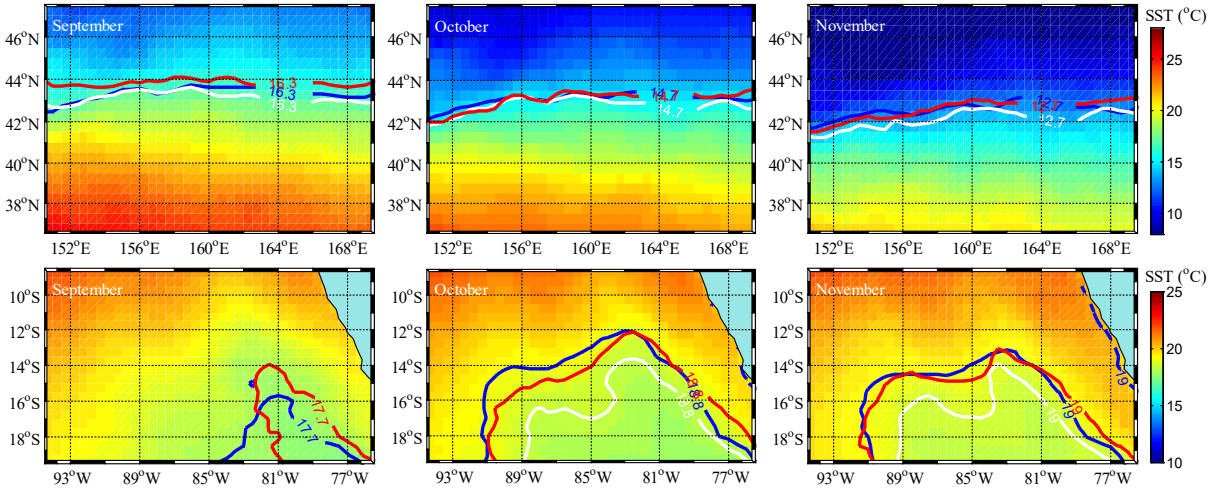
# Results




Latitudinal gravity centers of habitat suitability index (LATG_HSI) for *Ommastrephes bartramii* and *Dosidicus gigas*, respectively, during different cold and warm PDO phase

The most preferred sea surface temperature from September to November for *Ommastrephes bartramii* and *Dosidicus gigas*, respectively, during different cold and warm PDO phase



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# Conclusions

1. Significant seesaw-like patterns of environmental variability and habitat changes, consistent with the regime shift of warm and cool PDO, were observed for the two squid species.
2. In a negative (cool) PDO phase, both SST anomaly and SSHA increased on the fishing ground of O. bartramii, however, the suitable SST and SSHA decreased, as a result, the areas of suitable habitat of O. bartramii remarkably contracted. Conversely, on the fishing ground of D. gigas, the situation was opposite.
3. Moreover, due to the most favorable SST for O. bartramii and D. gigas moved northward in the cool PDO regime, the suitable habitat for both squid species shifted into the northern regions. Correspondingly, when the climate changed into a positive (warm) PDO, the situation was opposite as that in the cold PDO phase.
4. The PDO played critical roles in “synchrony” of the habitat distribution patterns of neon flying squid in the Northwest Pacific Ocean and jumbo flying squid in the Southeast Pacific Ocean.

# *Thanks for your attention*