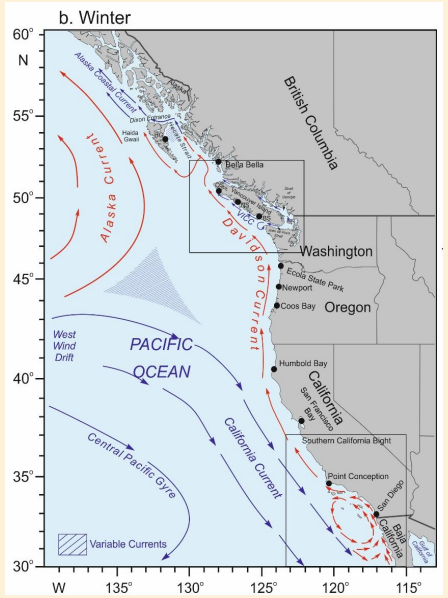
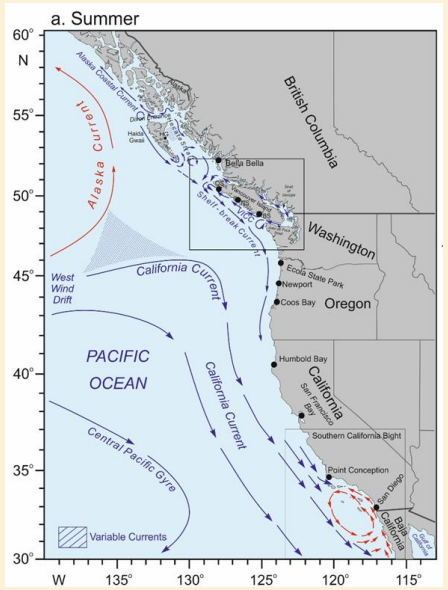


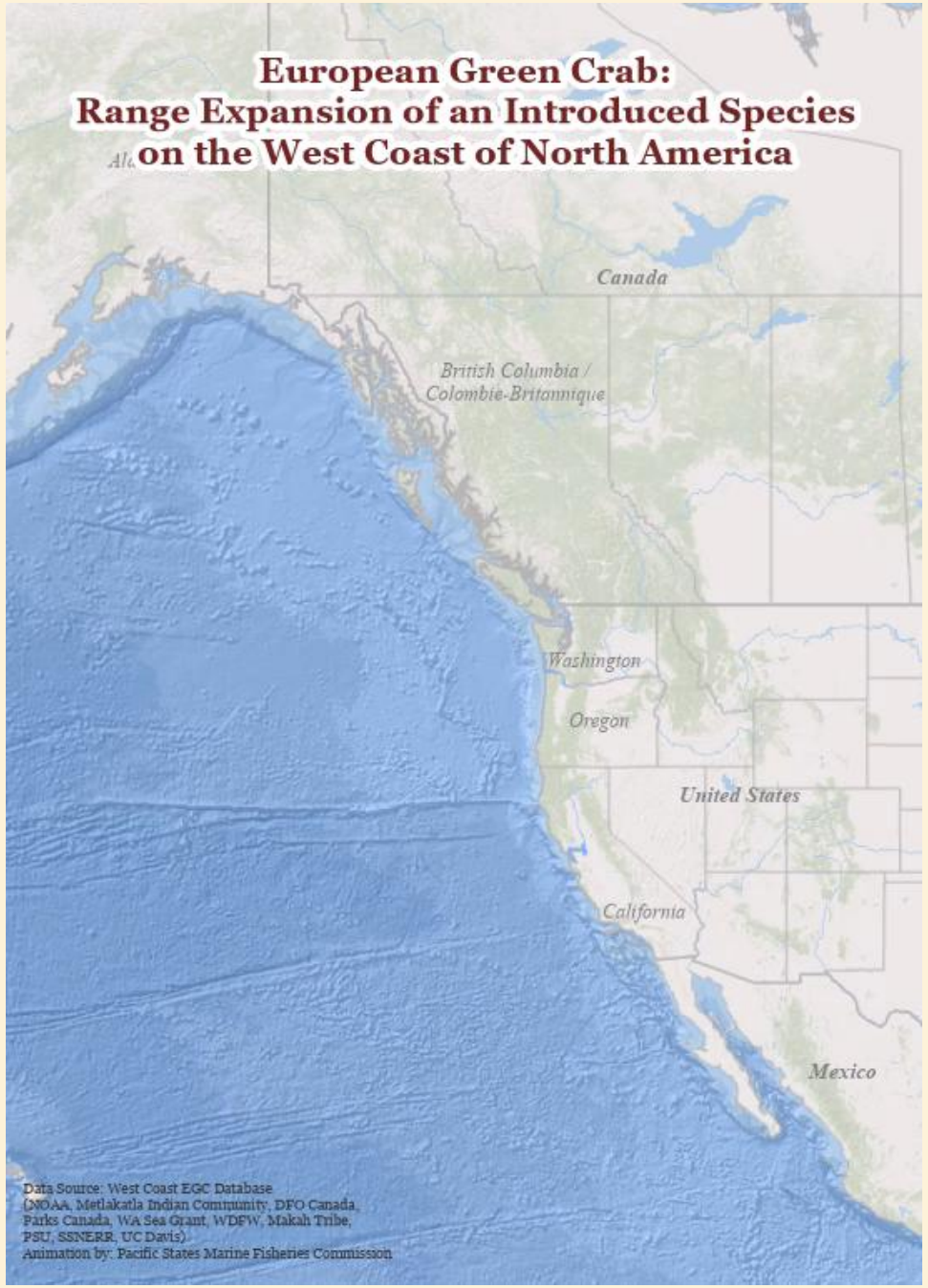


Multiple larval sources for Oregon and Coastal Washington Green Crab populations

Sylvia Yamada Oregon State University

Carolyn Tepolt Wood Hole Oceanographic Institute

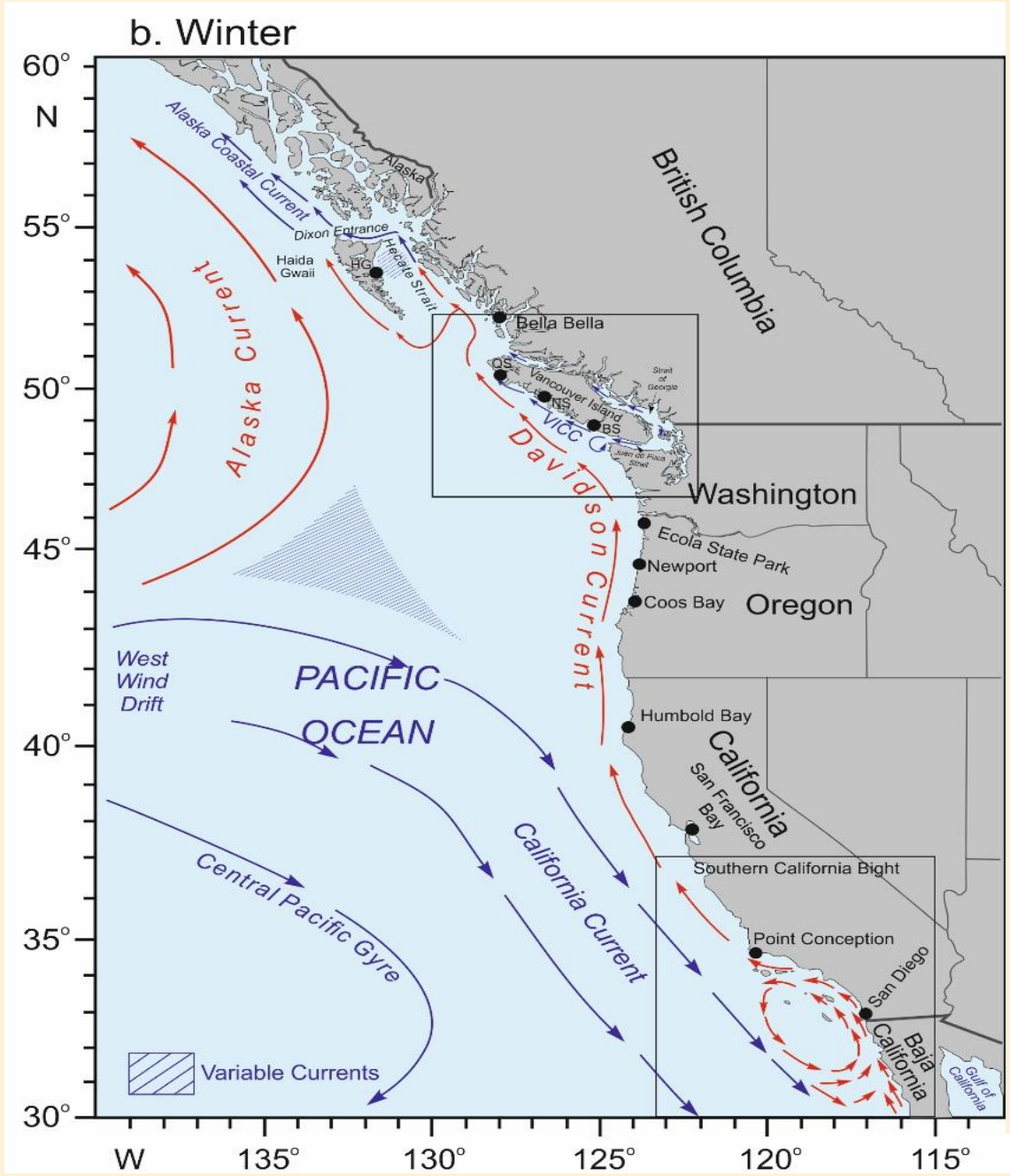
Alan Shanks Oregon Institute of Marine Biology



slide courtesy of
Kate Sherman

Rapid Range Expansion
after

El Niño events
1997-1998
2015-2016

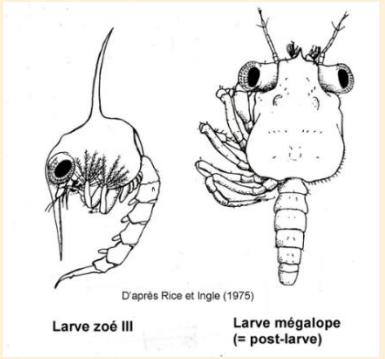


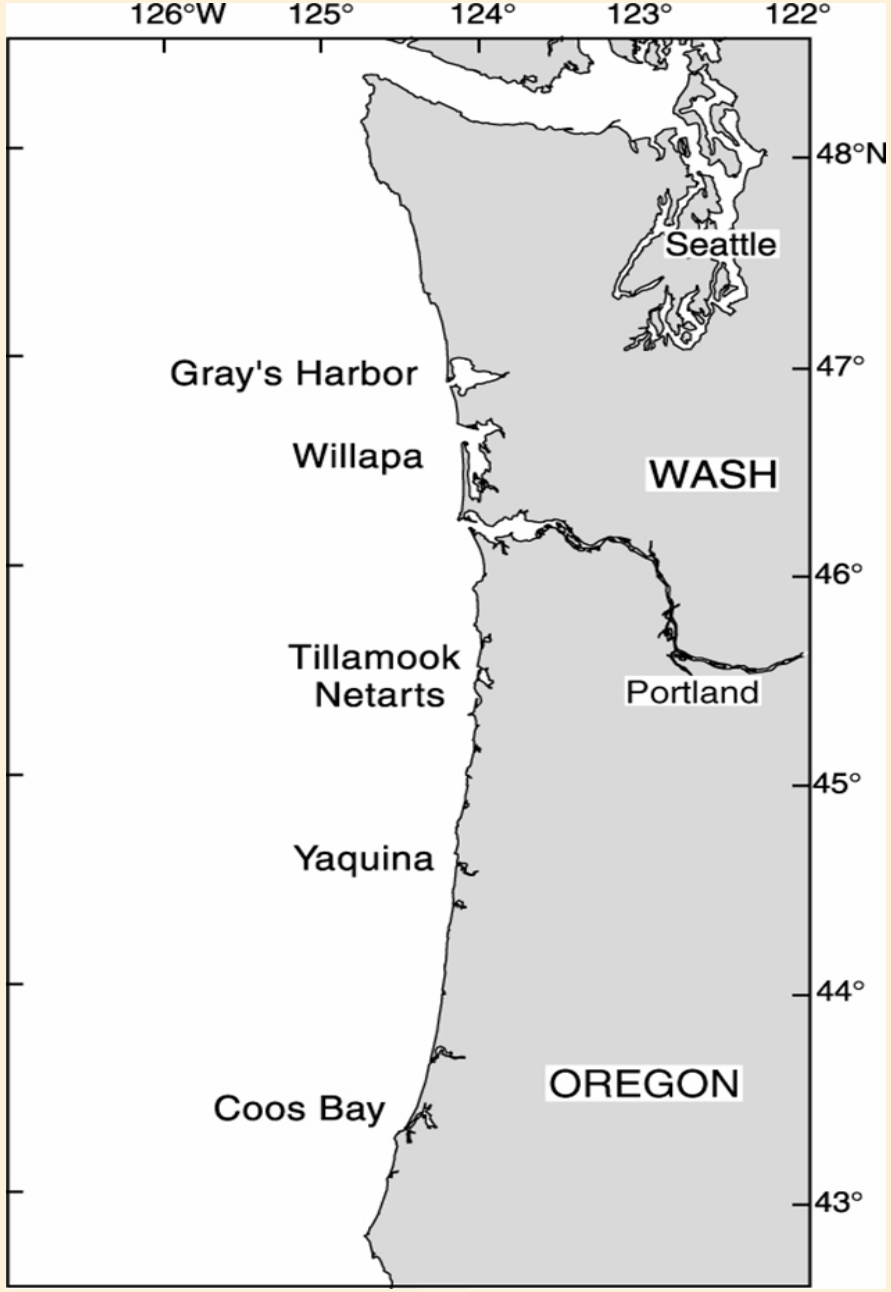
Davidson Current

acts like a giant

conveyor belt

transporting larvae north
from established populations in the south





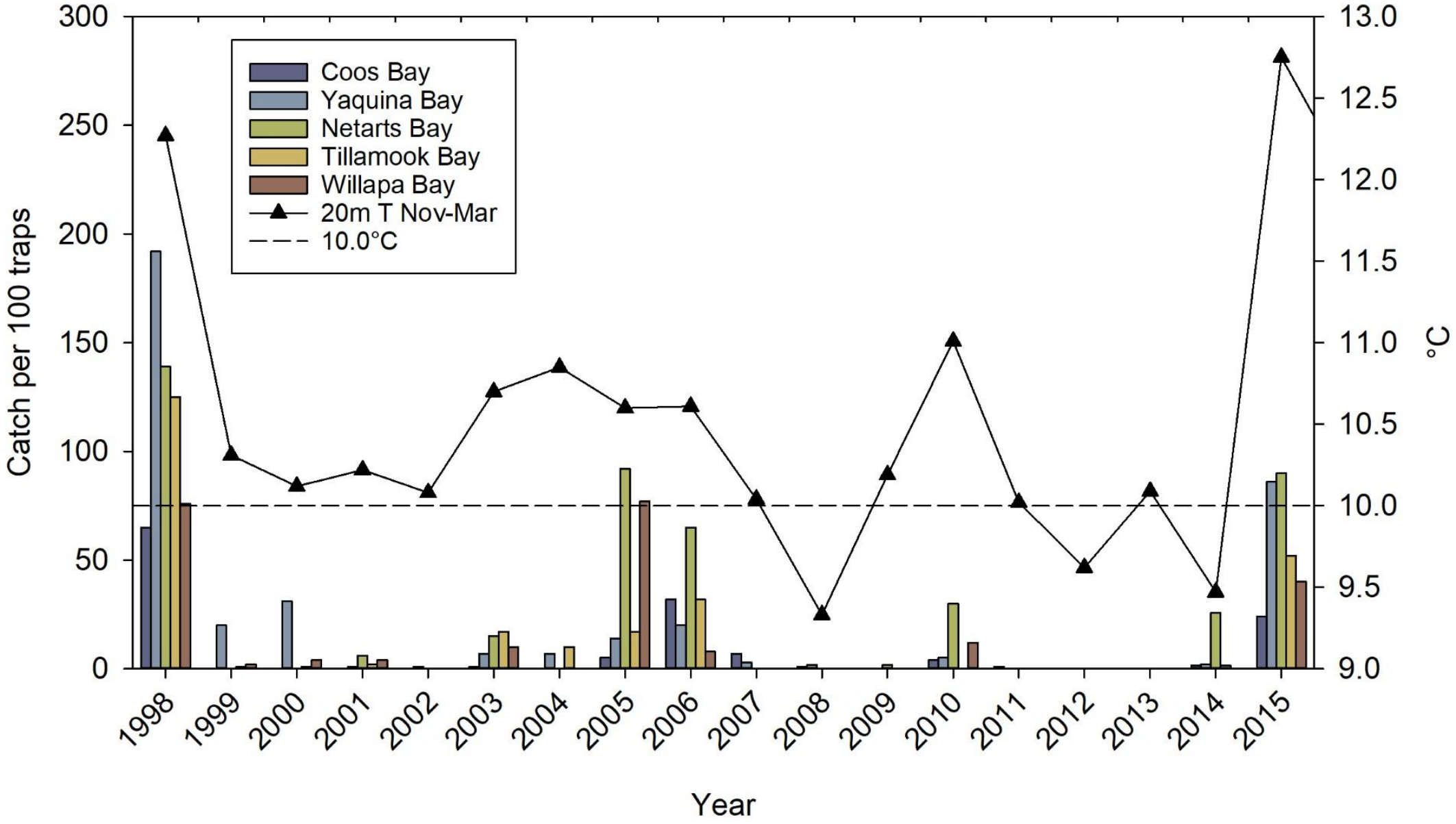
Study Sites

1998

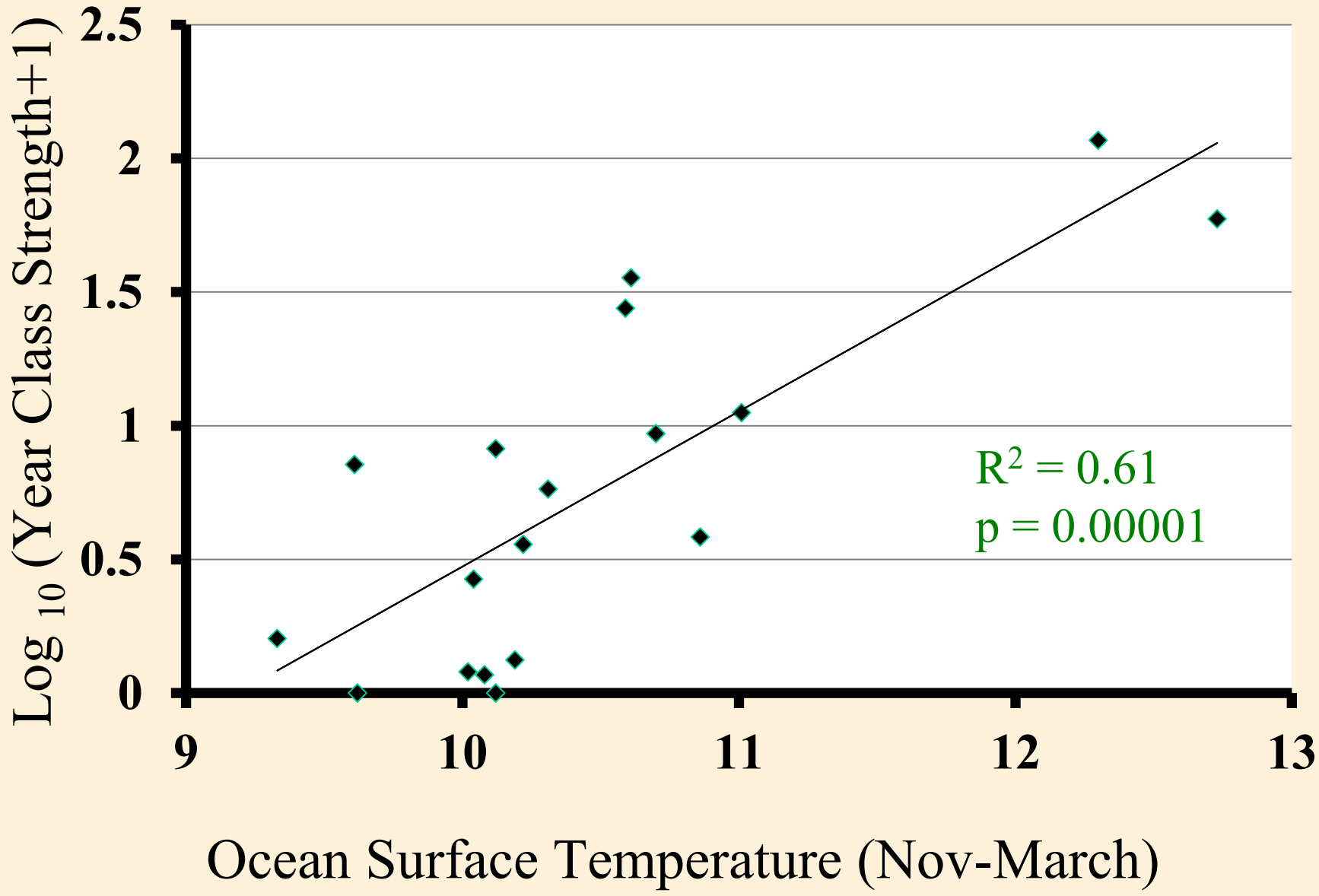
coast-wide colonization



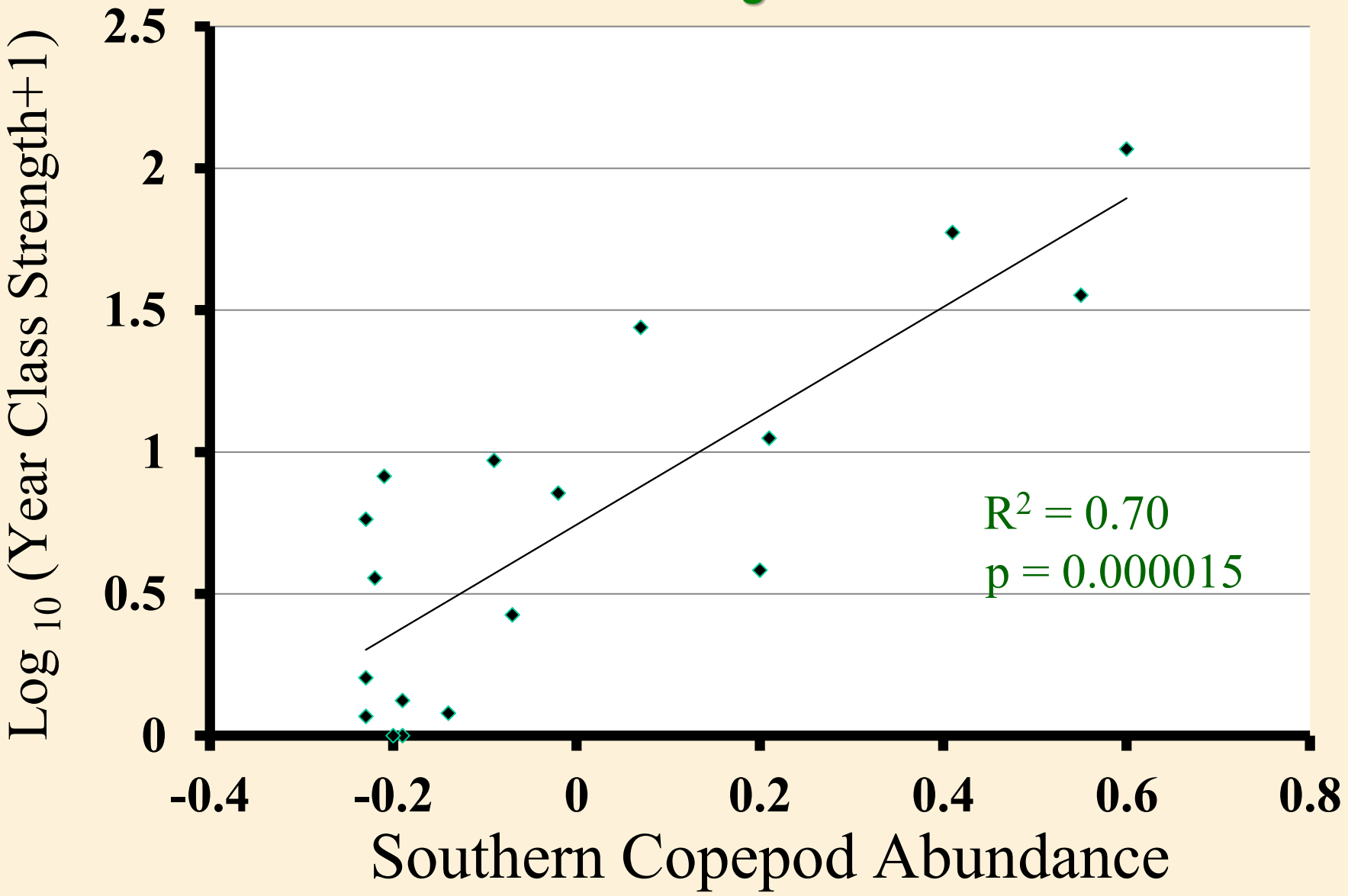
Recruitment of Young-of-the-Year C. maenas 1998-2015



Warm winters → Strong Year Class 1998-2015



Southern water mass → Strong Year Class 1998-2015

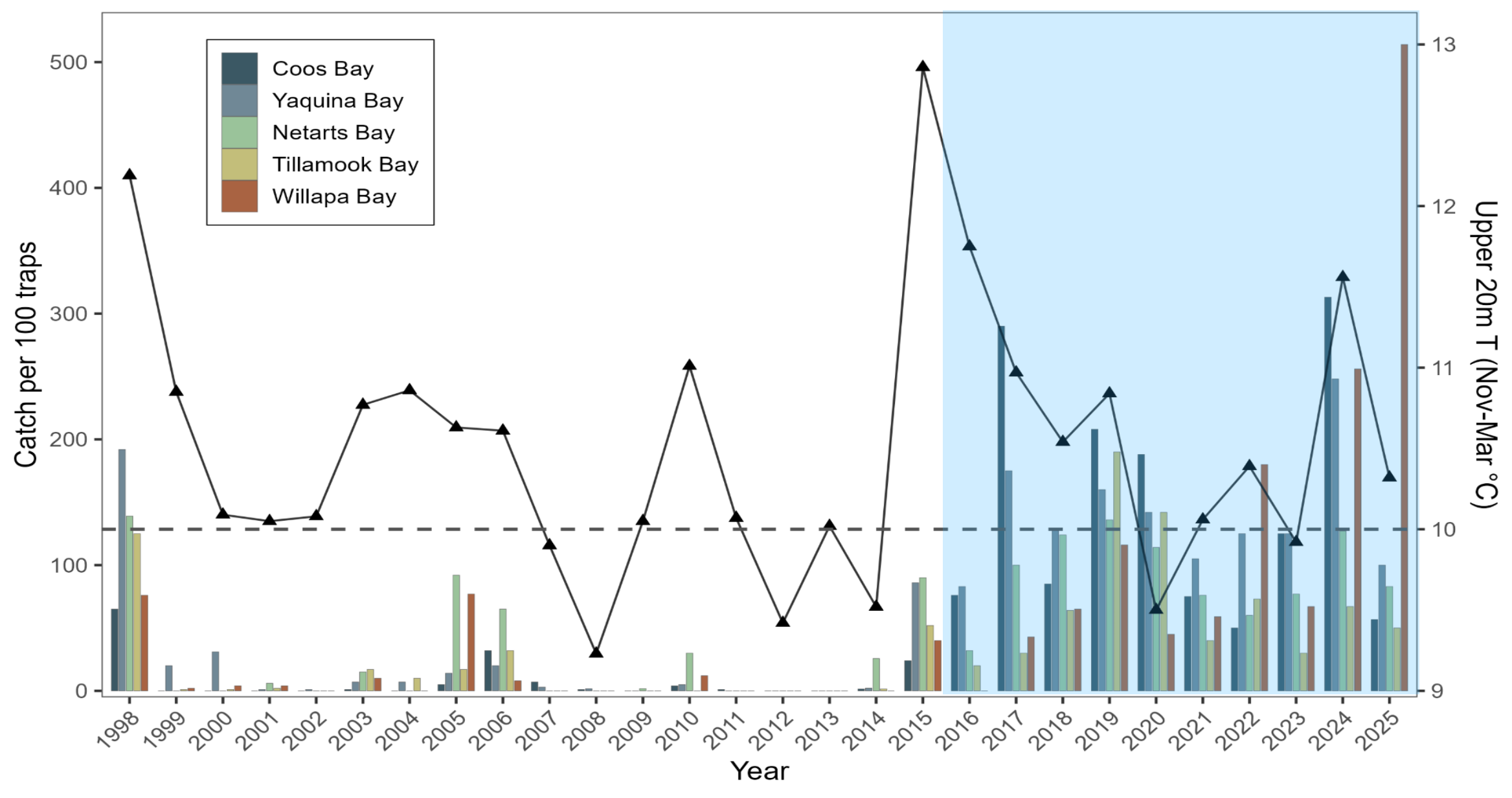


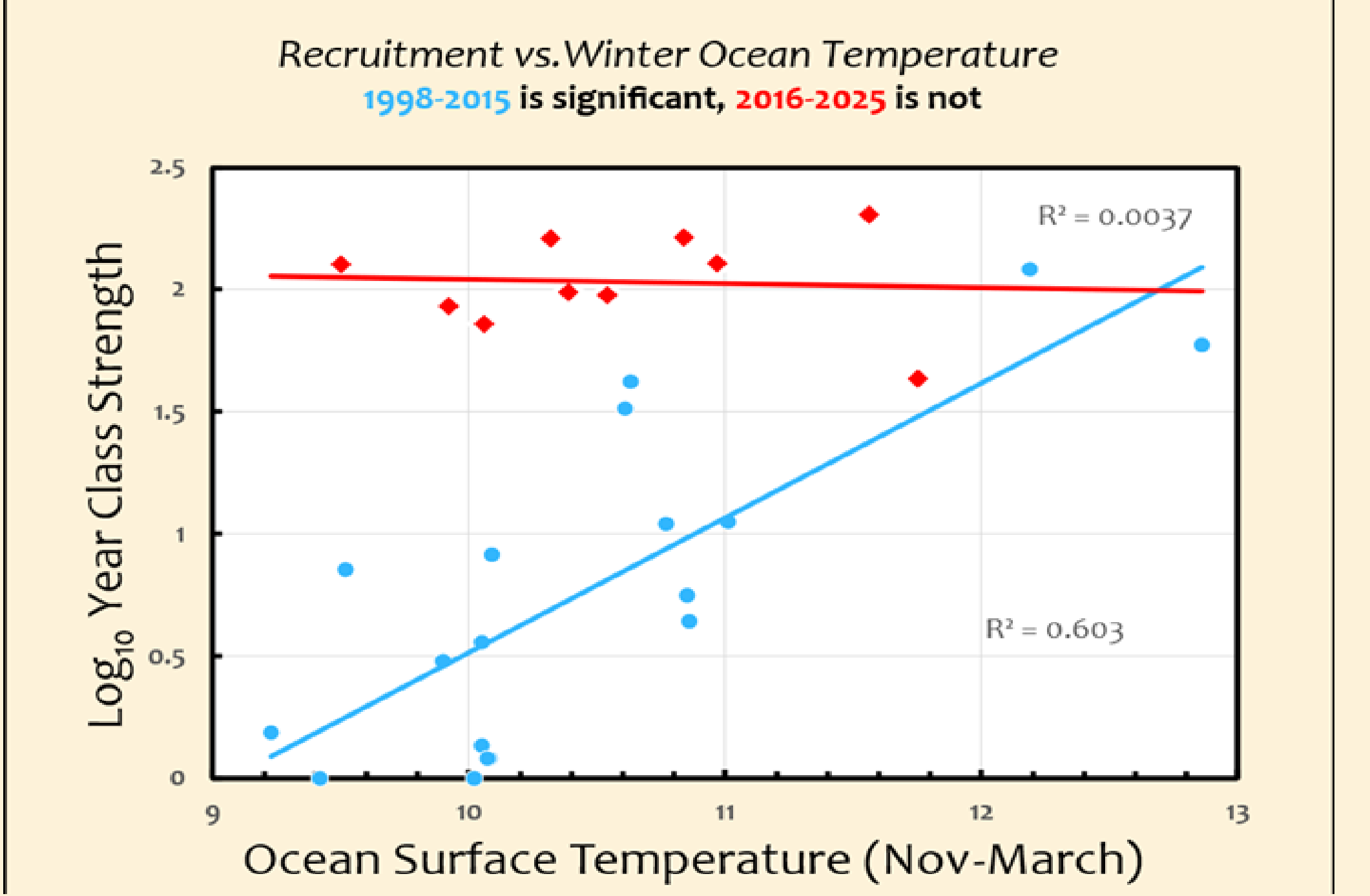
What is the source of the larvae for these 5 estuaries?

Hypothesis 1

- Larvae arrive from California during the winter in the Davidson Current.
- More larvae are transported to Oregon and Washington when the Davidson Current is unusually
    - warm
    - strong and
    - of long duration such as during El Niños.

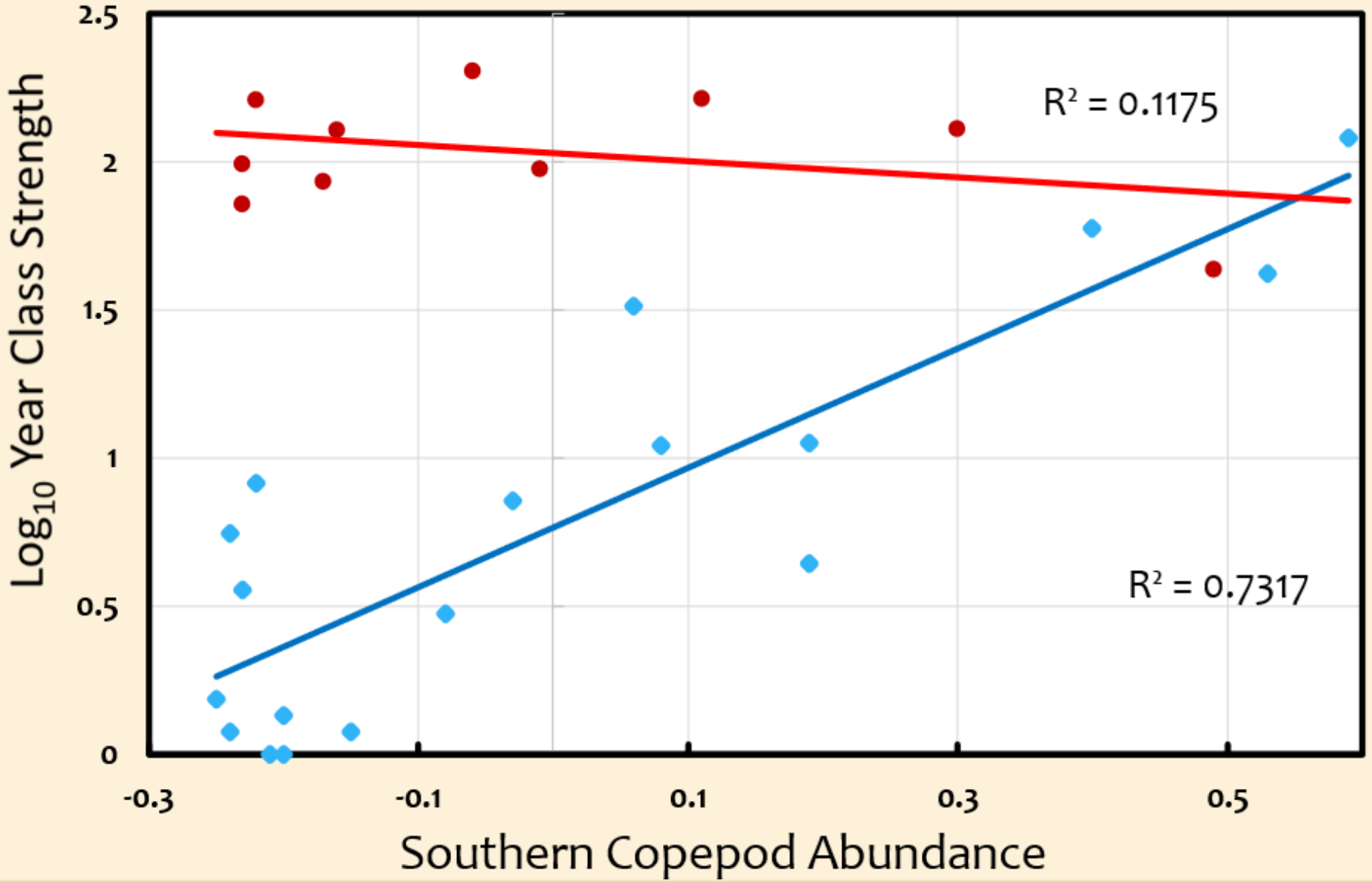
Recruitment of Young-Of-The Year *C. maenas*

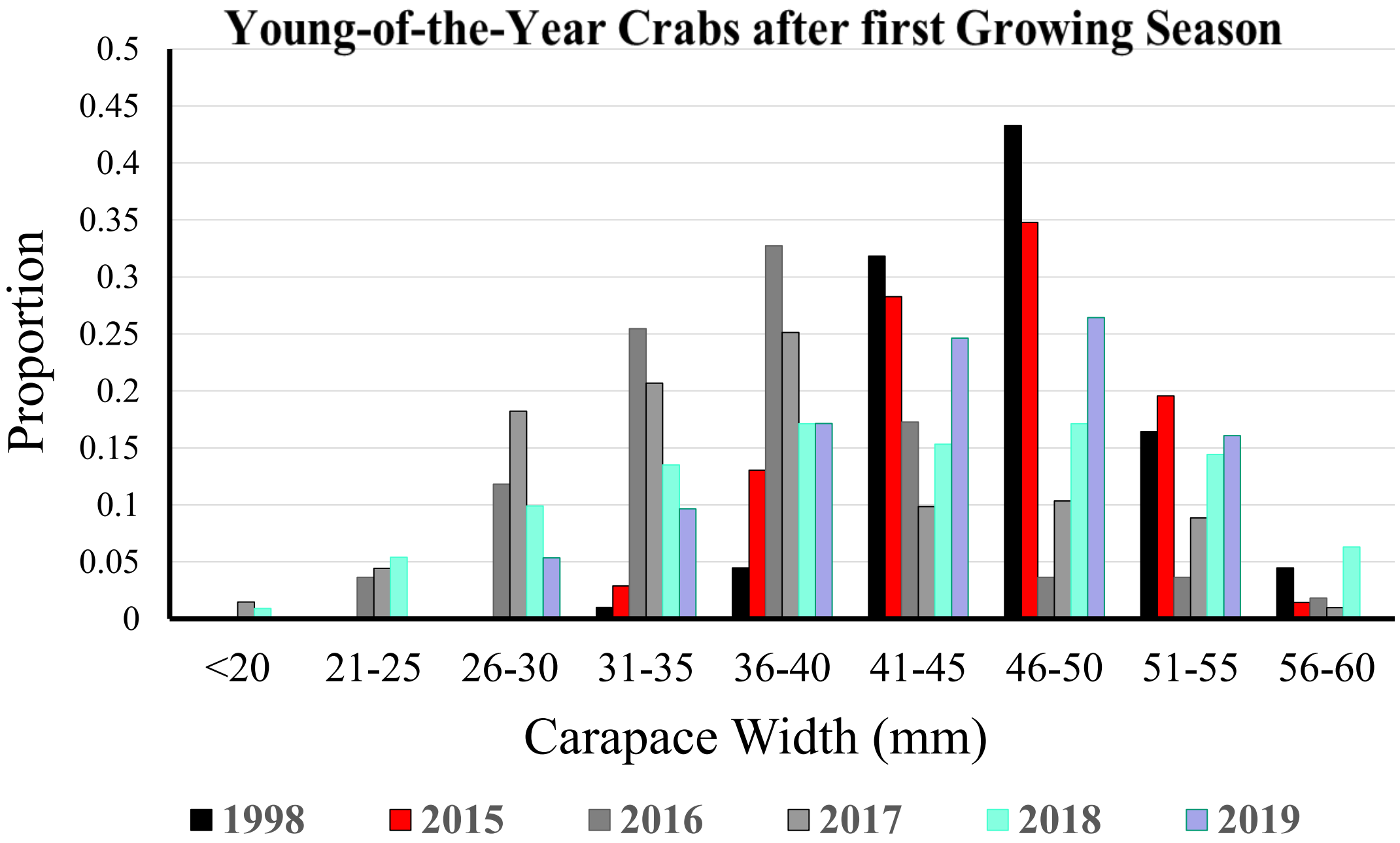



Recruitment vs. Winter Ocean Temperature
1998-2015 is significant, 2016-2025 is not
R² = 0.0037
R² = 0.603
Log10 Year Class Strength
2.5
2
1.5
1
0.5
0
9
10
11
12
13
Ocean Surface Temperature (Nov-March)

Recruitment vs. Southern Copepod Abundance

1998-2015 is significant 2016-2025 is not




Young-of-the-Year Crabs after first Growing Season
Proportion
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
<20
21-25
26-30
31-35
36-40
41-45
46-50
51-55
56-60
Carapace Width (mm)
1998
2015
2016
2017
2018
2019

What is the source of the larvae?

Hypothesis 1 -Larvae arrive in Davidson Current

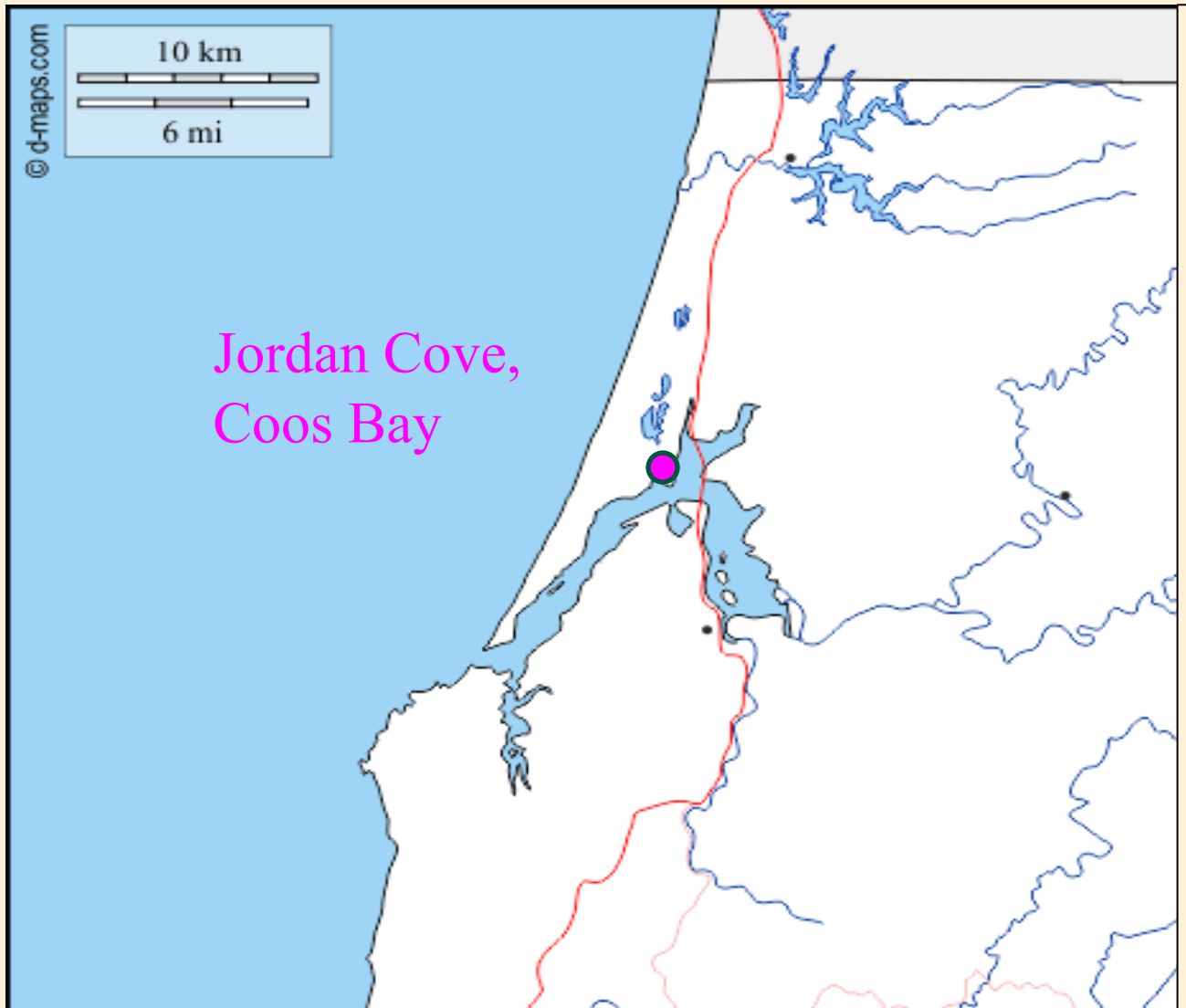
Hypothesis 2 -Additional Larval sources

- *Local Reproduction*
- *Transport of larvae from the North*

Local Reproduction in 2010

winter water temp > 10°C

Alan Shanks Oregon Institute of Marine Biology



First instar zoea

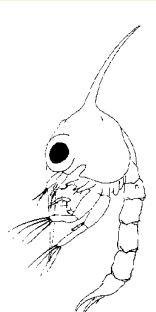
January



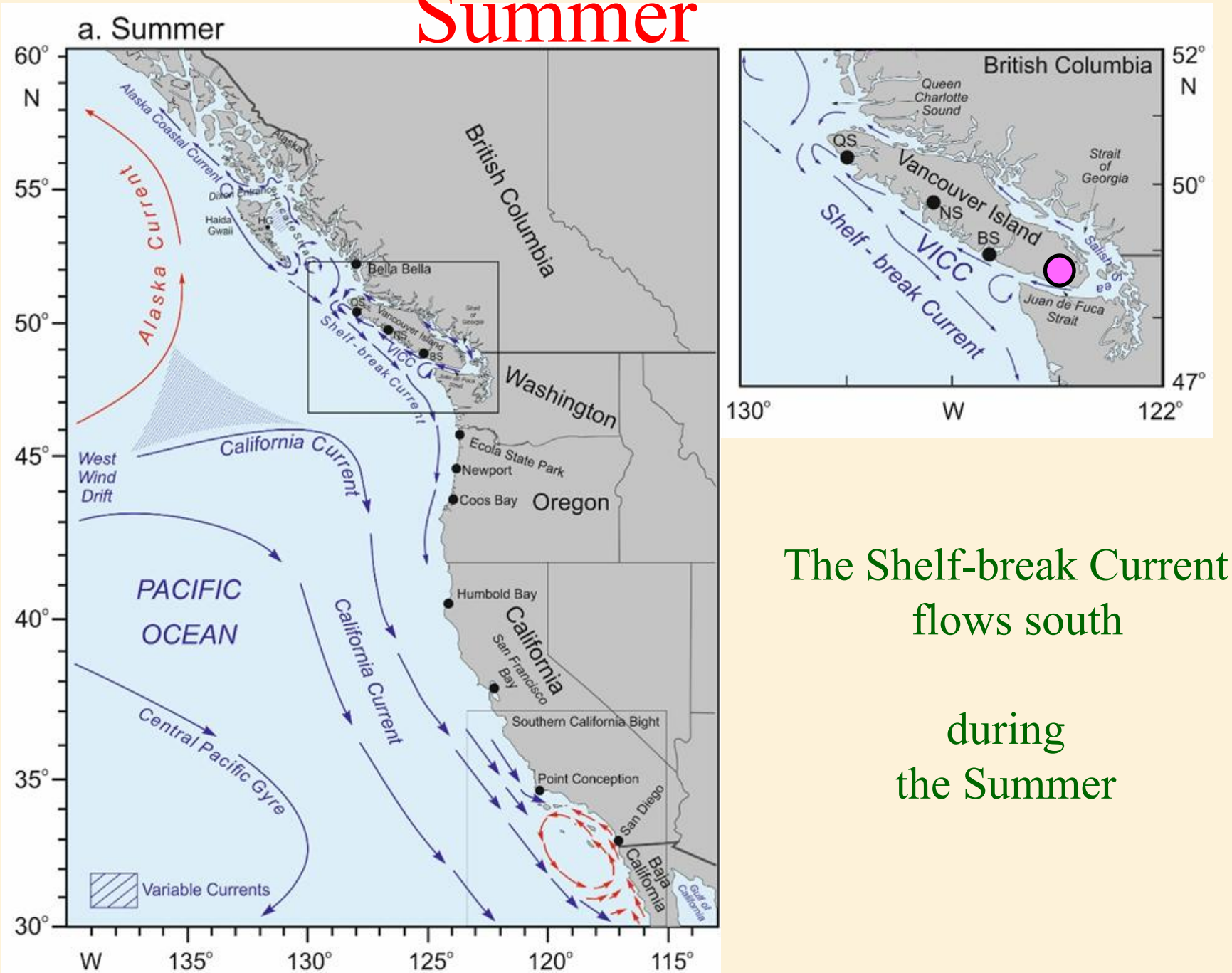
February



March



Summer



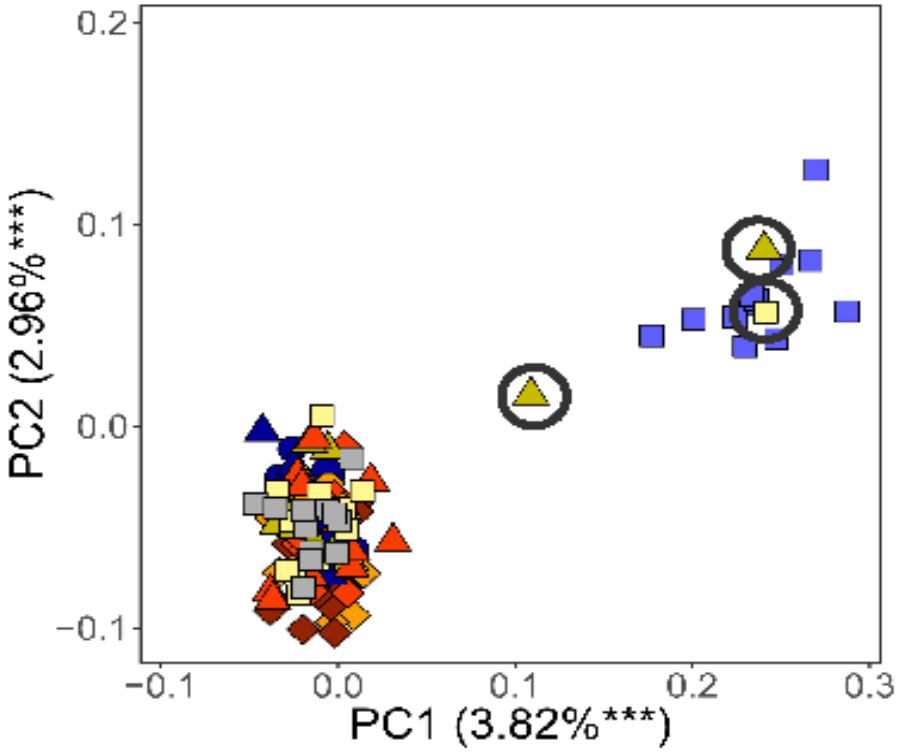
The Shelf-break Current
flows south

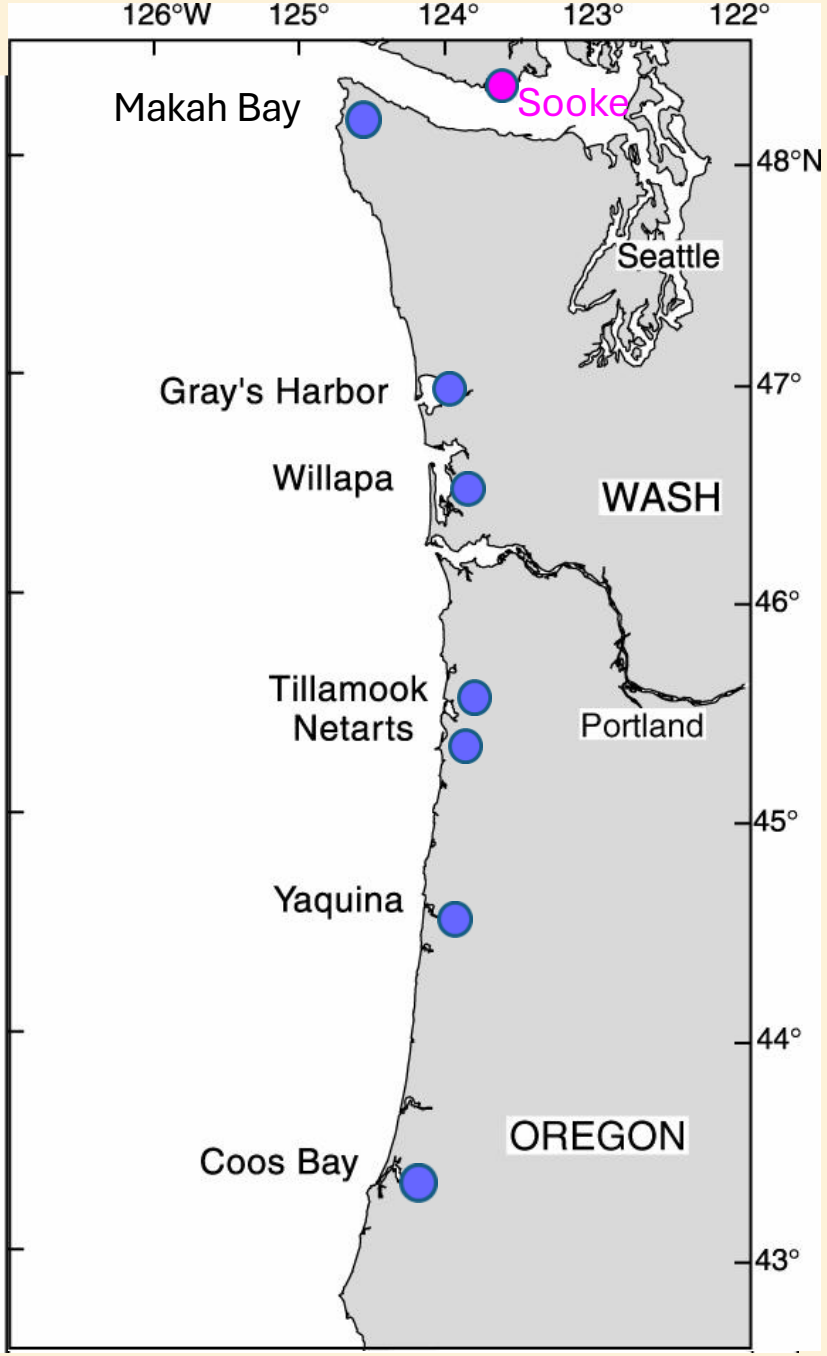
during
the Summer

Larvae from the north



Sooke larvae swept down coast as far as Oregon





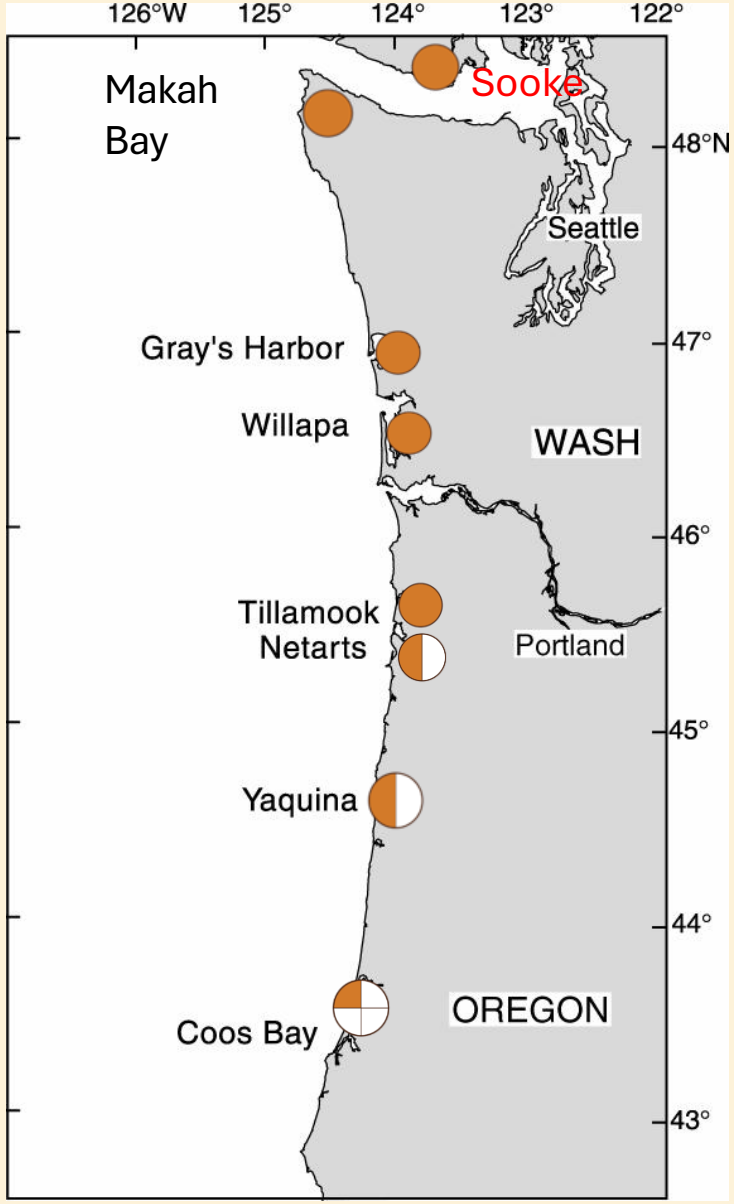
Multiple Larval Sources

North *- from British Columbia*
Carolyn Tepolt, WHOI

Local *- "self-seeding" Oregon*
Alan Shanks, OIMB

South *- from California*

Sylvia.Yamada@oregonstate.edu



Acknowledgements

Jennifer Fisher NOAA
Mike Kosro COAS, OSU
Cameron Royer IB, OSU
Shon Schooler SSNERR

Andrea Randall
Emily Grason, P. Sean McDonald U of W
Chelsey Buffington, Alan Pleus WDFW
Adrianne Akmajian Makah Tribe

Richard Thomson, Graham Gillespie, Tammy Norgard

Fisheries and Oceans Canada

Thank you

Questions?

yamadas@oregonstate.edu