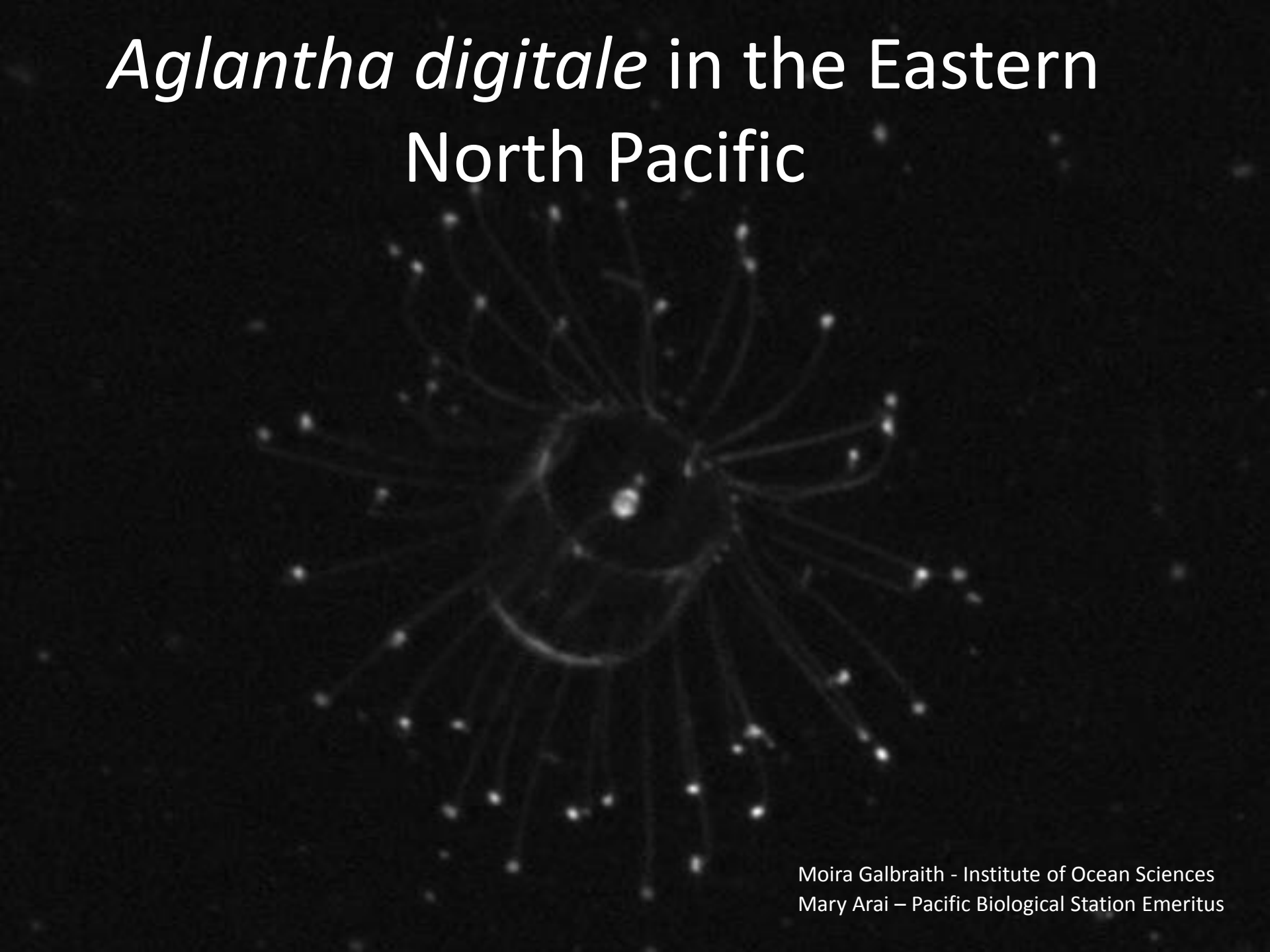
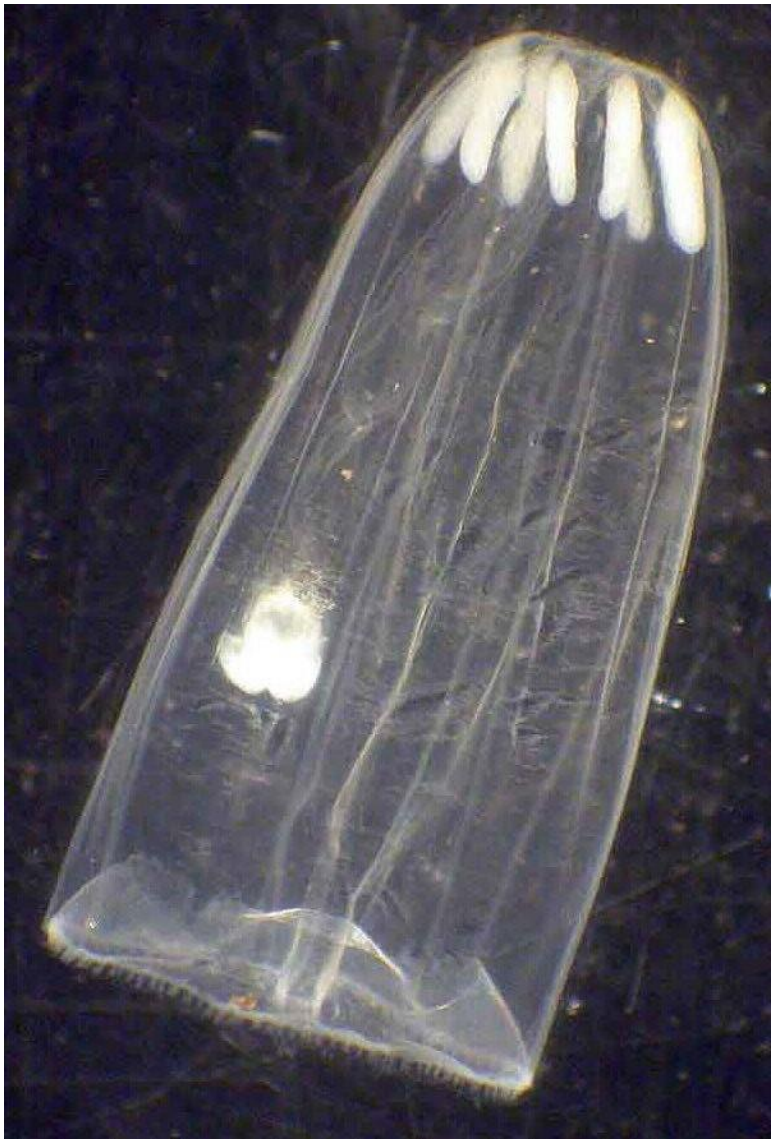
Aglantha digitale in the Eastern North Pacific



Moira Galbraith - Institute of Ocean Sciences
Mary Arai – Pacific Biological Station Emeritus



Aglantha digitale:

- one of the most common hydromedusae in north Pacific waters,
- widely distributed from 40° northwards into Arctic waters,
- making up to 80% of hydromedusae abundance off our west coast of Canada
- usually in the upper 250m
- diel migrator, feeding at night at the surface and moving down in the water column during the day to around 100m

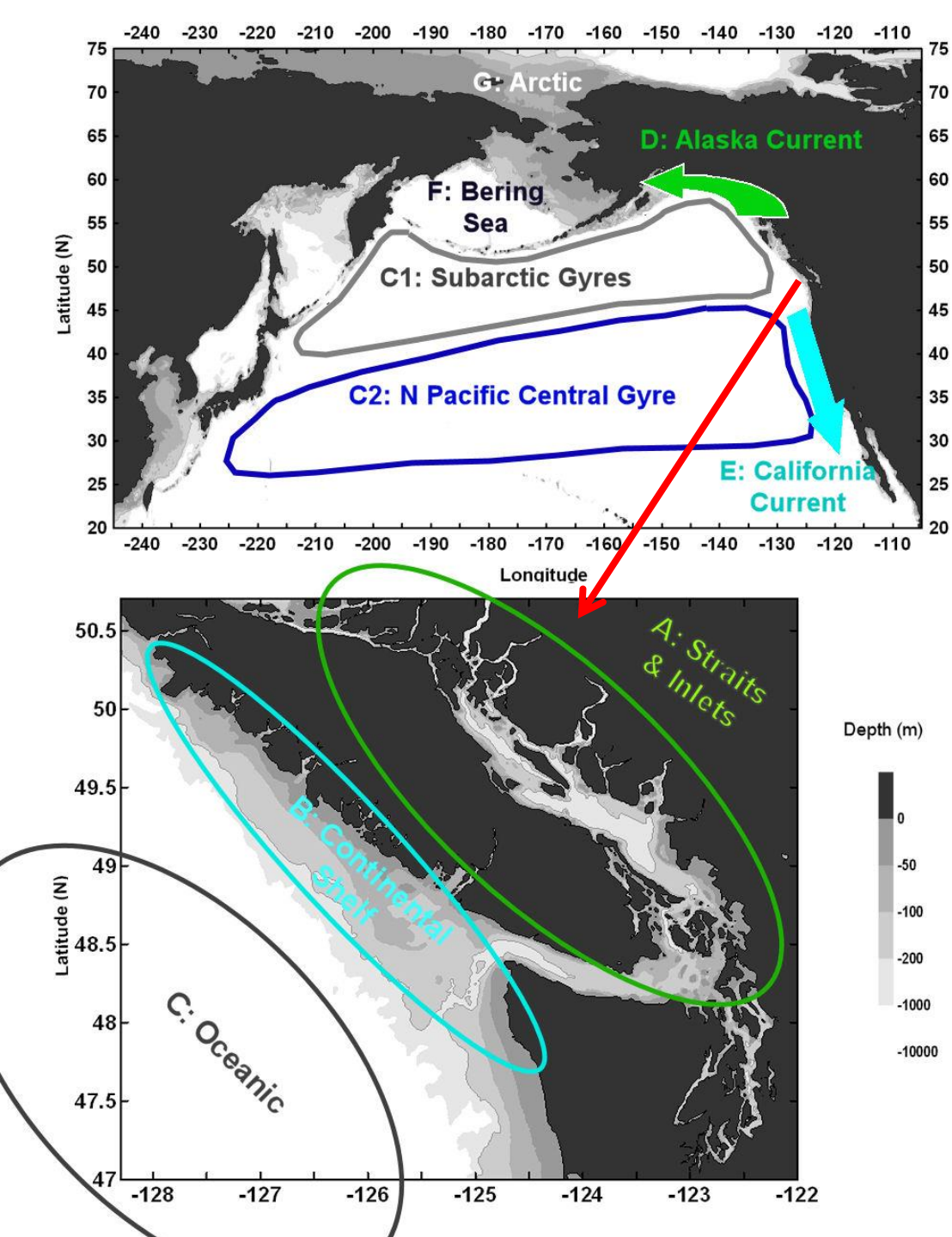
Developmental stages

- Juvenile, no gonad buds
- approximately 4mm length wise
- tentacles unfurled
- size category, s1

- immature, gonads just developing
- approximately 8mm lengthwise
- tentacles retracted
- size category, s2

- mature, gonads long, digitiform
- approximately 12mm
- tentacles retracted
- size category, s3

Special thanks to Russ Hopcroft for the use of his photos: Arctic Ocean Diversity; http://www.arcodiv.org/index.html



North Pacific:

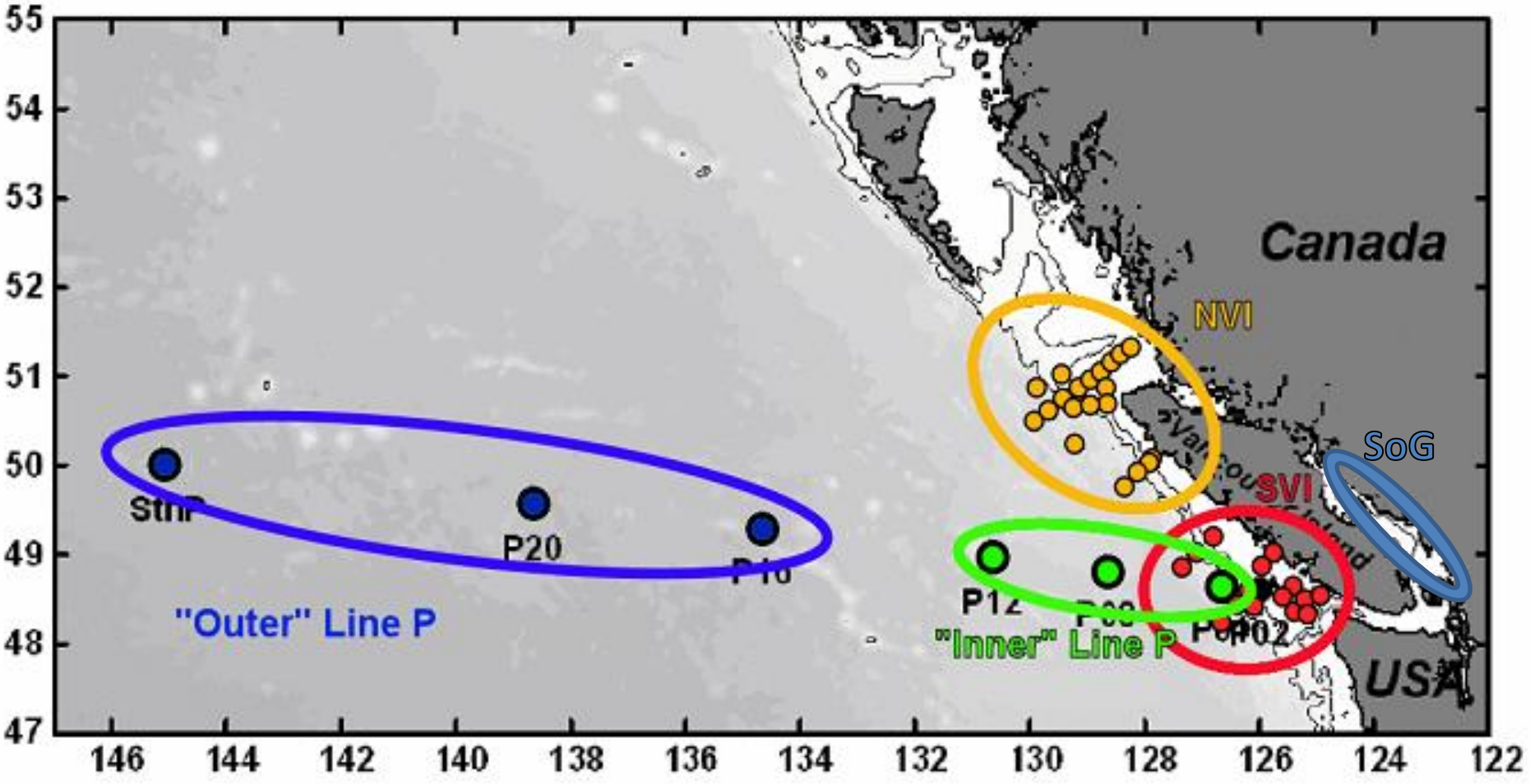
- two distinct gyres
- transitional zone
- strong coastal currents

Areas of Study:

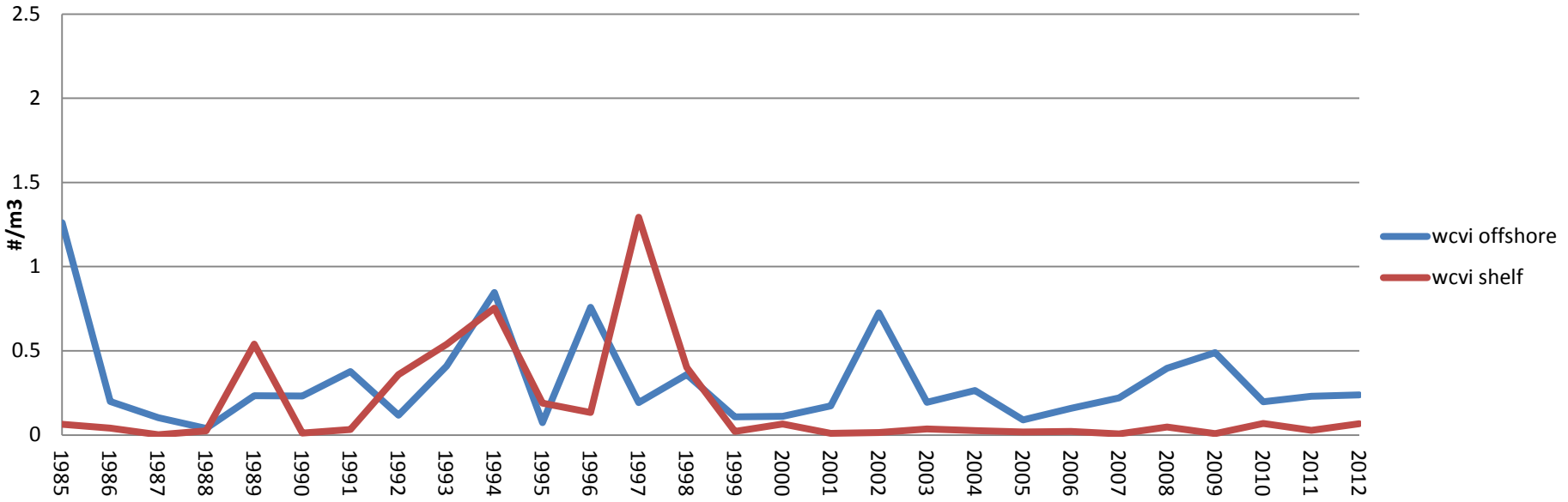
WCVI: west coast of Vancouver Island; shelf and offshore

SoG: inland waters Strait of Georgia

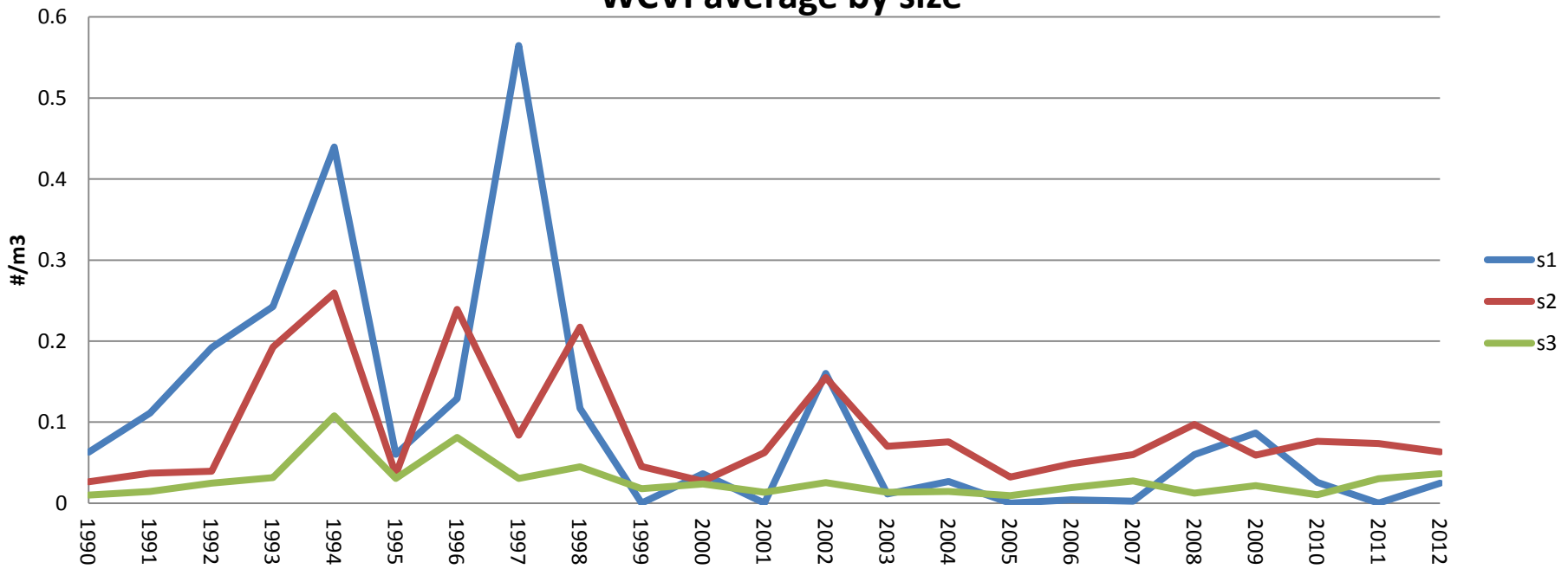
Line P: open ocean


55
54
53
52
51
50
49
48
47
146
144
142
140
138
136
134
132
130
128
126
124
122
Canada
USA
NVI
SVI
SoG
P20
P16
P12
P04
P02
"Outer" Line P
"Inner" Line P

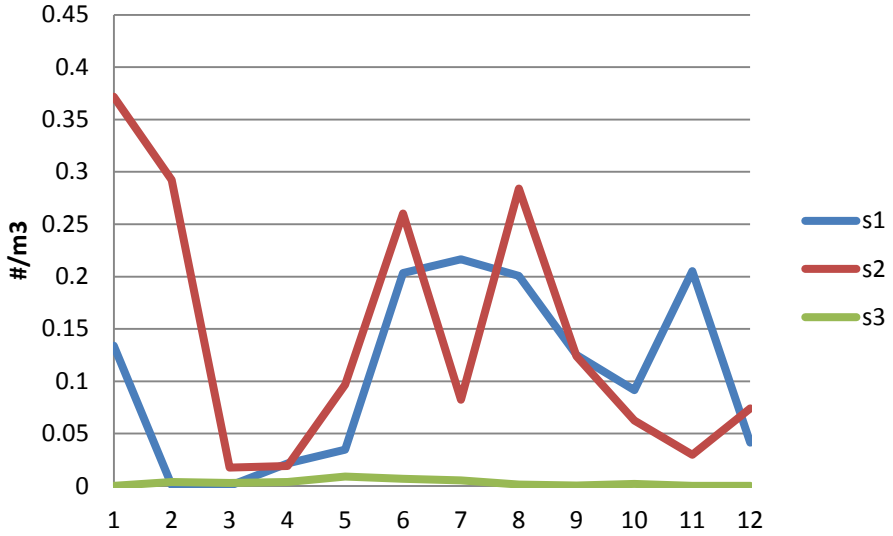
Agldi WCVI average



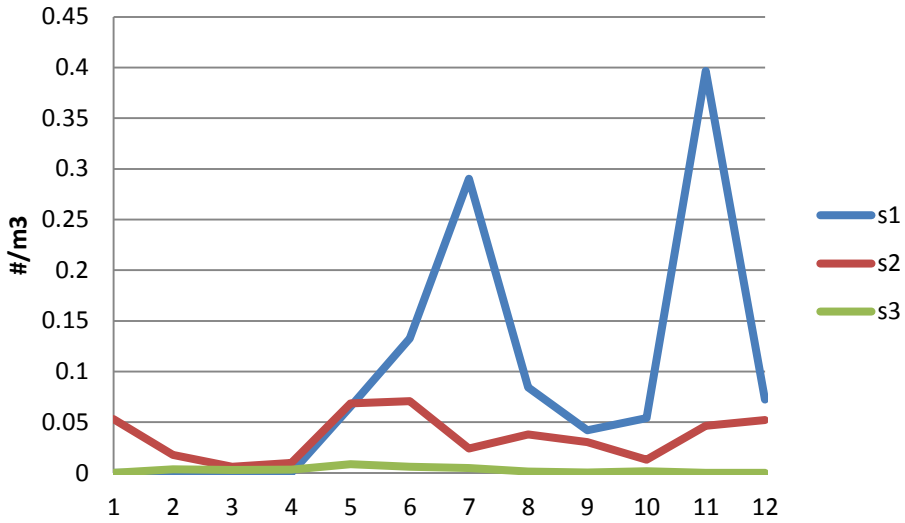
WCVI average by size



WCVI 1985-2012 average



WCVI shelf 1985-2012



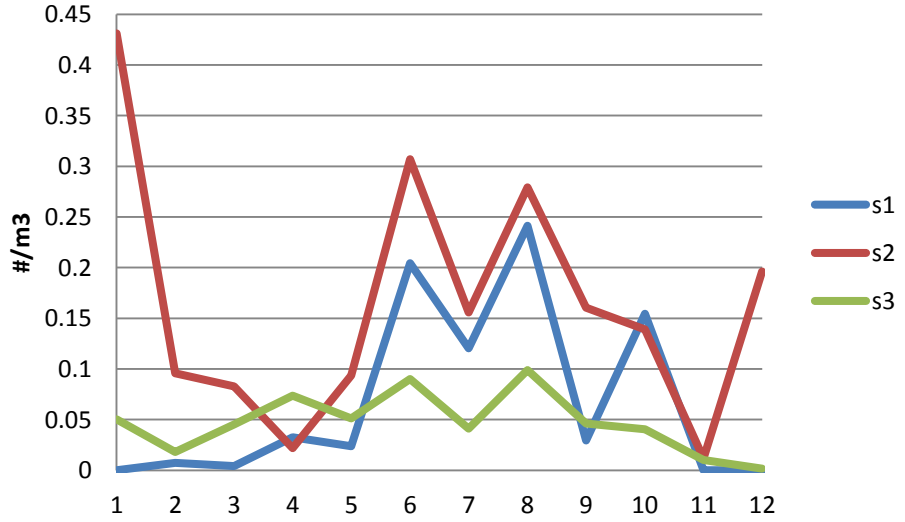
- Size graph:

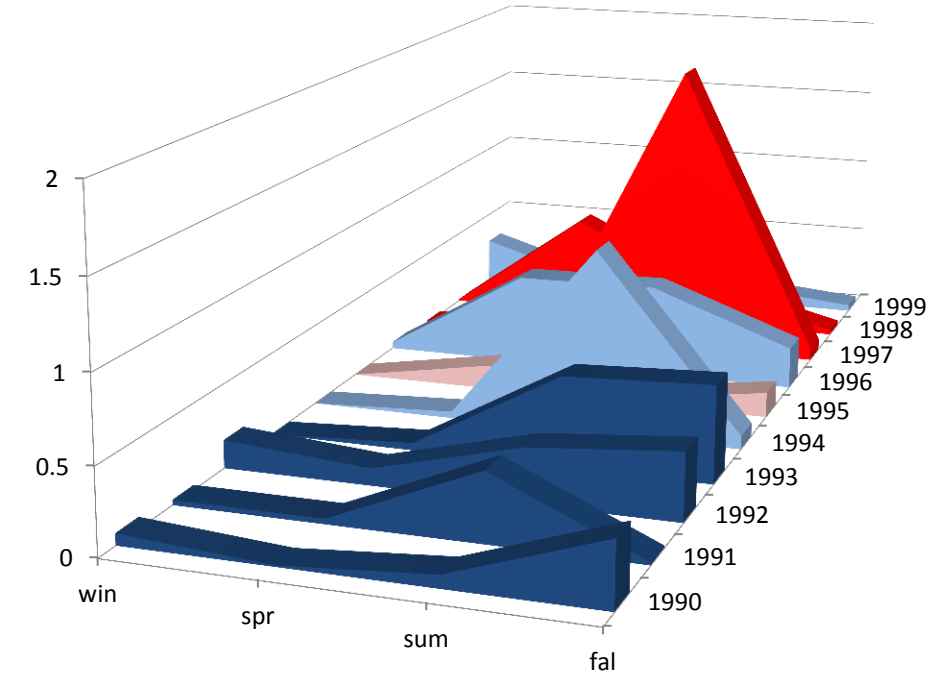
s1 < 5mm - juvenile

s2 <10mm>5mm - immature

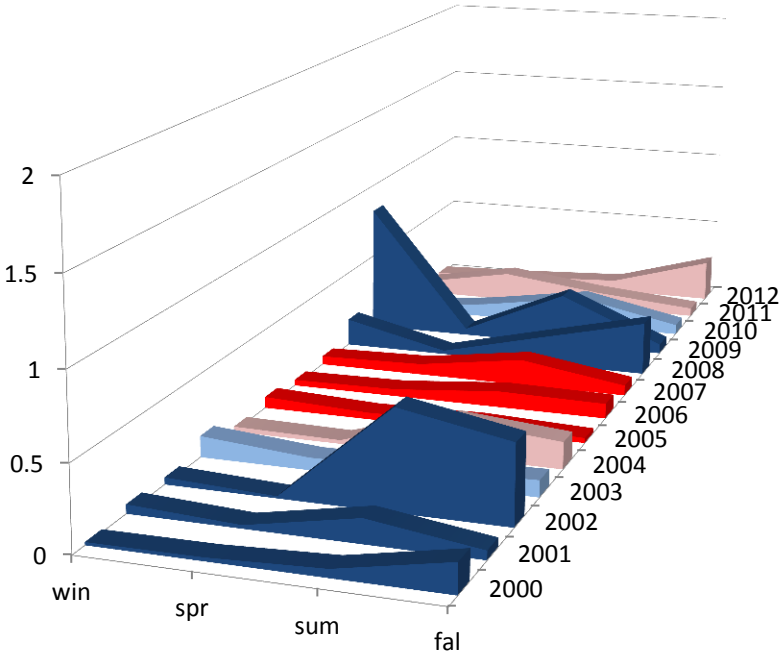
s3 >10mm - mature

WCVI offshore 1985-2012





Yearly averages for West Coast of Vancouver Island: shelf and offshore

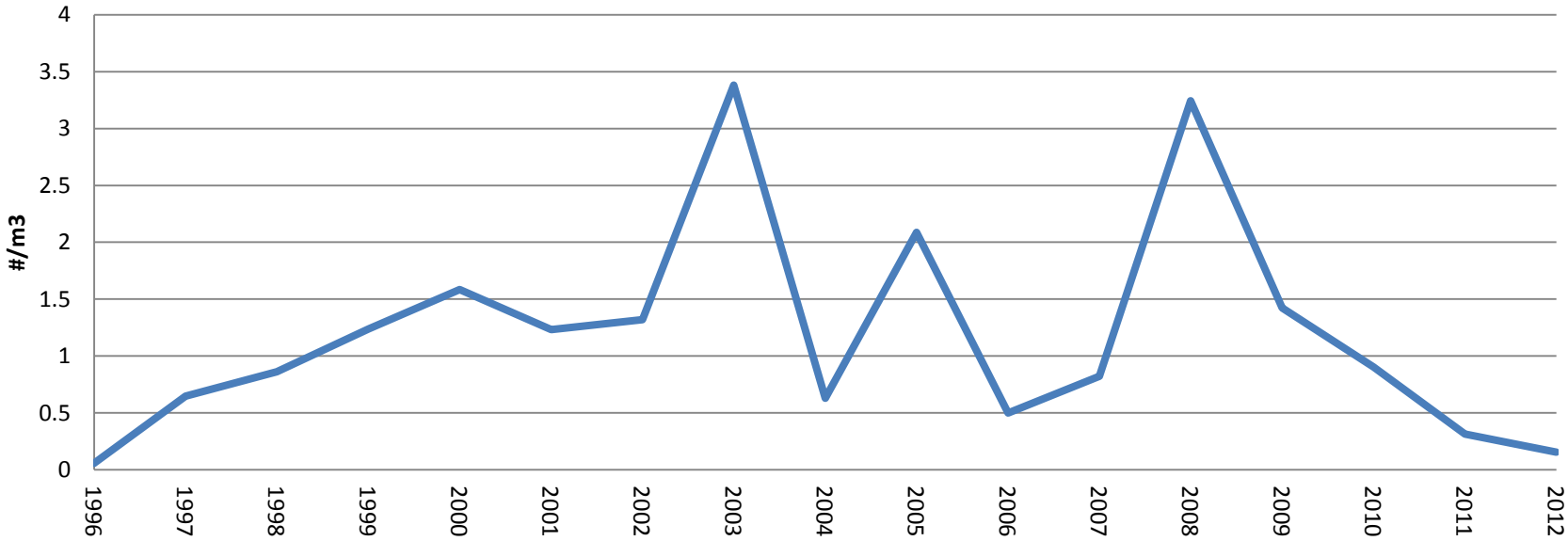


Data averaged into three month bins

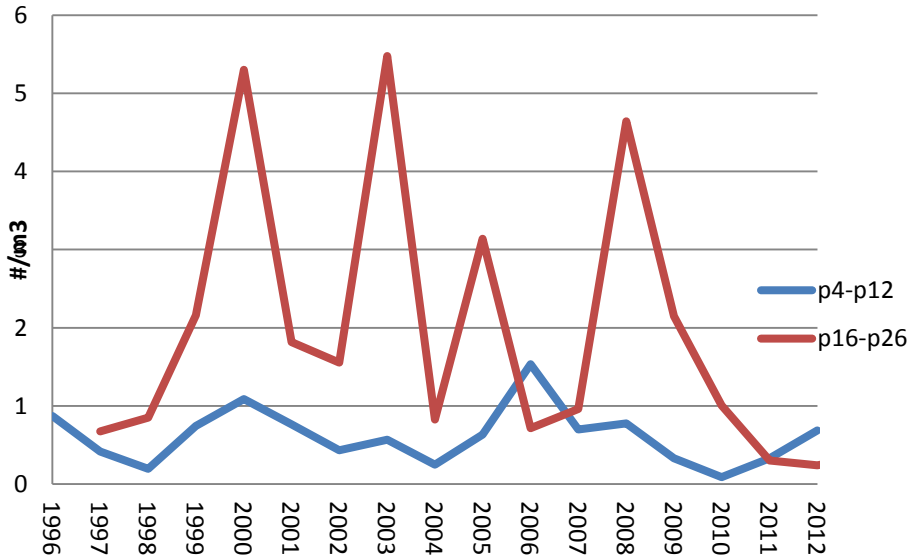
- Winter: Dec, Jan, Feb
- Spring: Mar, Apr, May
- Summer: Jun, Jul, Aug
- Fall: Sep, Oct, Nov

Red for warm years
Blue for cold years
Pale red and blue for transition years

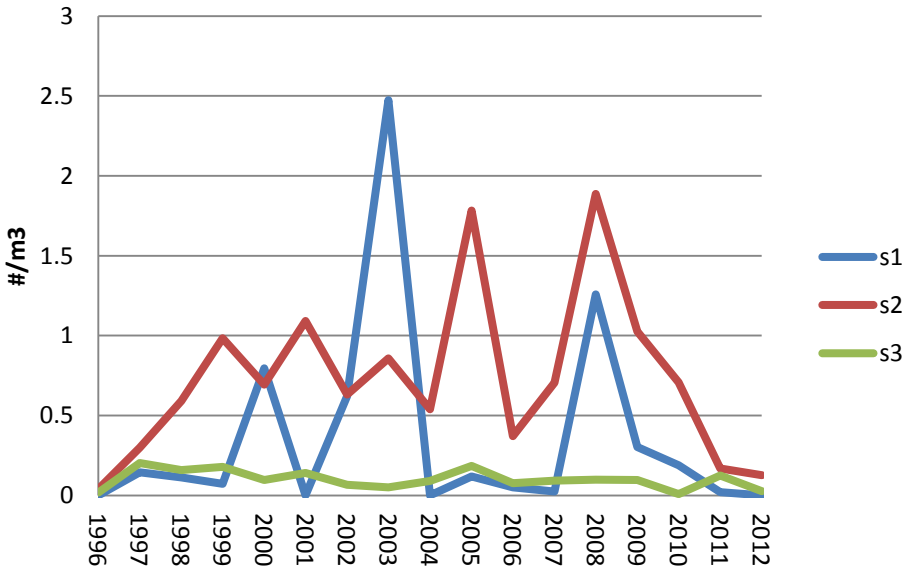
Line P average

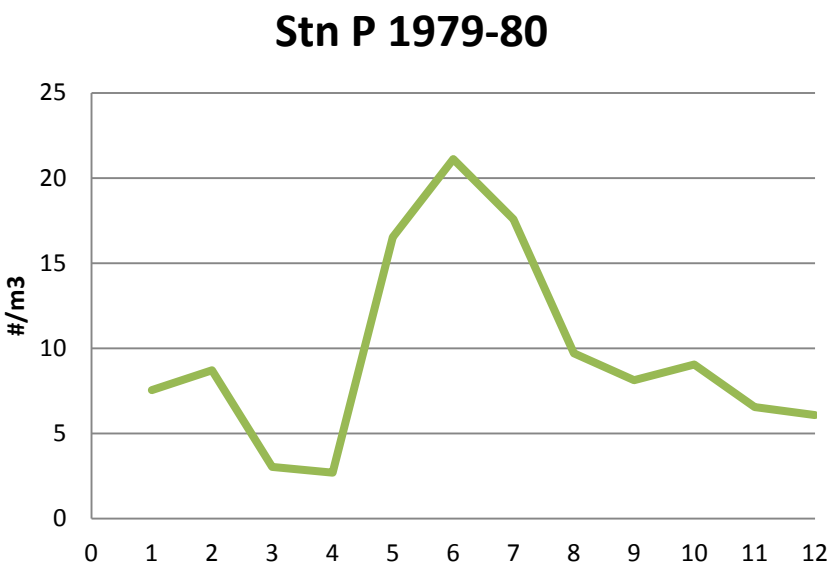


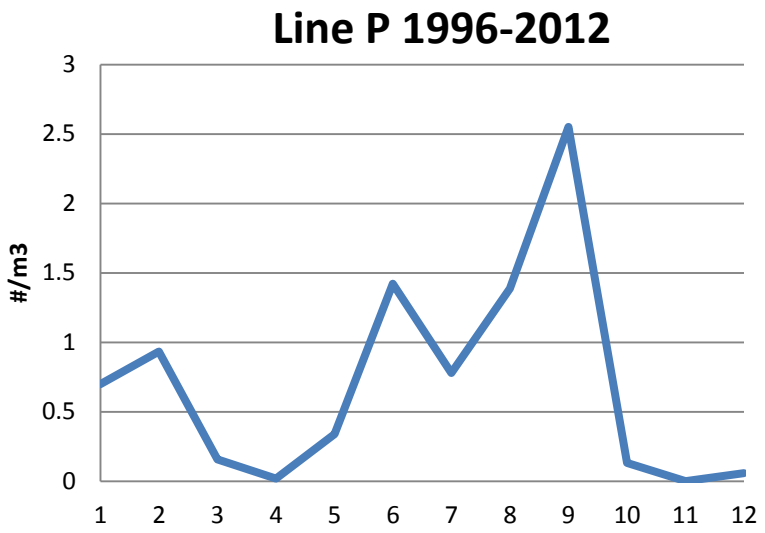
Line P average by region



Line P average by size





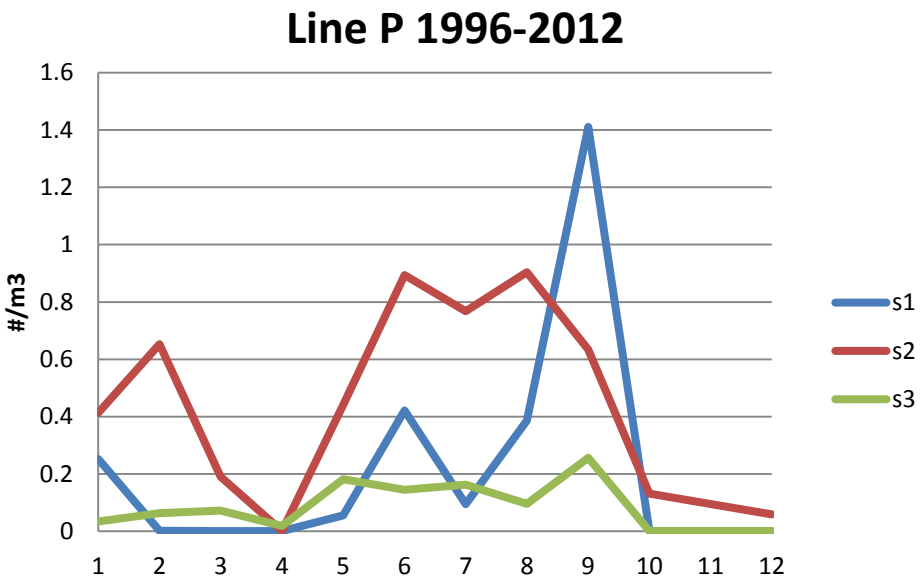


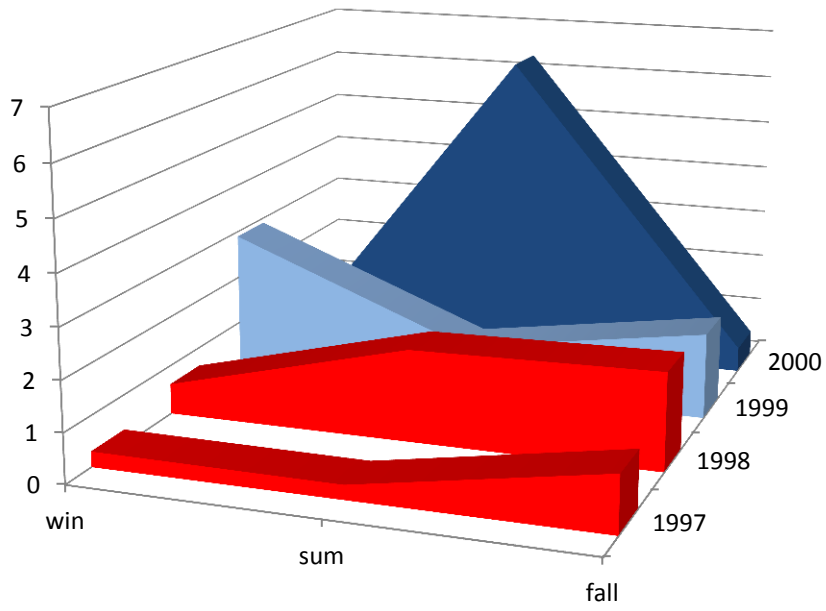
- Two year study at P26, sampling monthly
- Line P: P4-P26, 17 years, sampling three times a year
- Line P by size
- Size graph:

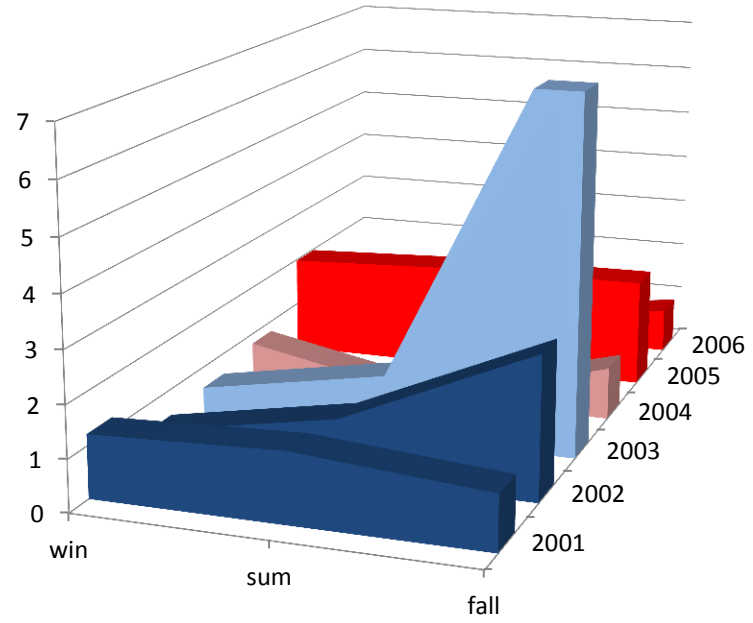
s1 < 5mm - juvenile

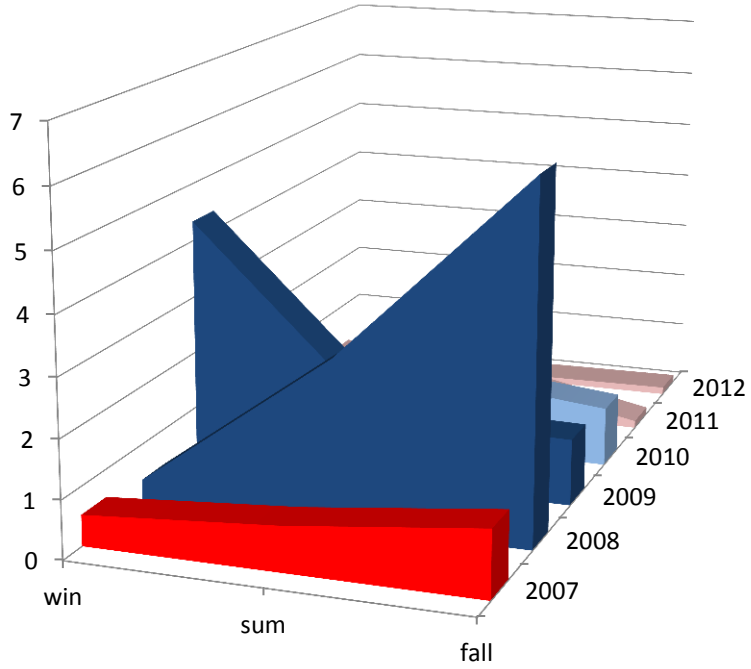
s2 <10mm>5mm - immature

s3 >10mm - mature

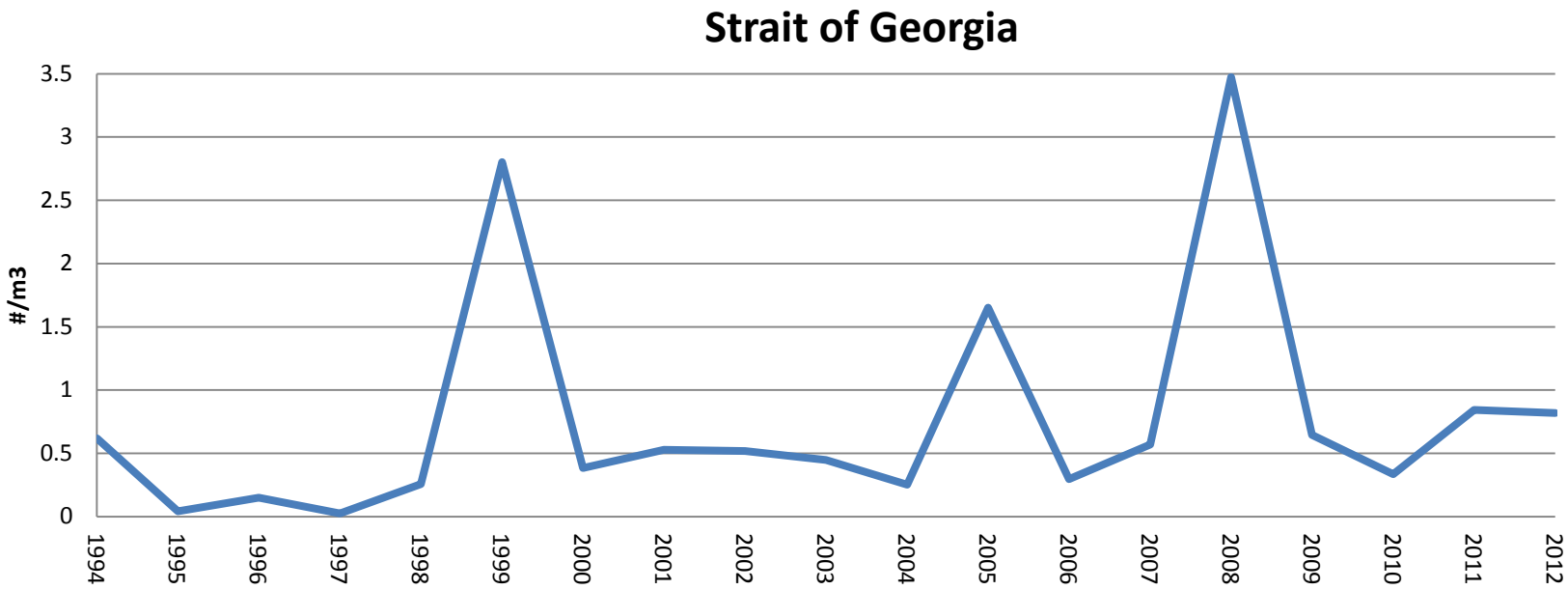


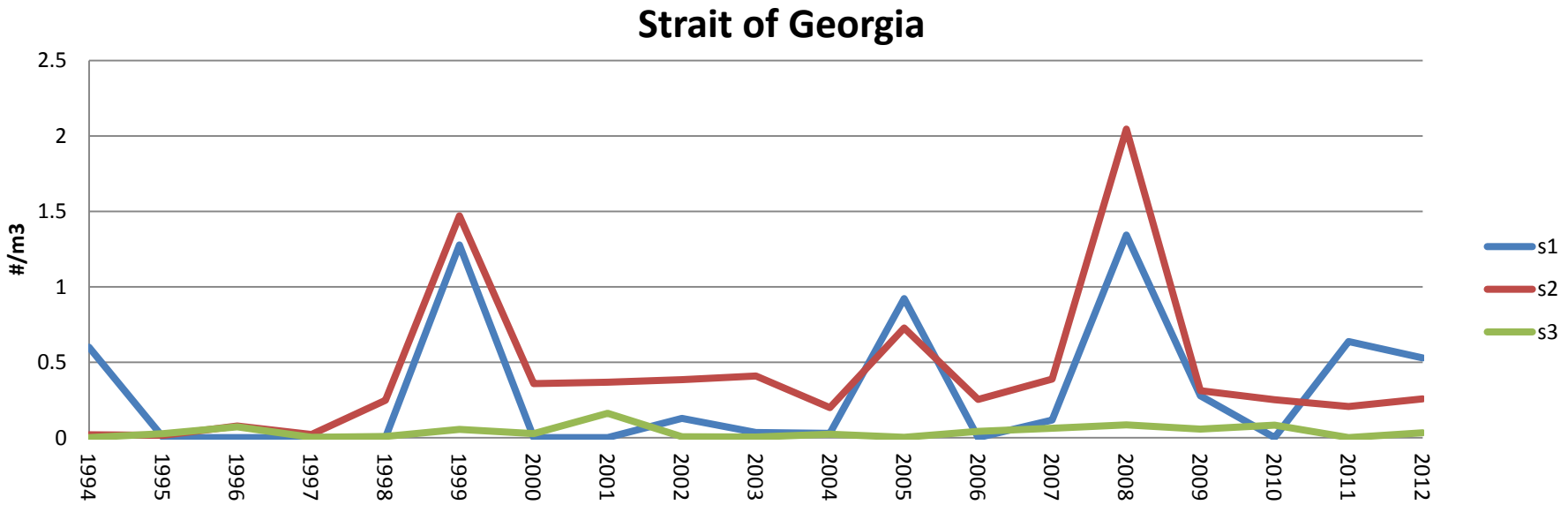


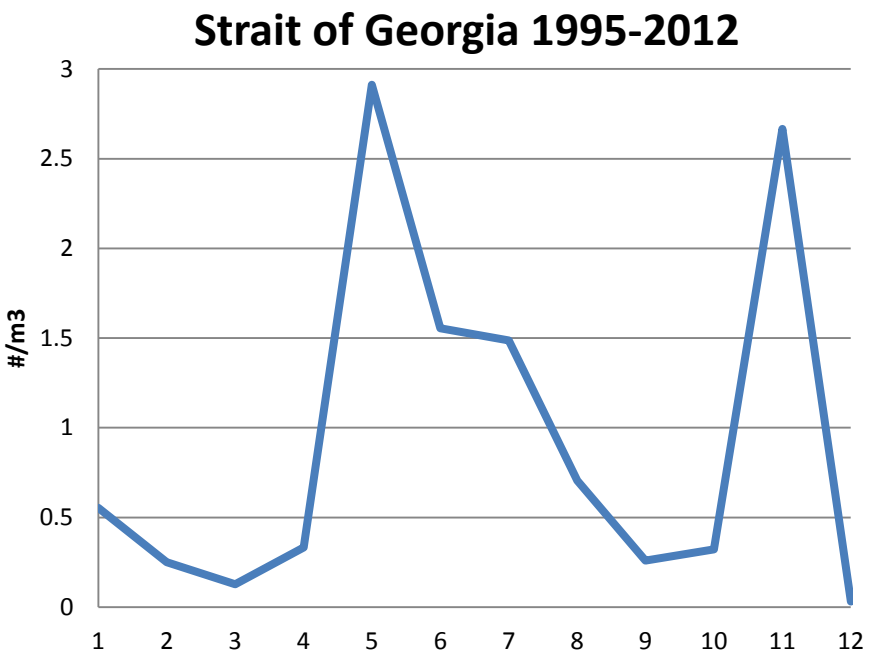




- Yearly averages for Line P in number per cubic metre
- colour coded as per WCVI
- all graphs same scale

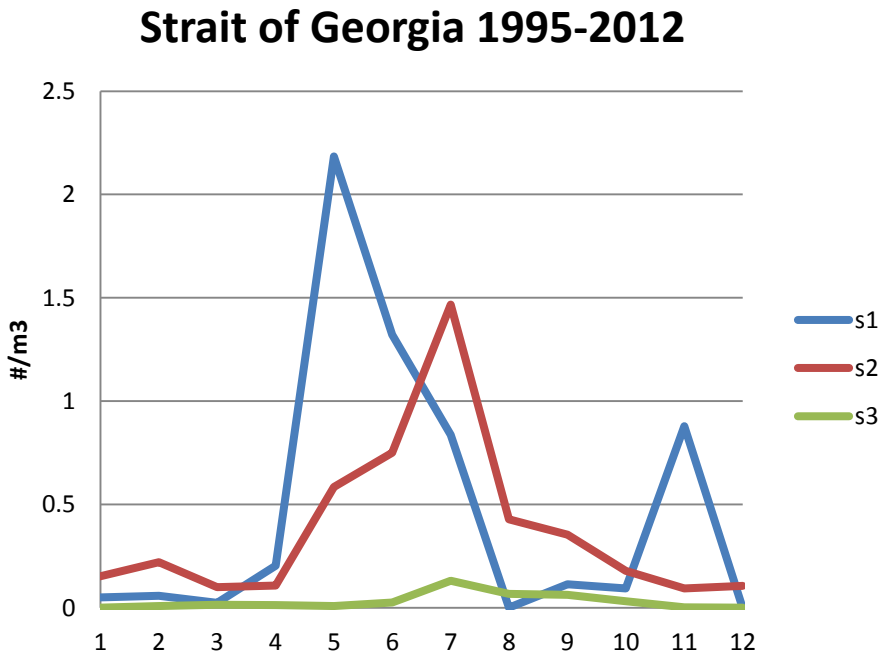

Strait of Georgia
#/m3
3.5
3
2.5
2
1.5
1
0.5
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012

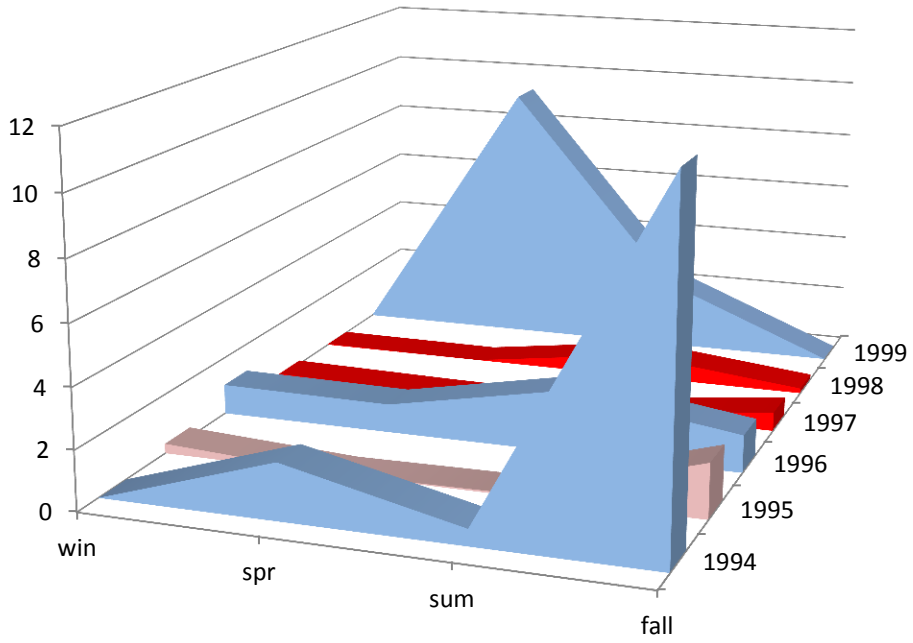

Strait of Georgia
#/m3
2.5
2
1.5
1
0.5
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
s1
s2
s3



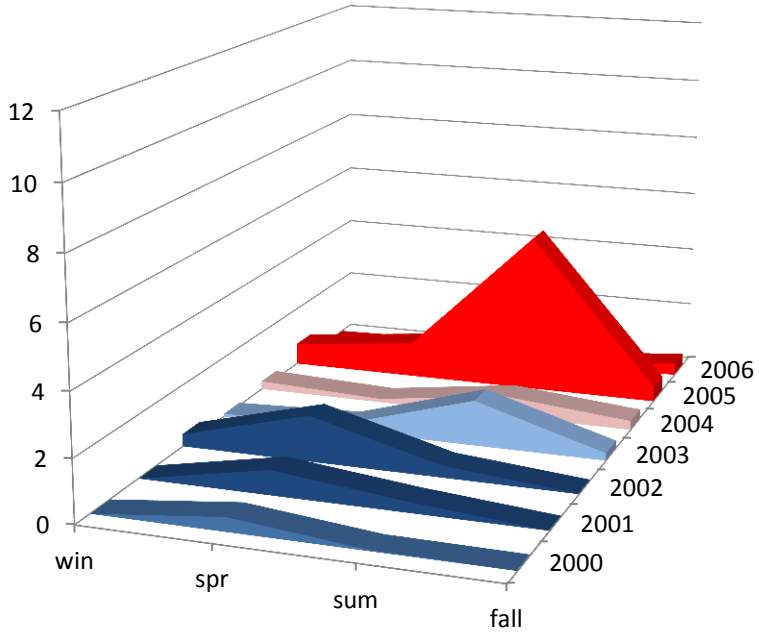
- Sampling three times a year
- Usually little to no sampling December through to February

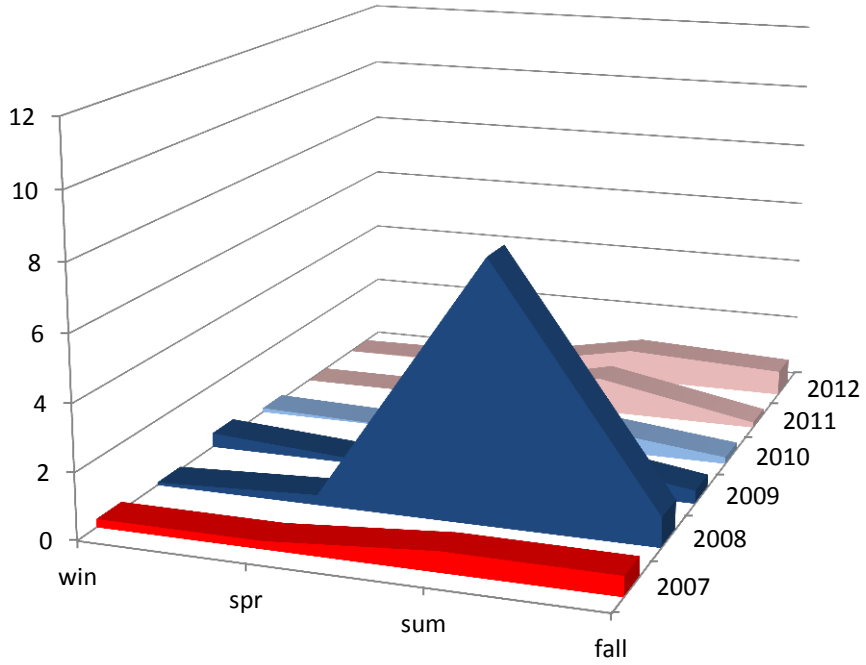
- Size graph:
  s1 < 5mm - juvenile
  s2 <10mm>5mm - immature
  s3 >10mm - mature

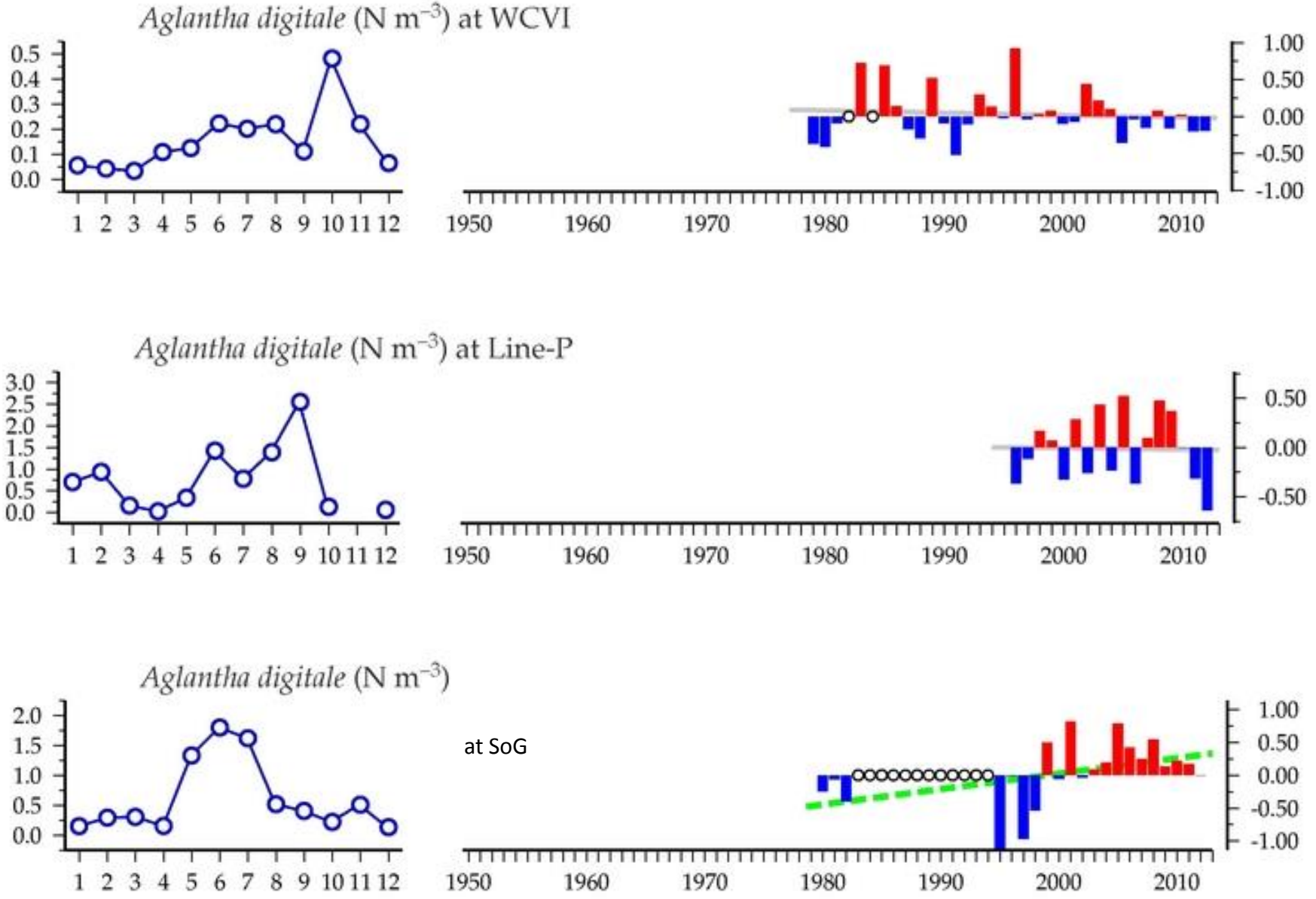




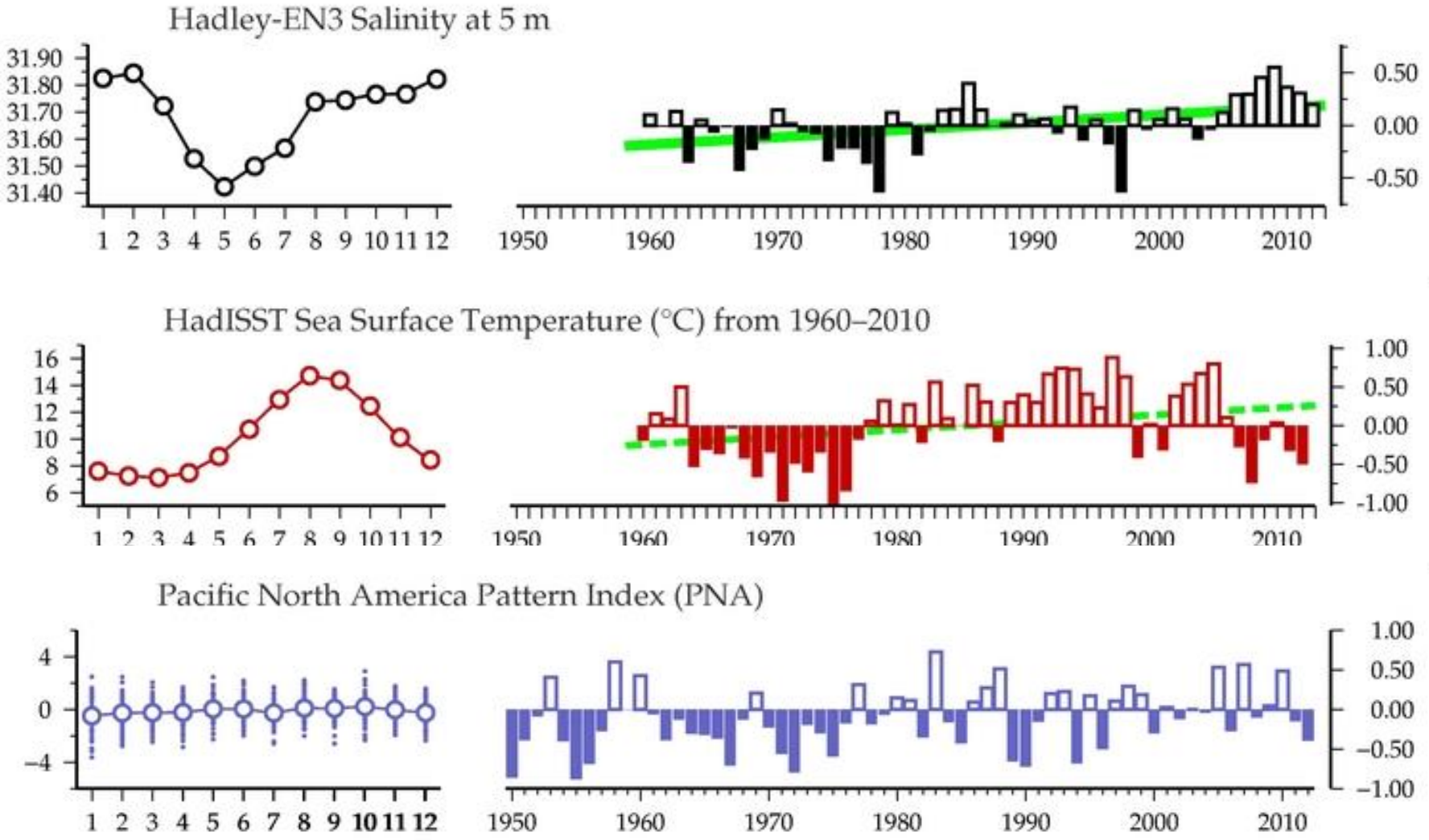
- Yearly averages for Strait of Georgia in numbers per cubic metre
- Same format as WCVI
- All graphs to same scale







Special thanks to Todd O'Brien, NOAA and COPEPODITE for the graphs, http://www.st.nmfs.noaa.gov/copepodite/



Aglantha correlates positively with salinity at 5m and negatively with SST in the Strait of Georgia. Aglantha Line P has a positive correlation with the PNA index but WCVI Aglantha do not correlate with any climate indexes

Conclusions:

- Something happened off WCVI in 1999 and numbers there have not recovered to historic highs, WCVI series has a definite decline in 2011/12 (Speculation: drop in O2 levels, loss of small copepods ,<1mm, to feed on)
- WCVI shelf animals appear to be moving offshore as they grow, the large number of less than 5mm Aglantha in the fall could be the late winter/early spring medium sized animals (Speculation: poleward transport of waters in the fall and winter combined with upwelling)
- Line P, P16-P26 show a lot of variability whereas P04-P12 are fairly even across the years but both areas show a decline in recent years (Speculation: movement of the gyres, south, impacts growth and reproductive success)
- SoG shows an overall increase in abundance since 1994 but numbers have never been very high and missing data could be skewing the data to a more positive anomaly
- Peak abundances occur in colder years for all three series with the exception of 1997 for WCVI and 2005 in SoG
- 2013 should be very pivotal in establishing the trend for each of the series
- **Long term time series are an invaluable tool**