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Canada



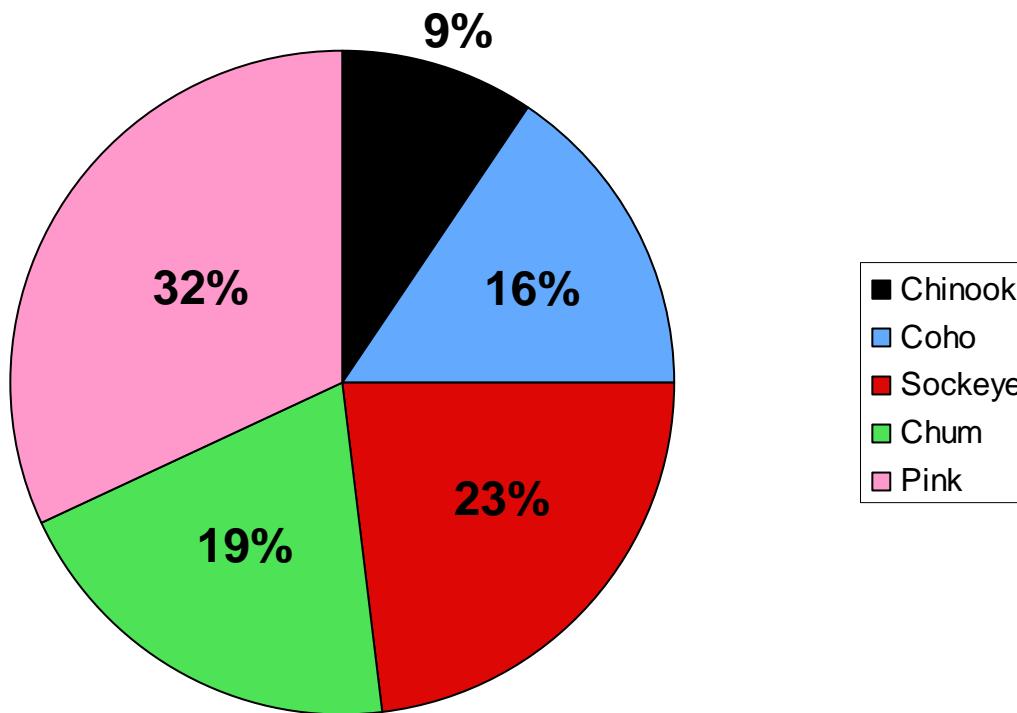
Coincidental Distribution, Abundance and Growth of Juvenile Pink, Chum and Sockeye Salmon in Eastern Pacific coastal waters: competition??

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Fisheries and Oceans Canada
Nanaimo, British Columbia**

Canada The Government of Canada logo, featuring a red maple leaf icon above the word "Canada".

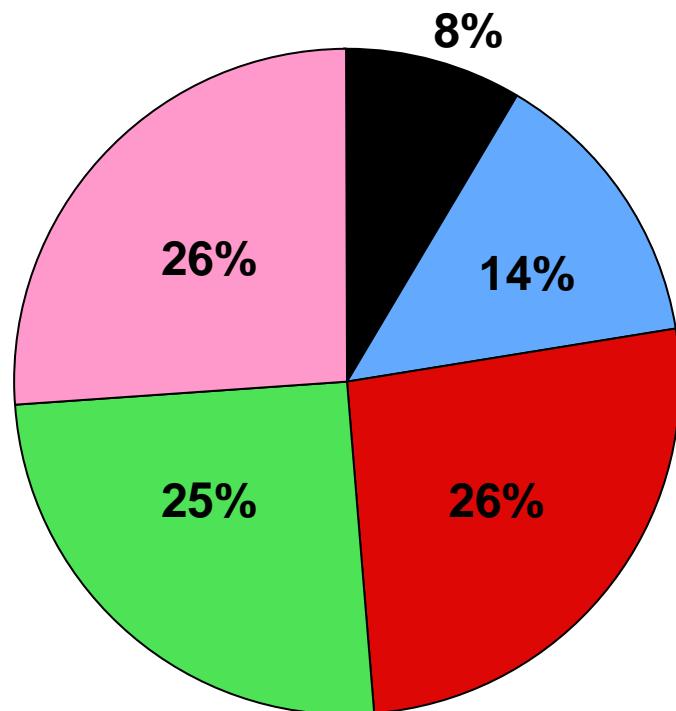


Pink, chum, and sockeye are the dominant salmonids in BC

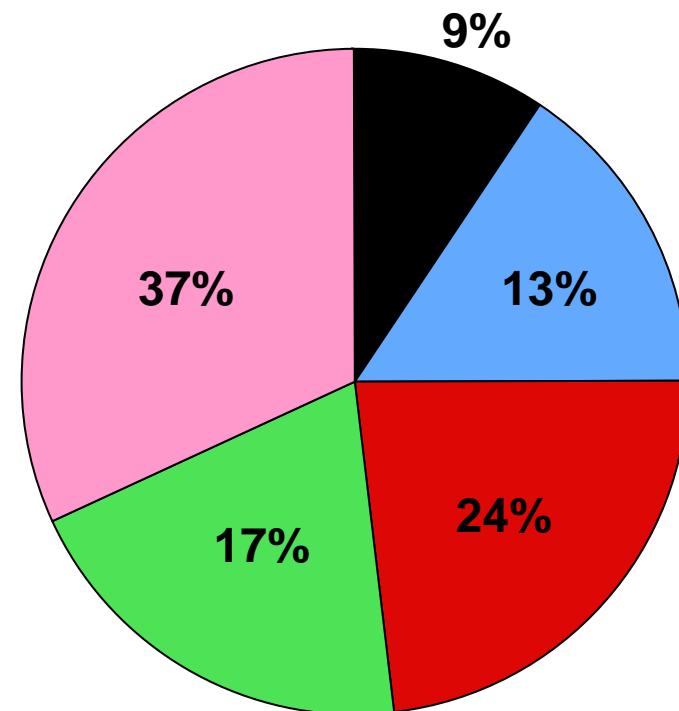


Pink salmon dominance varies between odd and even years

Even Years



Odd Years

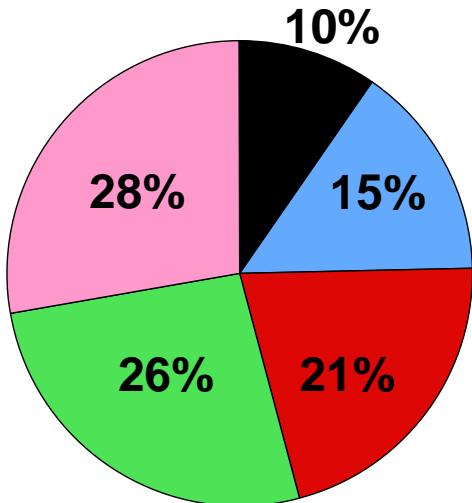


- Chinook
- Coho
- Sockeye
- Chum
- Pink

Sockeye dominance varies on a 4-year cycle

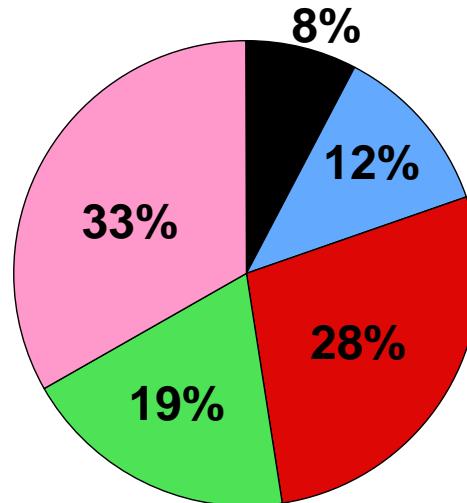
Even Years

1996 BY



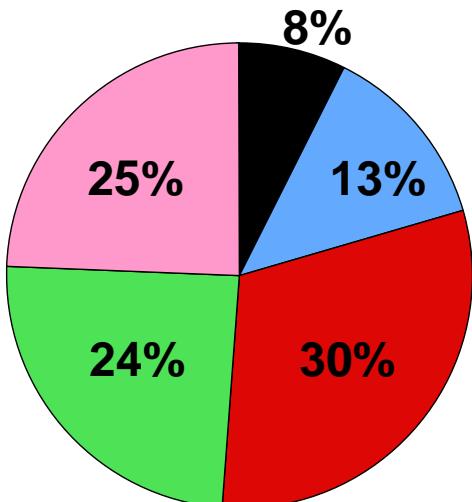
Odd Years

1997 BY

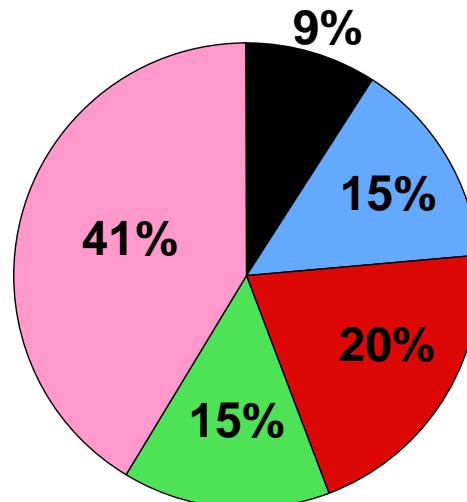


- Chinook
- Coho
- Sockeye
- Chum
- Pink

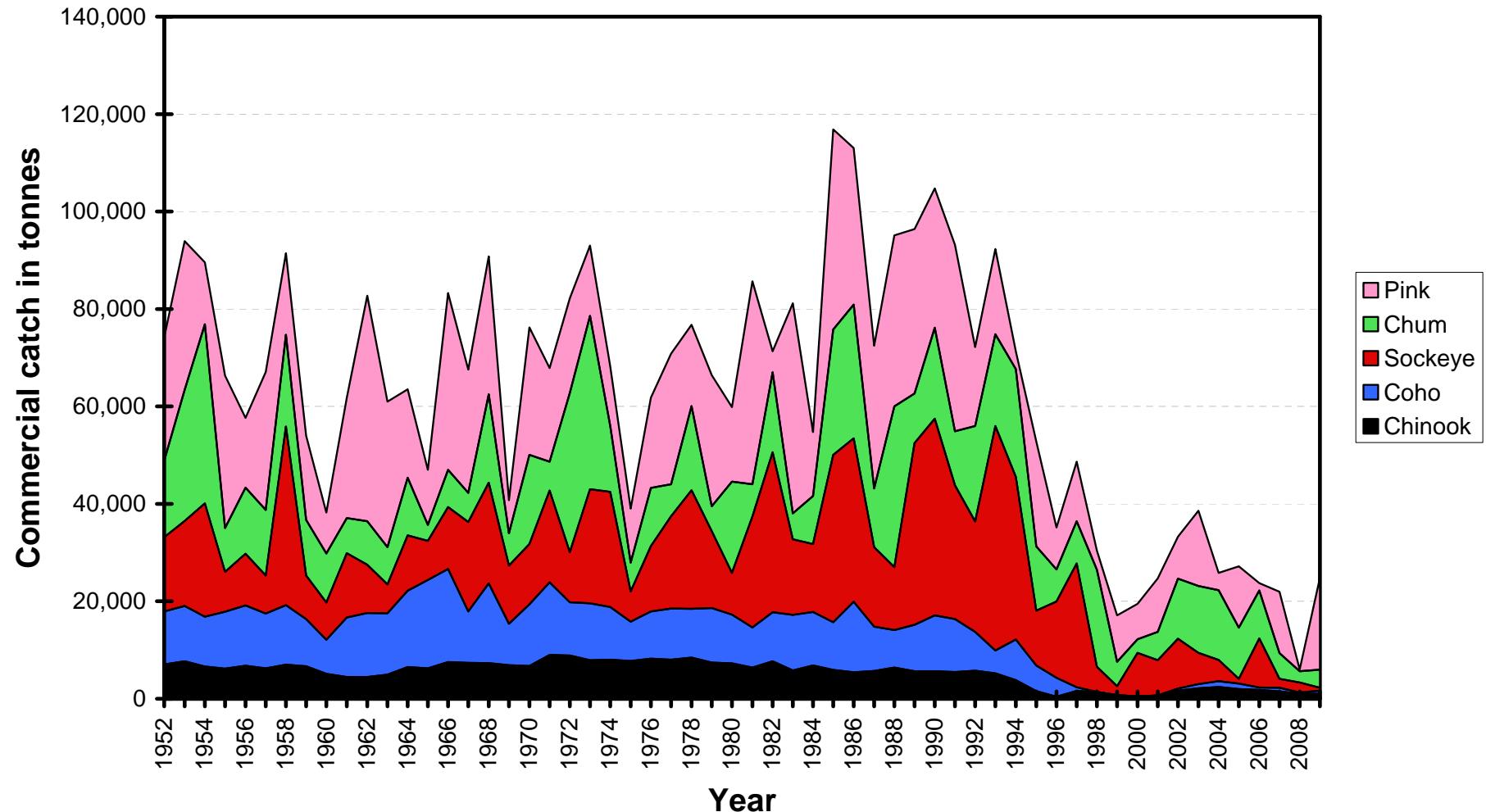
1998 BY



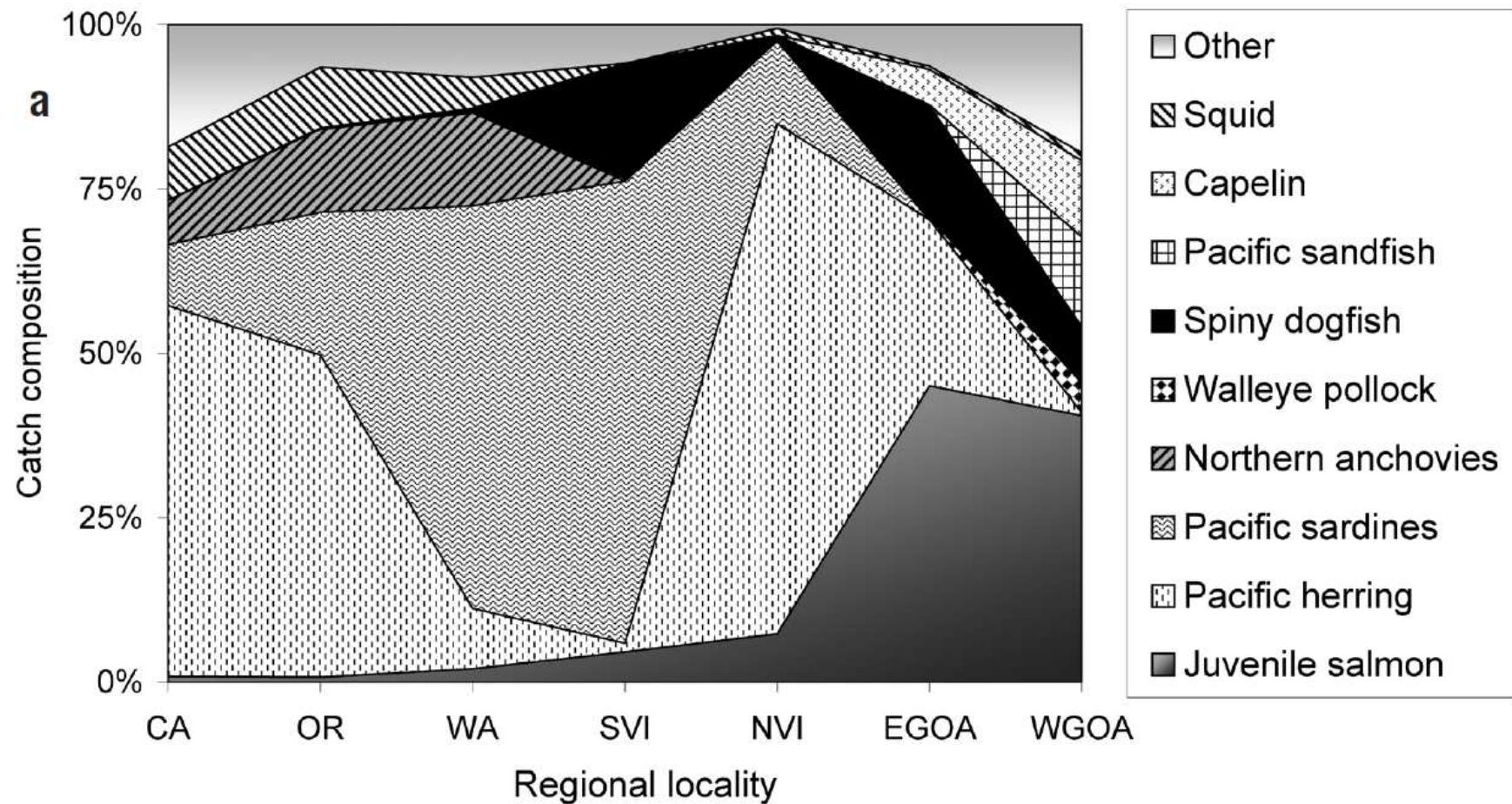
1999 BY



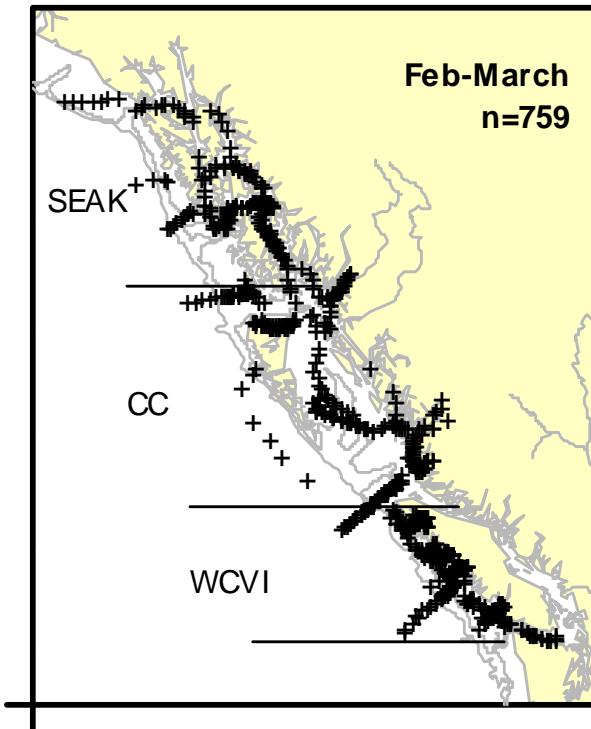
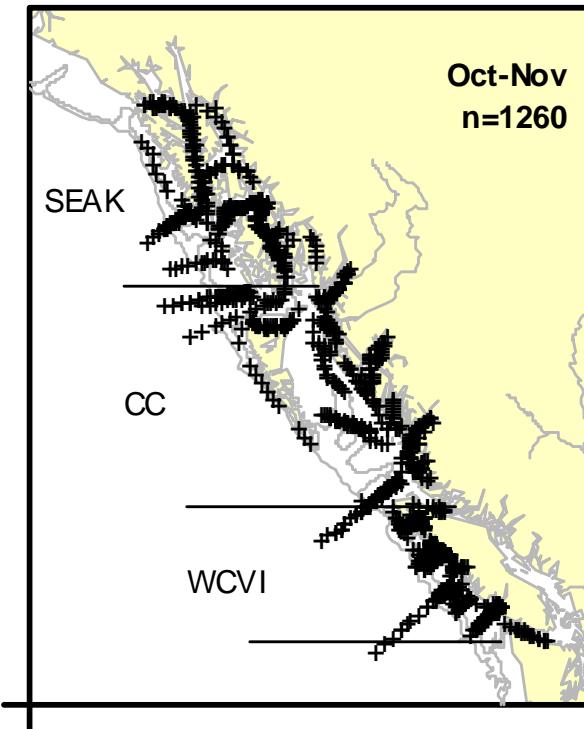
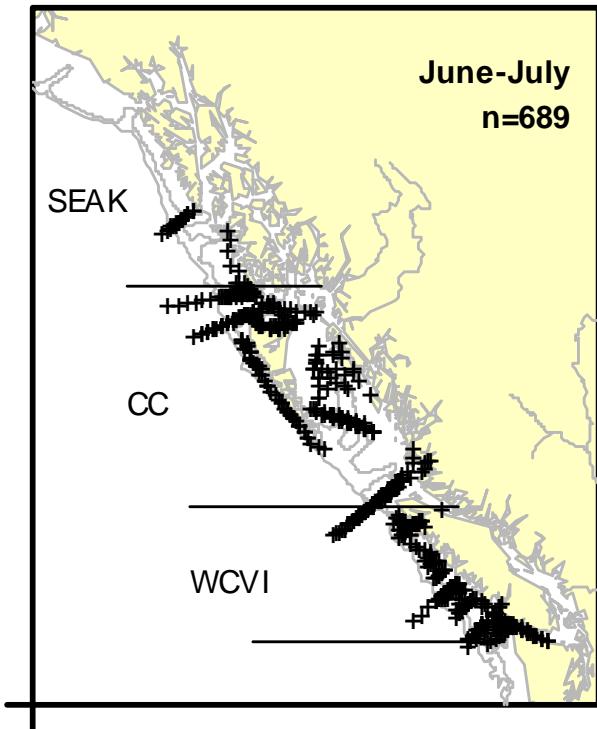
Salmon catches in British Columbia



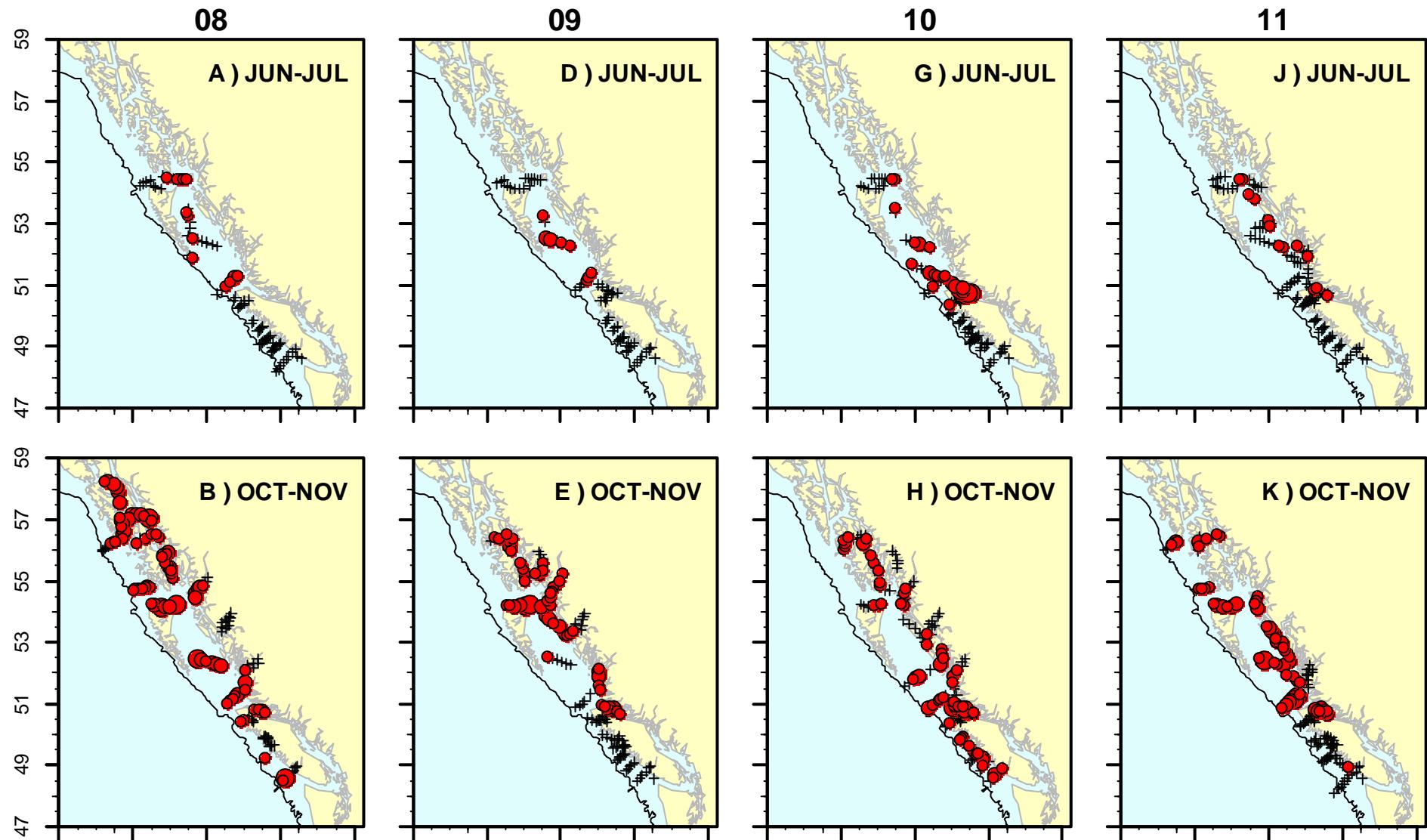
Pelagic community varies among regions



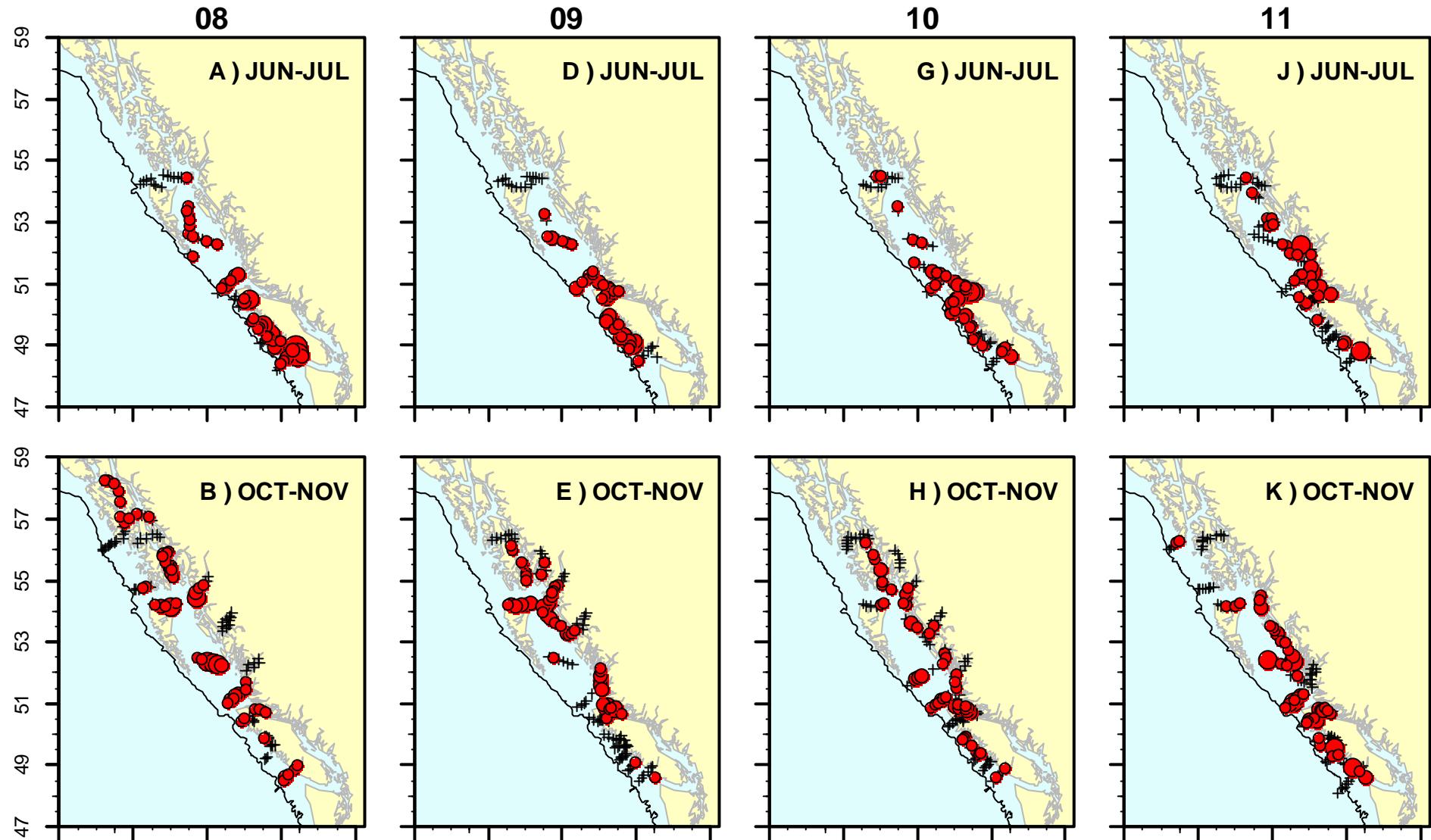
Survey location (1998-2011)



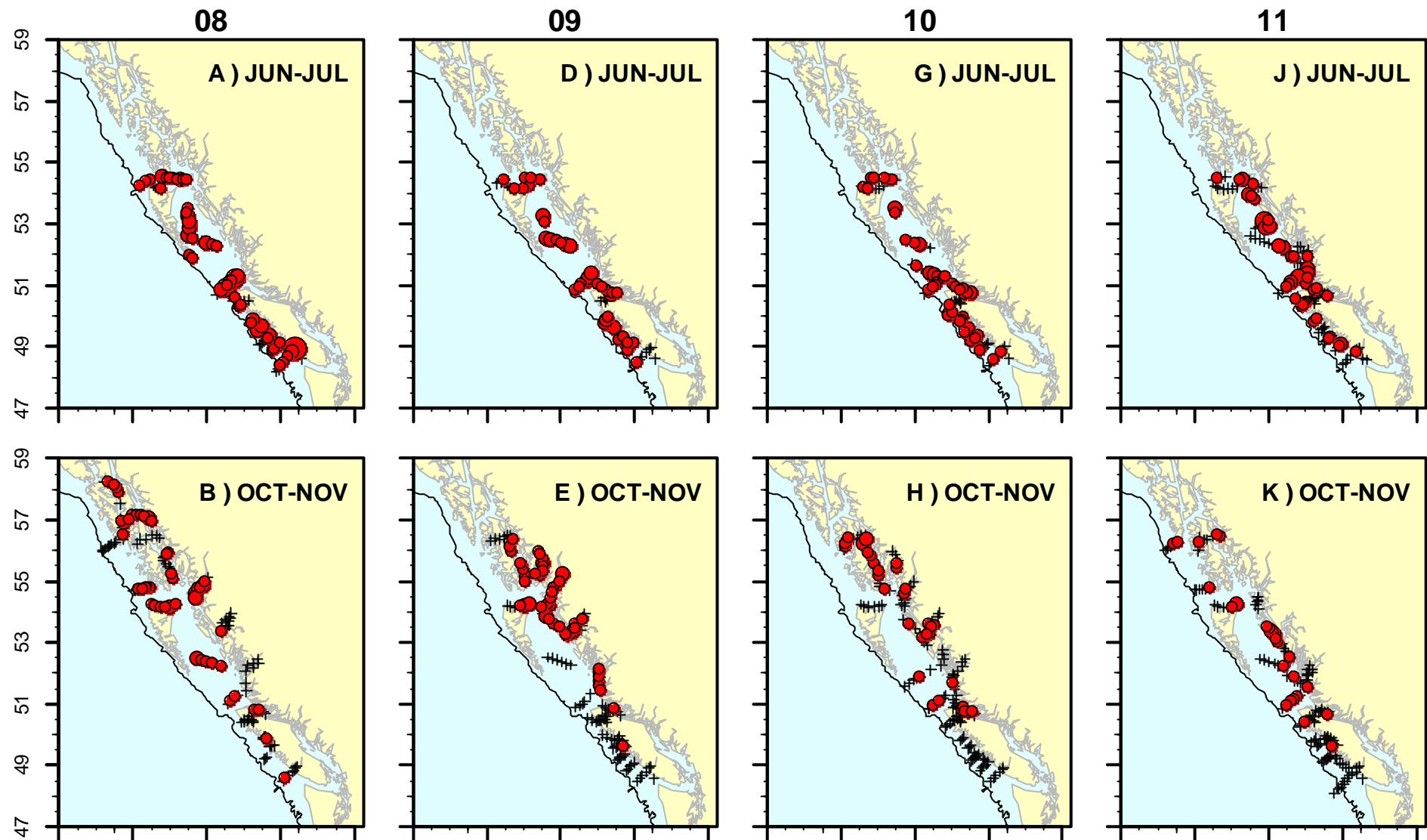
Interannual variability in seasonal catches and distribution ('08-'11):
Pink salmon



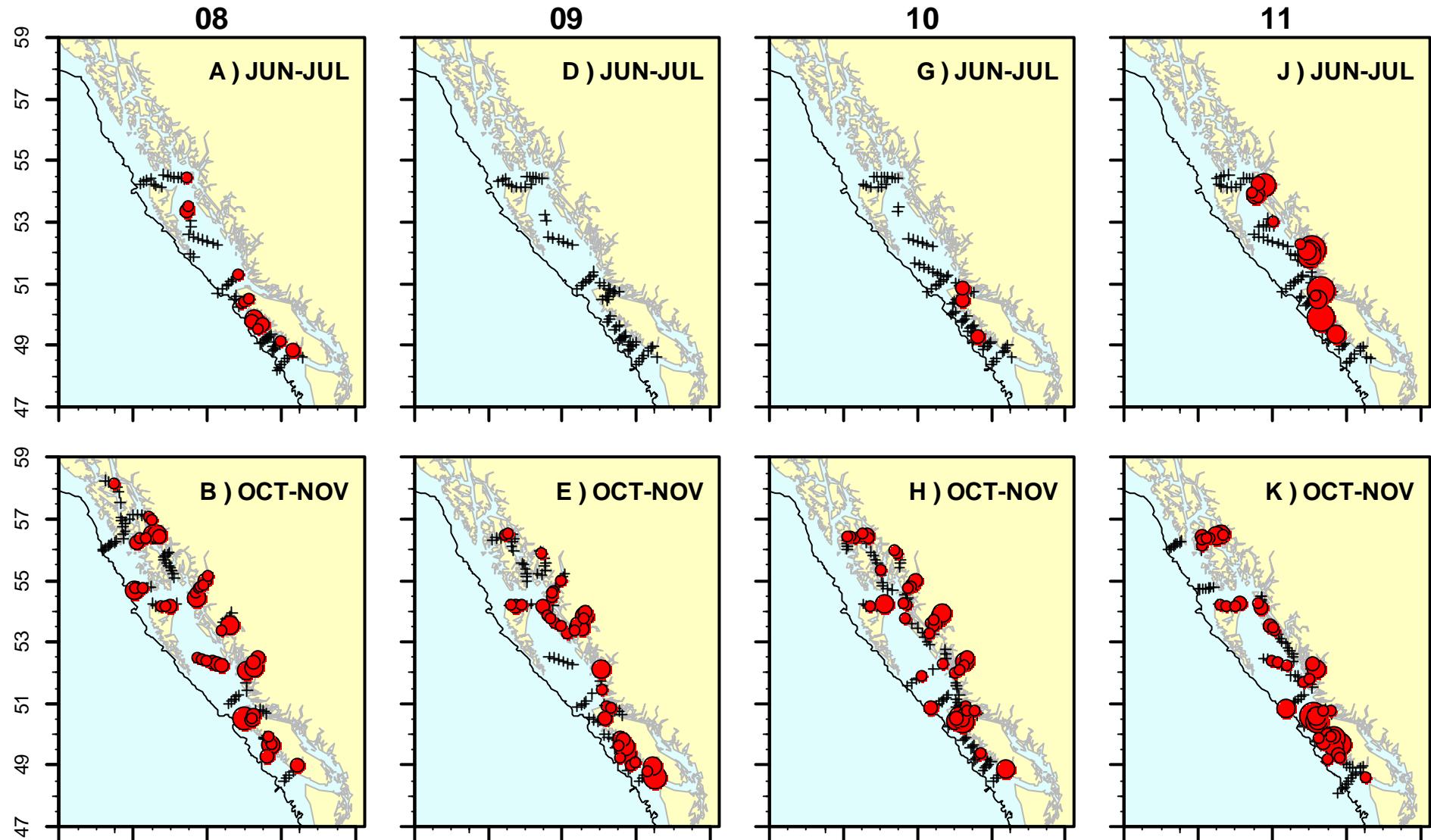
Interannual variability in seasonal catches and distribution ('08-'11):
Chum salmon



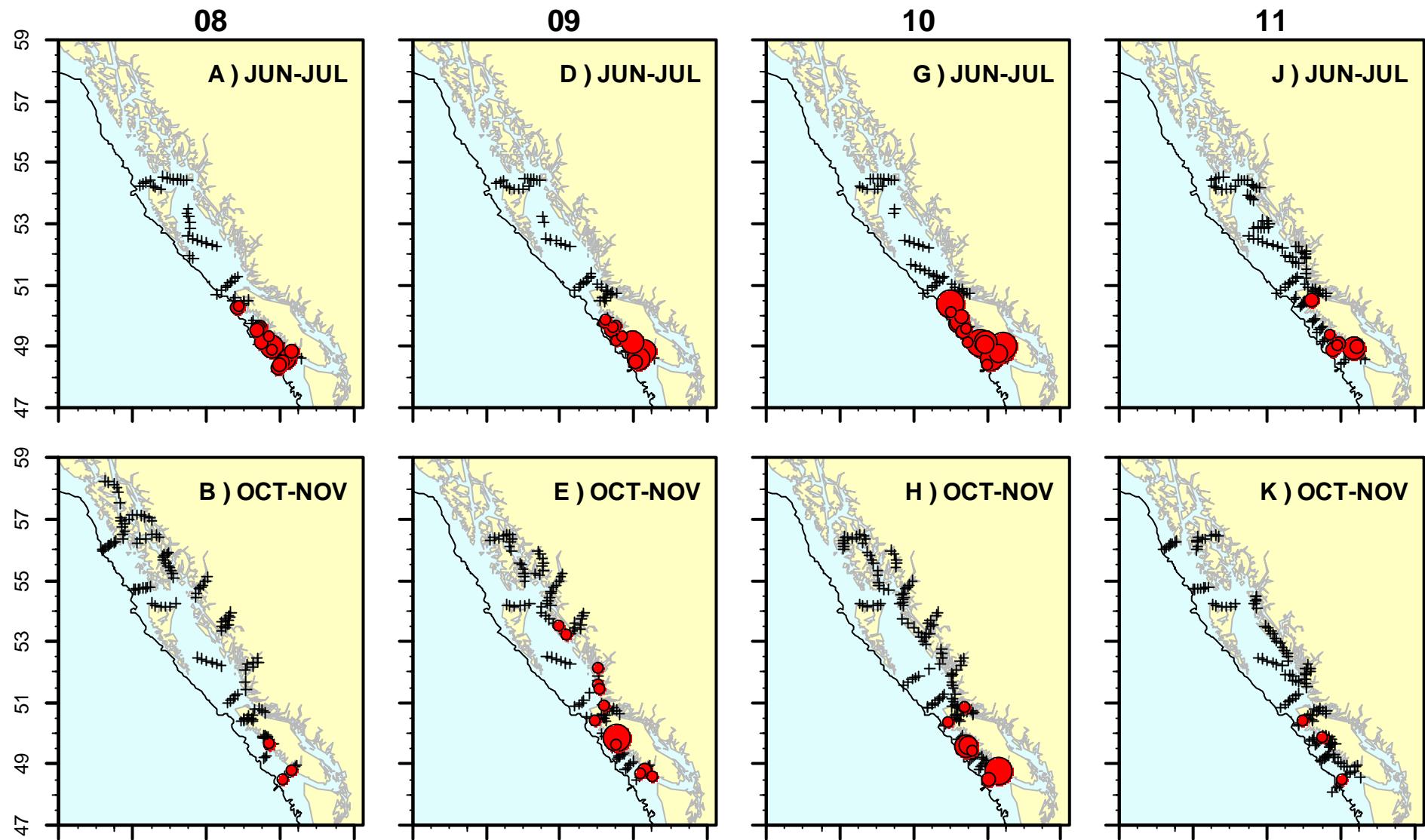
Interannual variability in seasonal catches and distribution ('08-'11):
Sockeye salmon



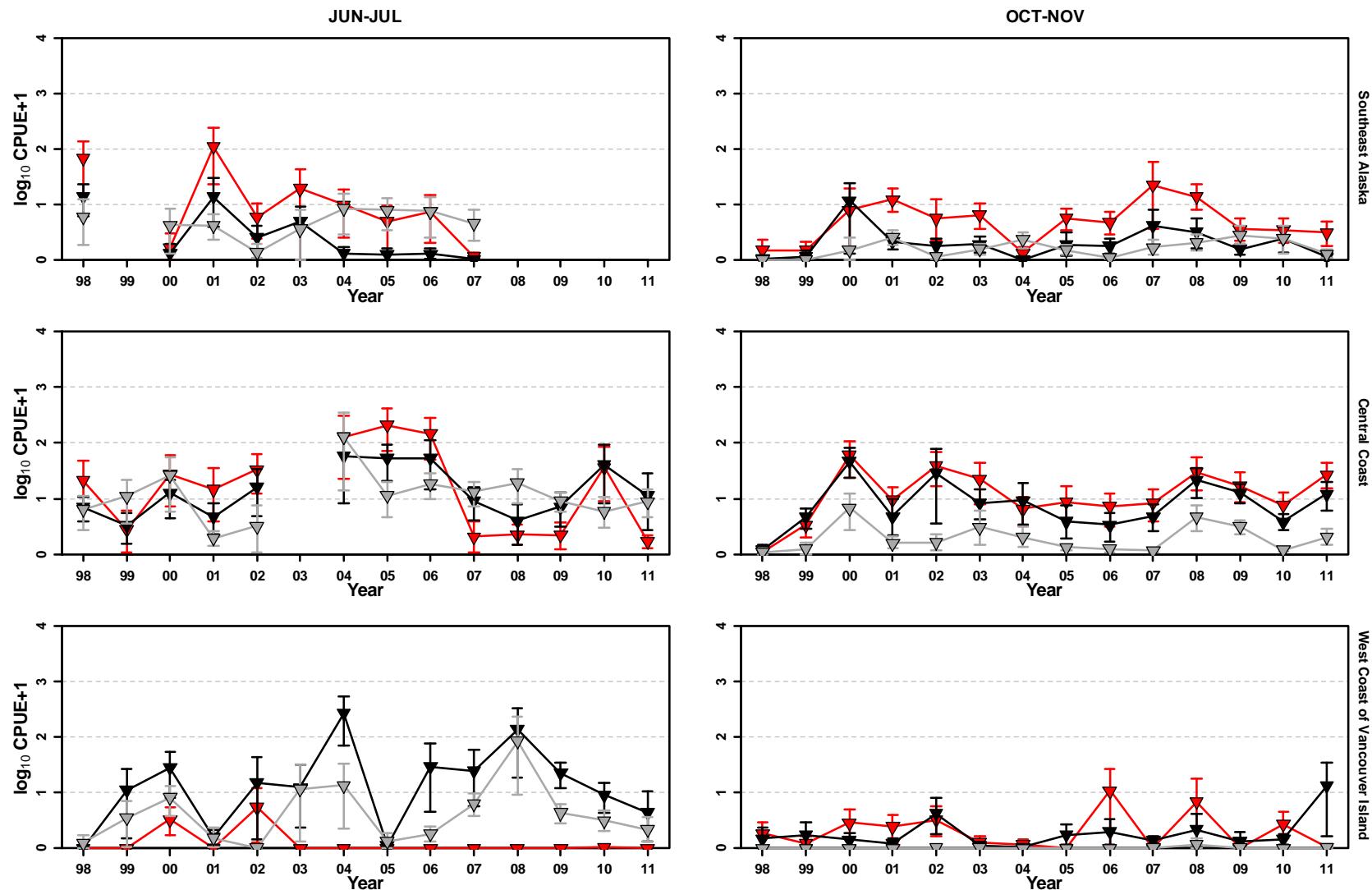
Interannual variability in seasonal catches and distribution ('08-'11): Herring



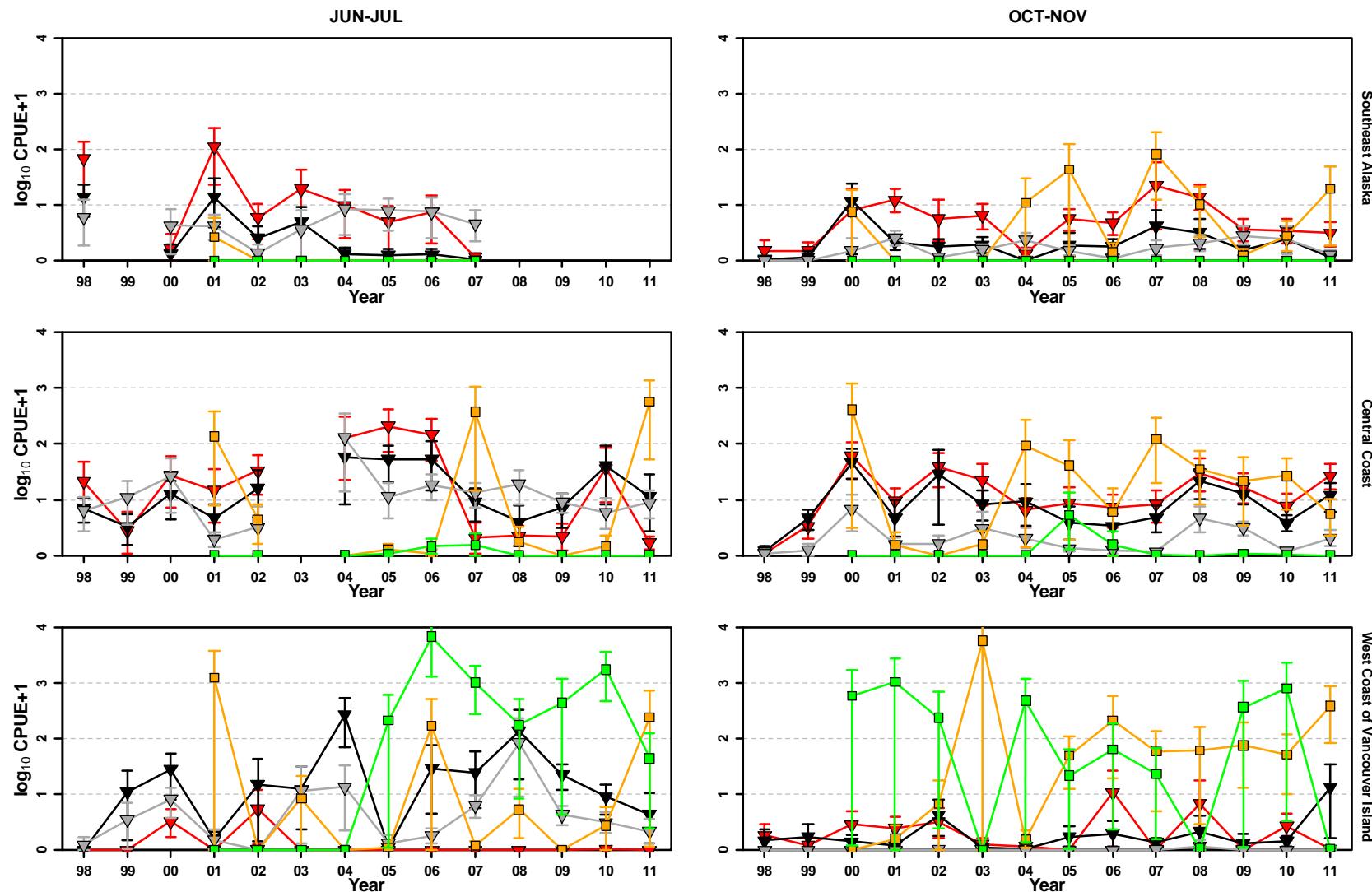
Interannual variability in seasonal catches and distribution ('08-'11):
Sardines



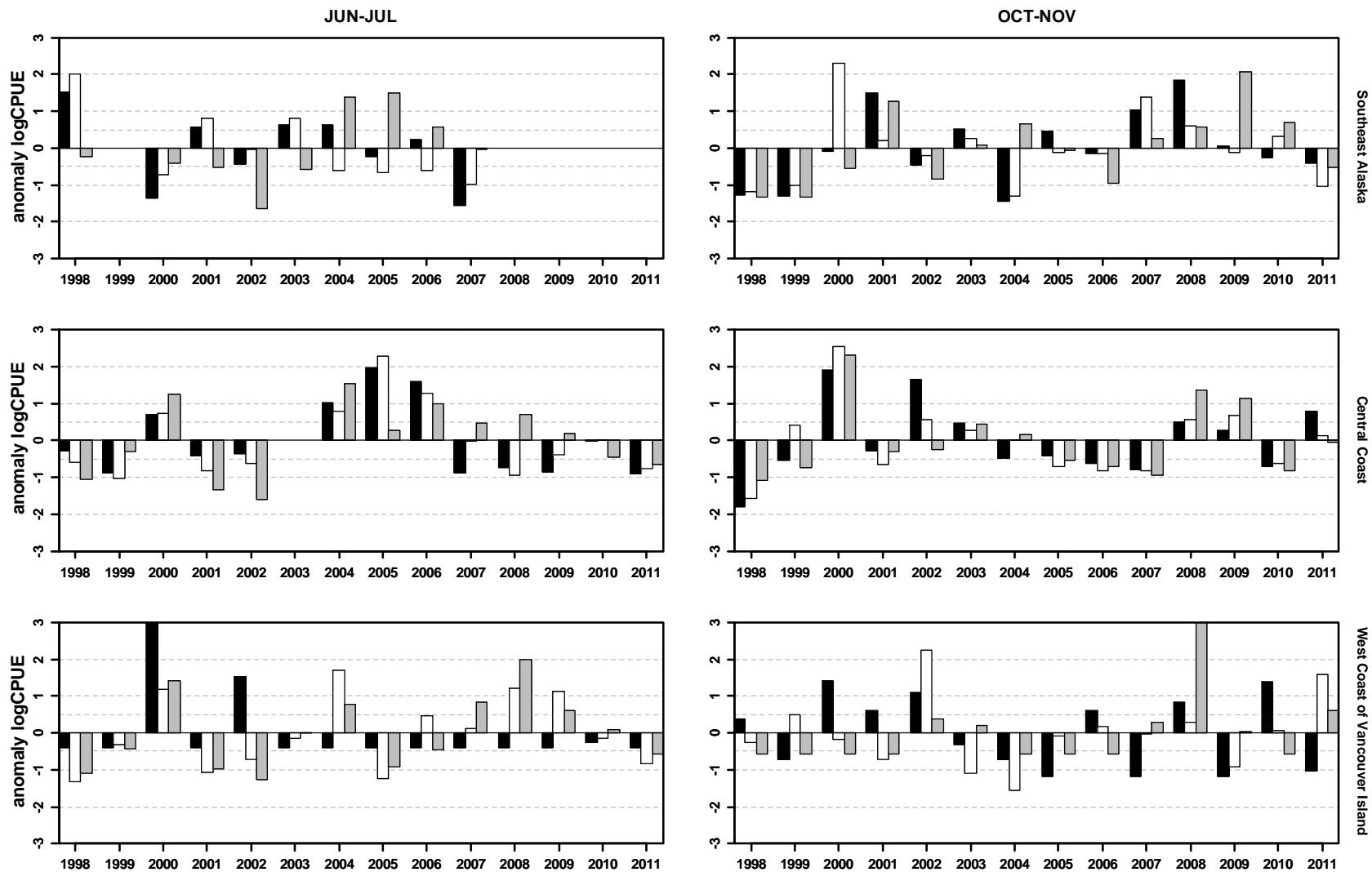
Interannual variation in the catch-per-unit effort of juvenile salmonids (pink, chum, and sockeye)



Annual variation in the catch-per-unit effort of juvenile salmonids & clupeids (pink, chum, sockeye, herring, and sardines)



Interannual variation in the catch-per-unit effort of juvenile salmonids (pink, chum, and sockeye)



Species association: Kendall's coefficient of concordance

a) Overall test of the W Statistic

H_0 : the 5 species are not concordant with each other

Kendall's W=0.284

p<0.001

Reject H_0

b) *a posteriori* tests

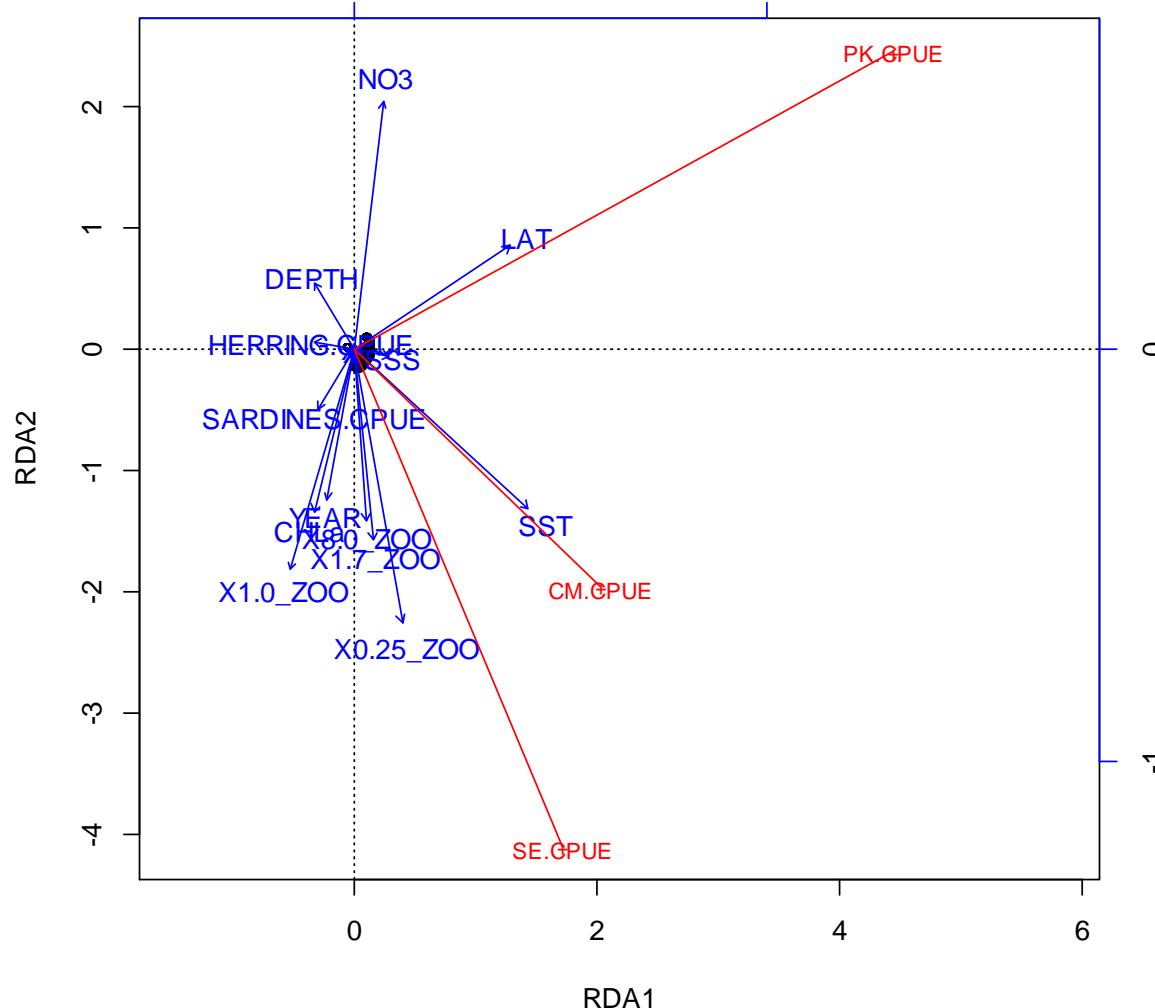
H_0 : this species is not concordant with other species

Pink	p=0.0005	Reject H_0
Chum	p=0.0005	Reject H_0
Sockeye	p=0.0005	Reject H_0
Herring	p=1.0	Accept H_0
Sardines	p=0.57	Accept H_0

→ pink, chum and sockeye CPUE are strongly associated

Species association and oceanography

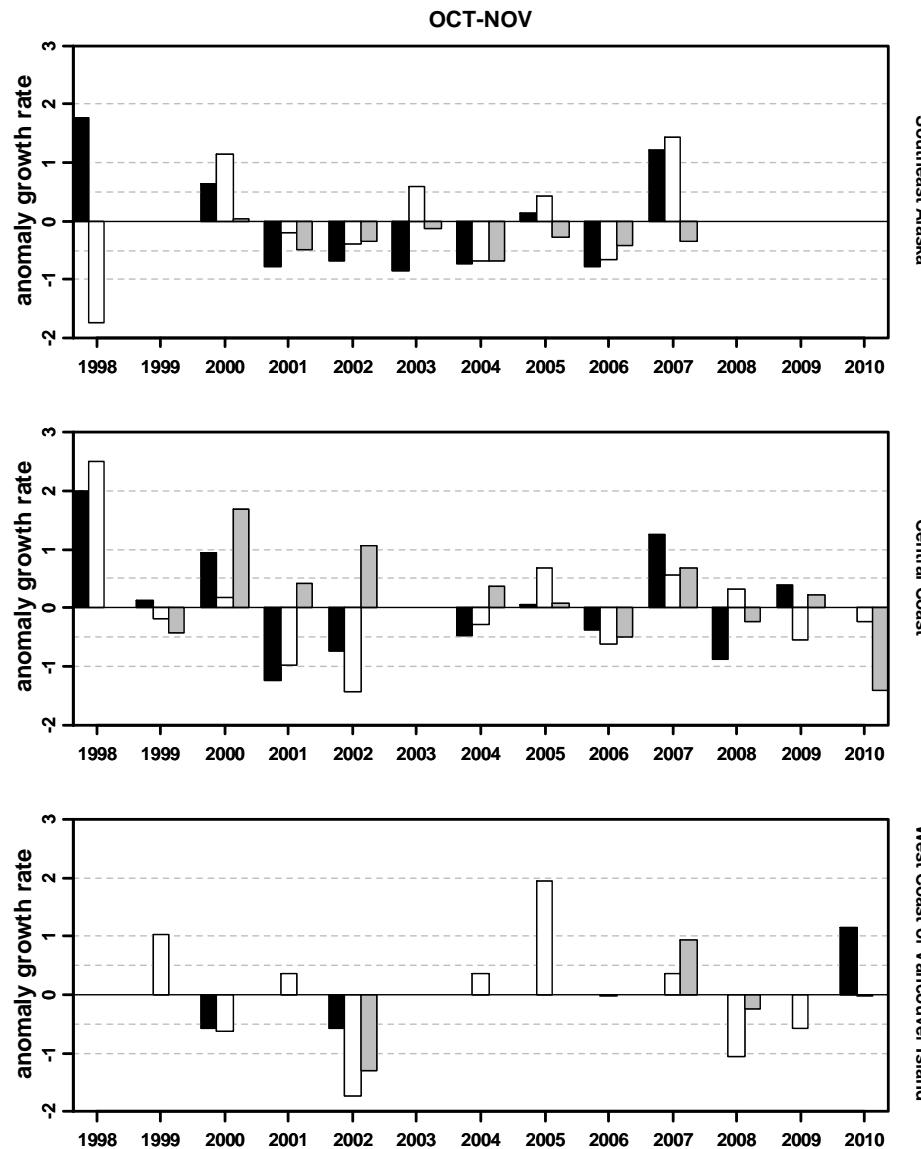
Redundancy Analysis



Distance matrix ANOVA

SST	p=0.002
NO3	p=0.03
Chl a	p=0.04
Zoop	p=0.04
Herring	p=0.17
Sardines	p=0.19

Interannual variation in the growth of juvenile salmonids (pink, *chum*, and sockeye)



Covariation in juvenile salmon growth

	chum	sockeye
pink	0.44*	0.30
chum	(0.031)	(0.19)
		0.29
		(0.19)

Summary & Conclusions

- CPUE of juvenile salmonids covaried positively among species along the continental shelf
- Growth of juvenile salmonids covaried positively among species along the continental shelf
- CPUE varied with indices of ecosystem productivity (i.e. NO₃, chl a, zoop), but not growth
- Changes in juvenile salmon CPUE appears to be driven by changes in ocean conditions rather than through competition

Some caveats

