WALLEYE POLLOCK:GLOBAL VIEW

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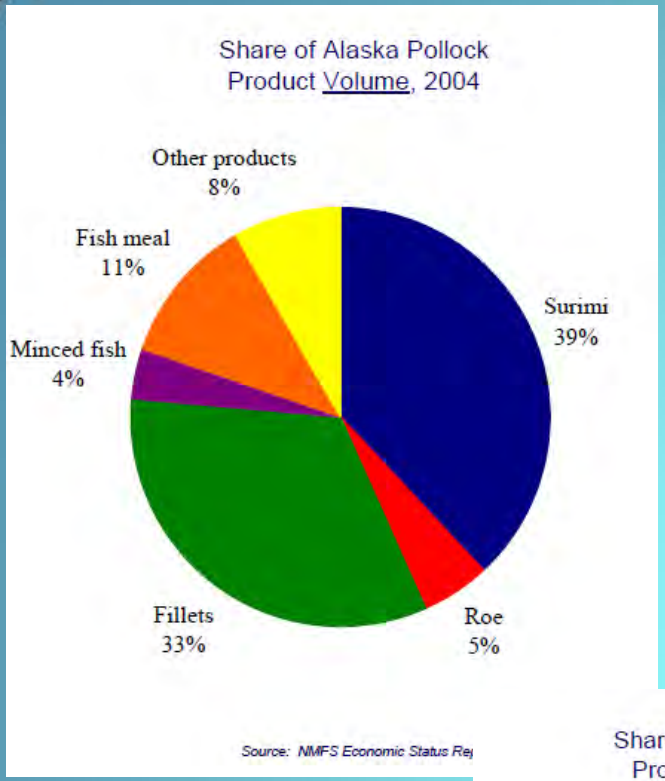
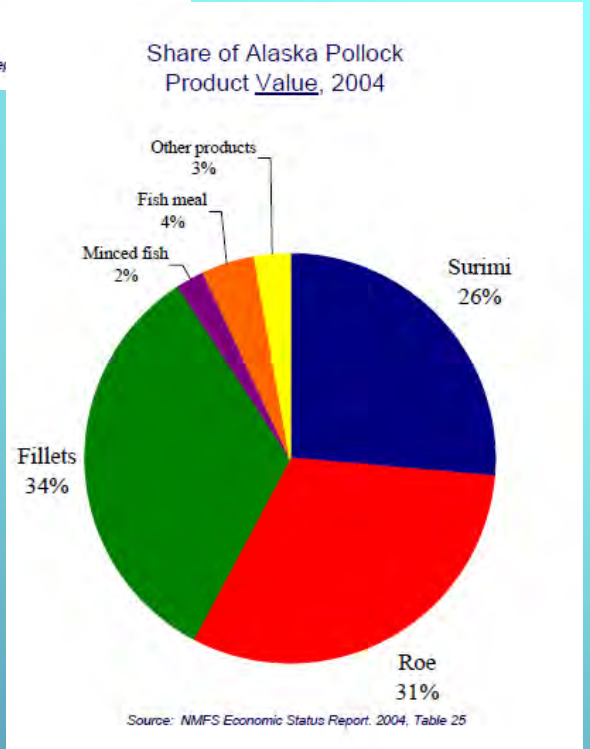


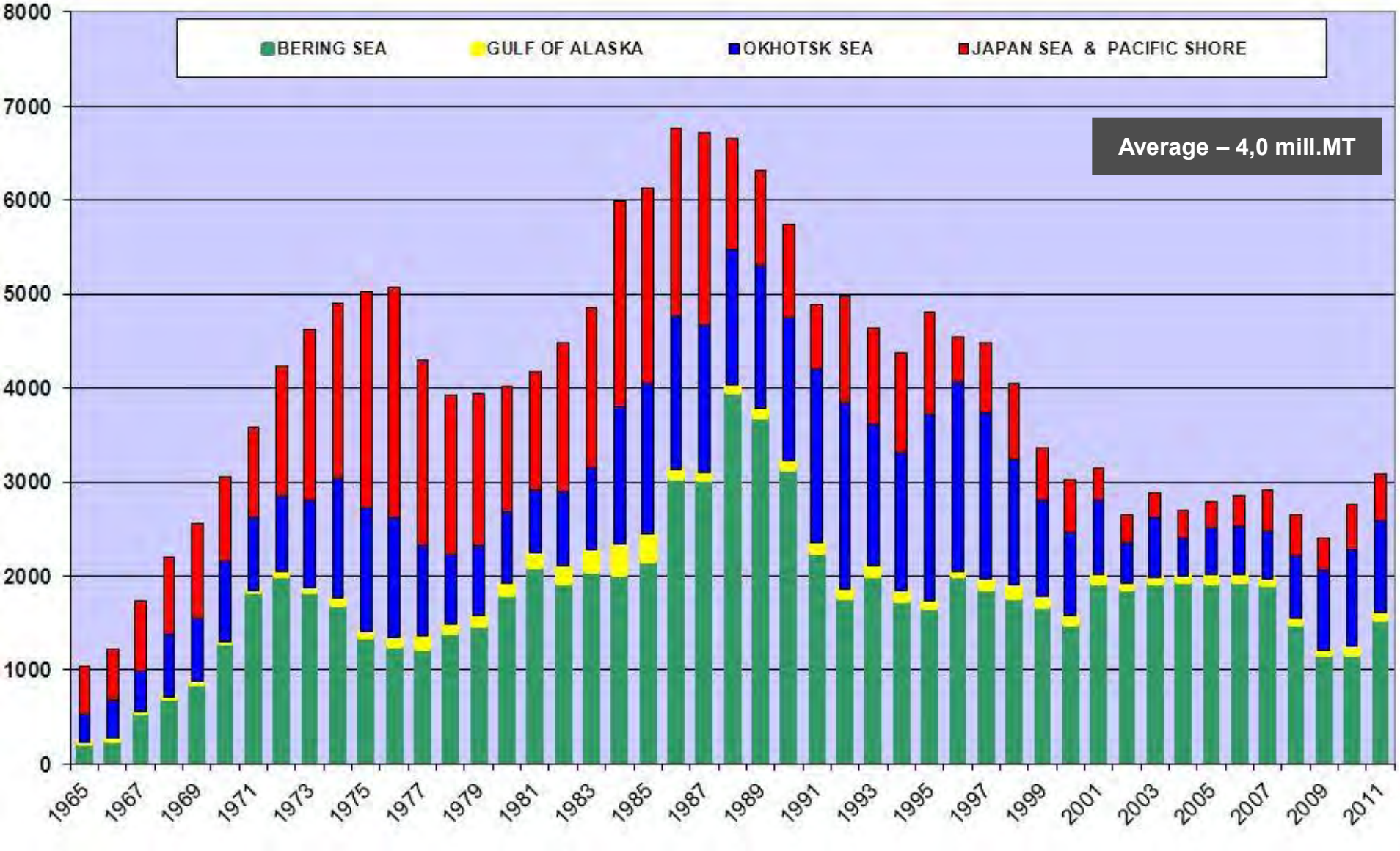
Fish meal,minced fish, and other low-priced products account for a relatively low share of value but a higher share of product volume.



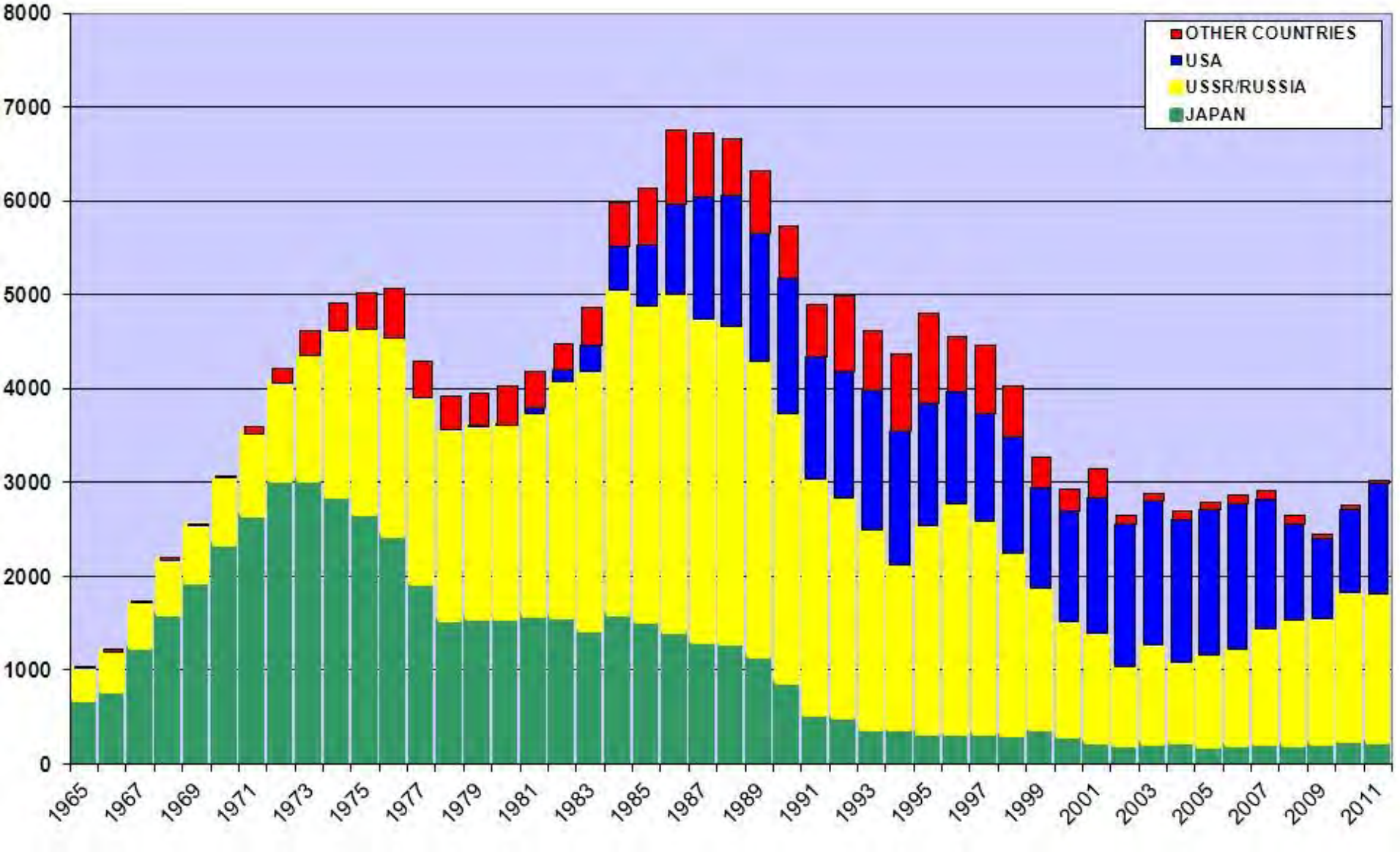
The most important products made from Alaska pollock are surimi, fillets, and roe. Pollock roe is a high priced product which accounts for a high share of value. In 2004, these three products accounted for 91% of product value.

Source: Knapp, 2006

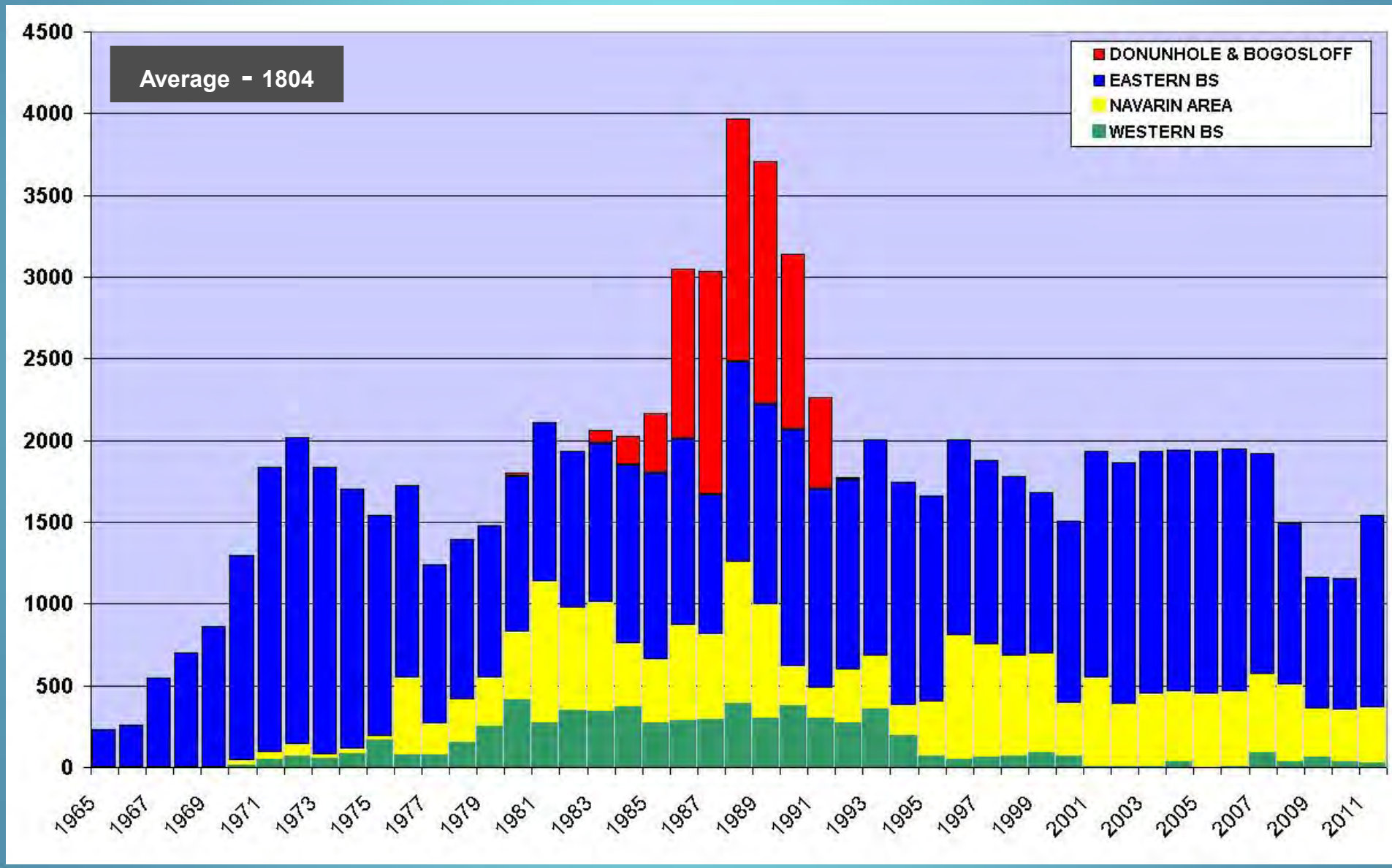
Walleye pollock landings by regions, thous.MT



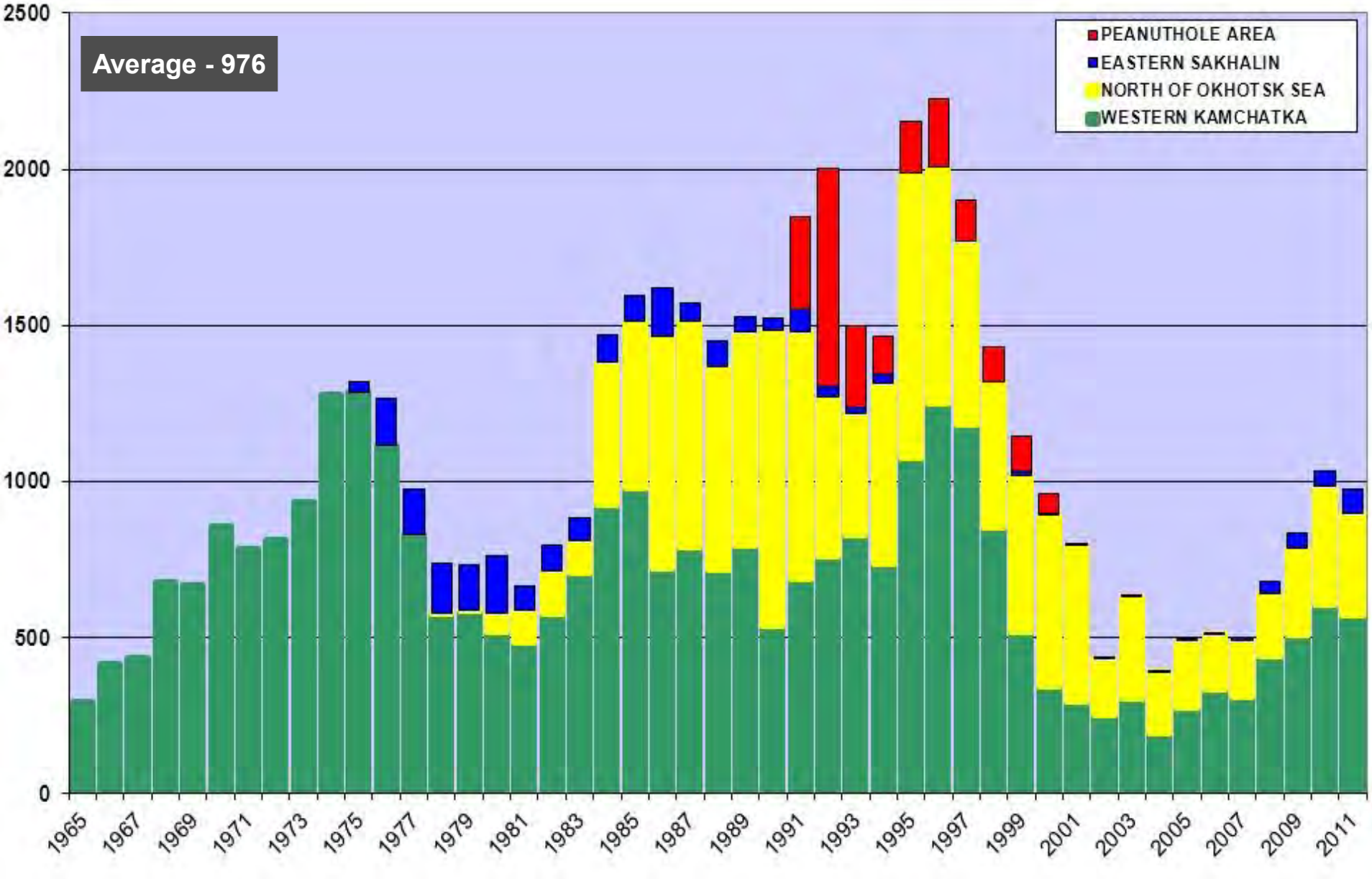
Walleye pollock landings by country (*without DPRK*), thous.MT



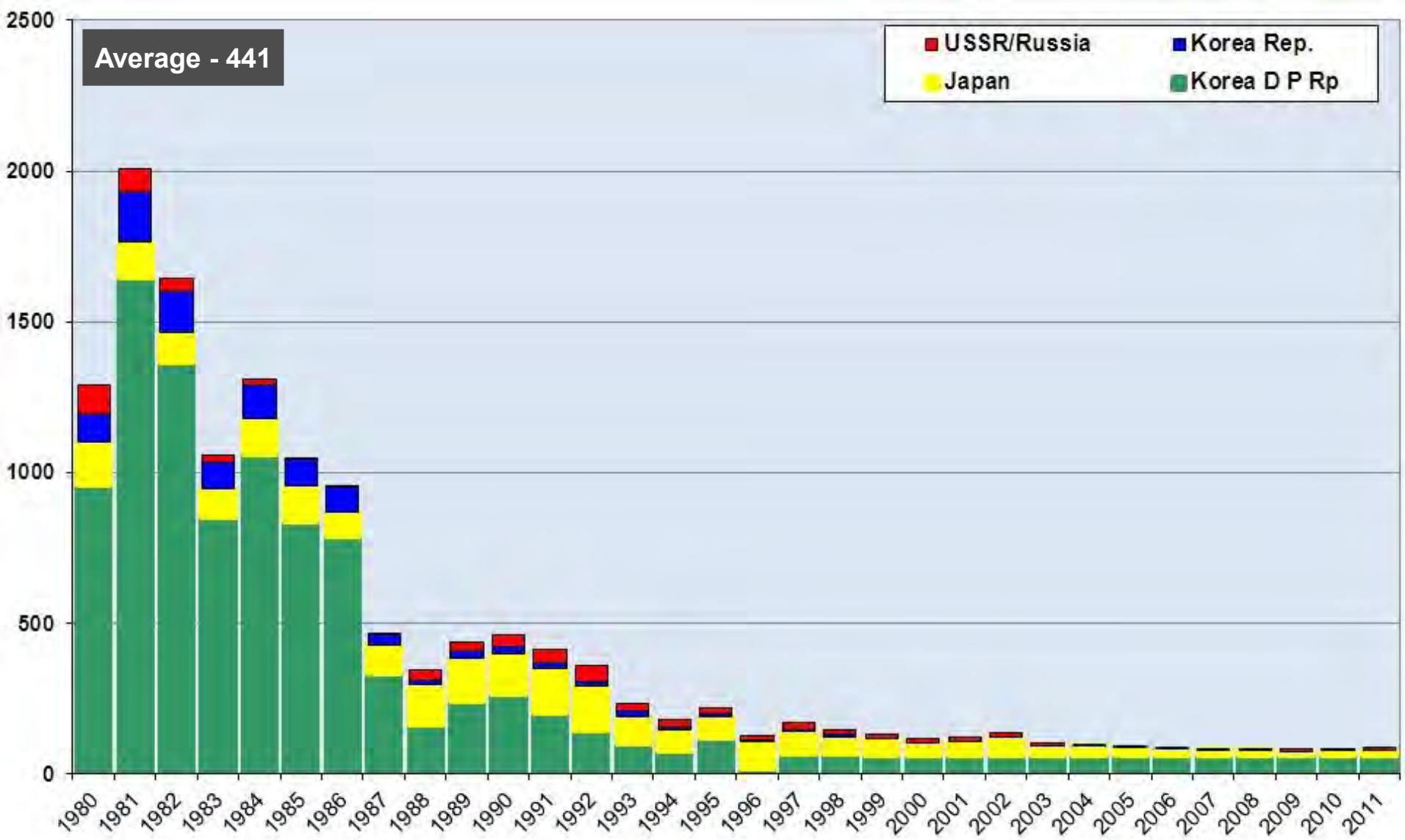
Walleye pollock catch in the Bering Sea, thous.MT



Walleye pollock catch in the Sea of Okhotsk, thous.MT

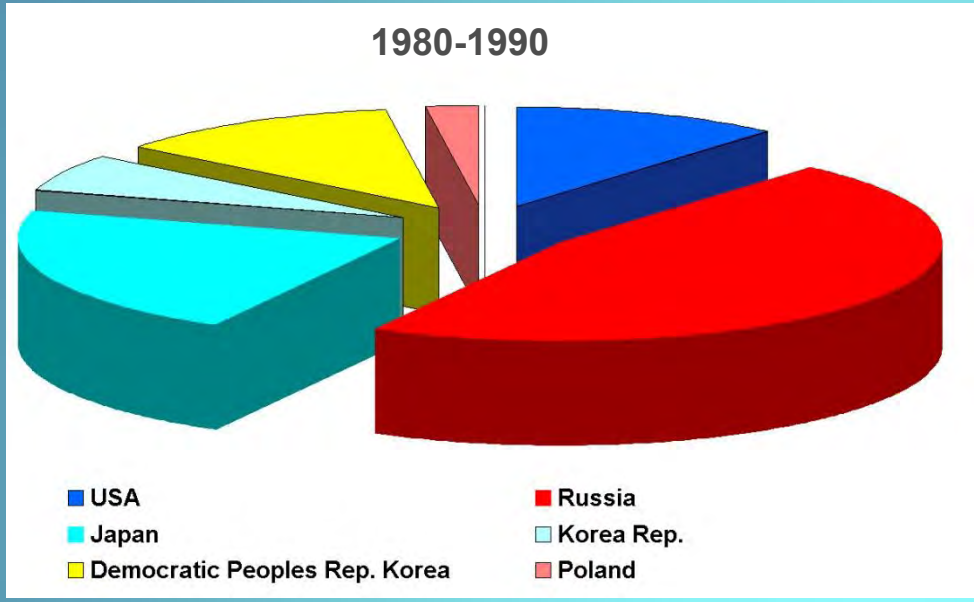


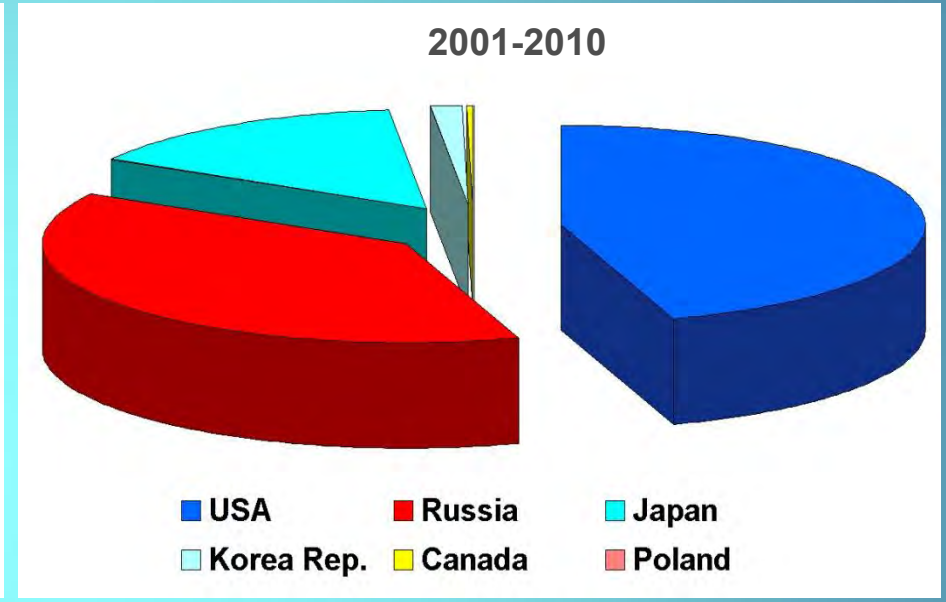
Walleye pollock catch in the Eastern/Japan Sea, thous.MT



Source: Fadeev, Wespestad, 2001; FAO,2011, Makino, pers. comm.

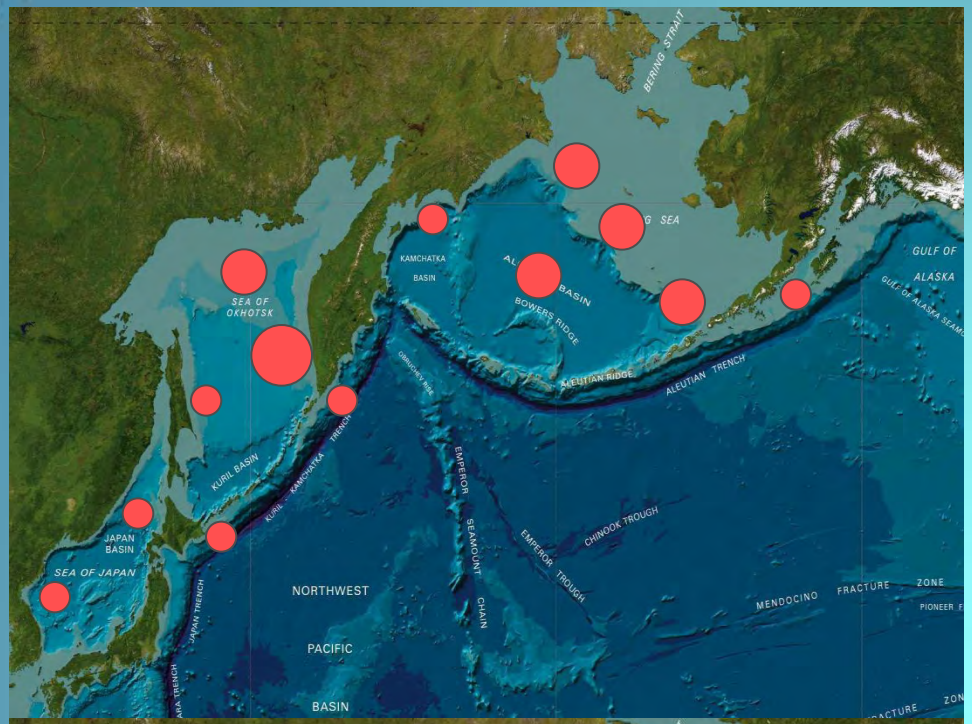
Average walleye pollock catch by country in 1980-1990 and 2001-2010, thous. MT





Country	1000 MT	%%
USSR/Russia	2964,272	46,36
Japan	1375,677	21,52
Democratic Peoples Rep. Korea	772,545	12,08
USA	731,736	11,44
Korea Rep.	382,755	5,98
Poland	148,503	2,32
Peoples Rep. of China	8	0,12
Germany	7,397	0,12
Canada, Ukraine, ROC	3,996	0,06
	6394,881	100

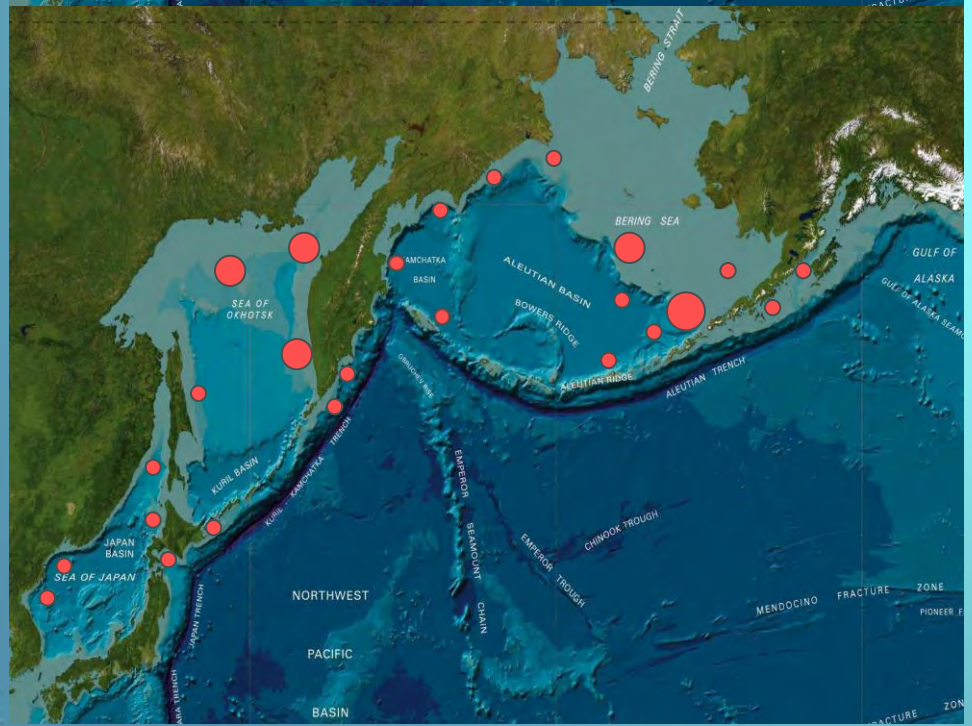
Country	1000 MT	%%
USA	1324,561	48,58
Russia	1130,181	41,45
Japan	222,24	8,15
Korea Rep.	44,829	1,64
Canada	3,022	0,12
Poland	1,659	0,06
	2726,492	100



The main *fishing* grounds in 80s

6 major fishing grounds:
South-east BS, north-east BS, Navarin, Donut Hole, South-west off Kamchatka, North the Sea of Okhotsk

8 average fishing grounds

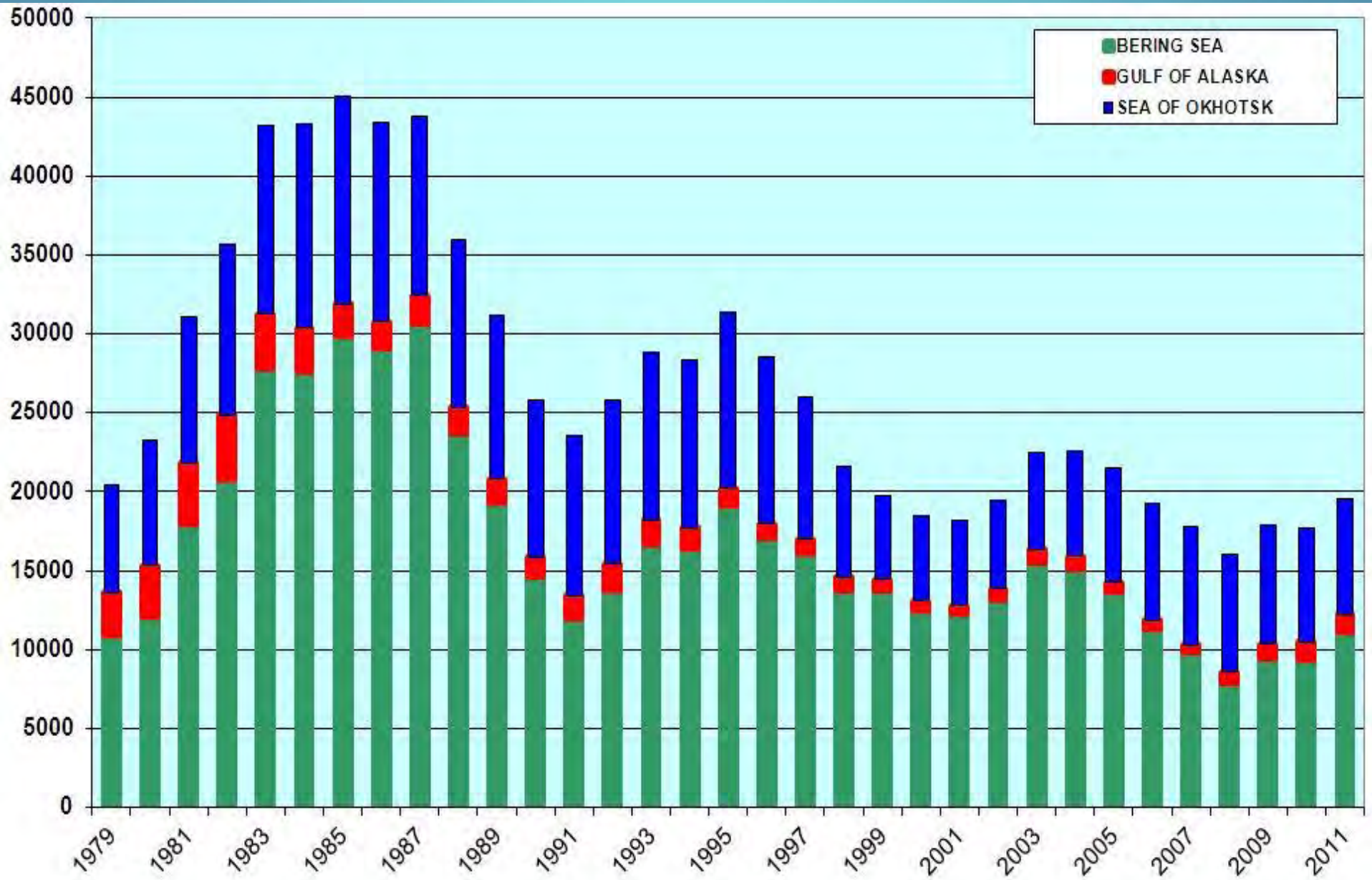


The main *spawning* grounds in 80s

5 major spawning grounds:
South-east BS, north-east BS, South-west off Kamchatka, Norht-west off Kamchatka, North the Sea of Okhotsk

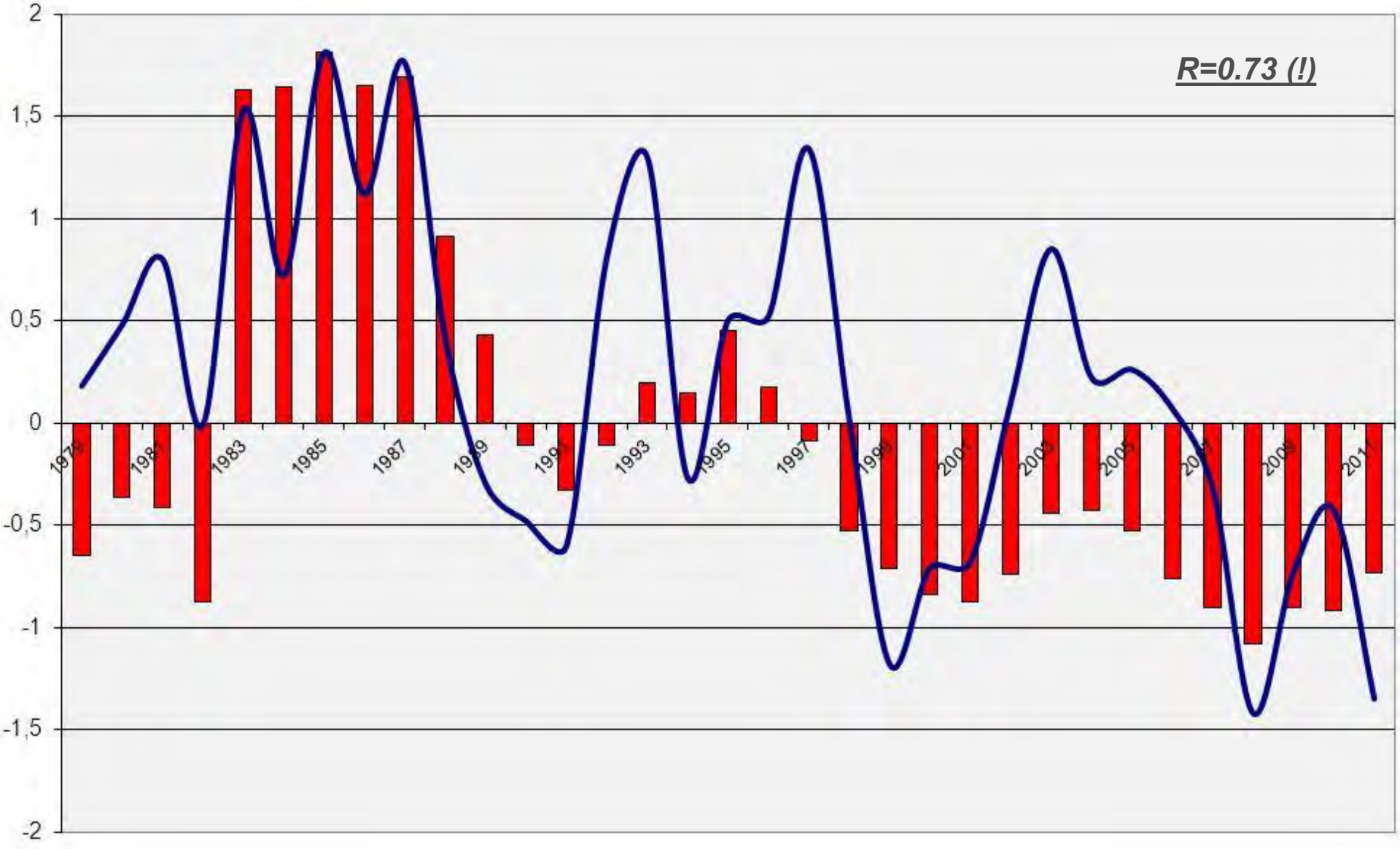
20 average and small spawning grounds

Walleye pollock biomass dynamics in Bering Sea, Gulf of Alaska and Sea of Okhotsk in 1979-2011 (thous. MT)

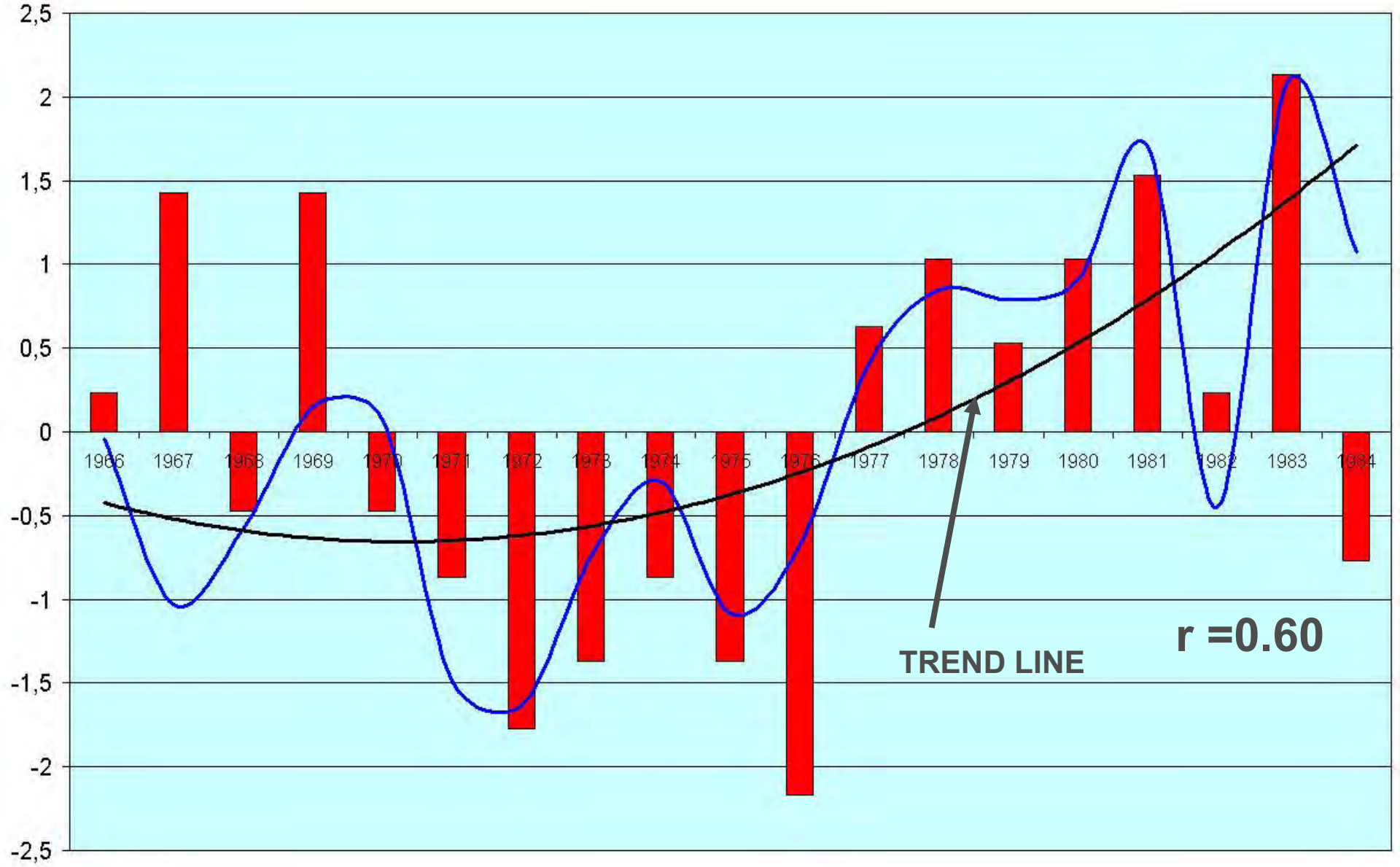


Source: Dorn et al., 2011; Ianelli et al., 2011; Zolotov et al., 2012; KamchatNIRO data

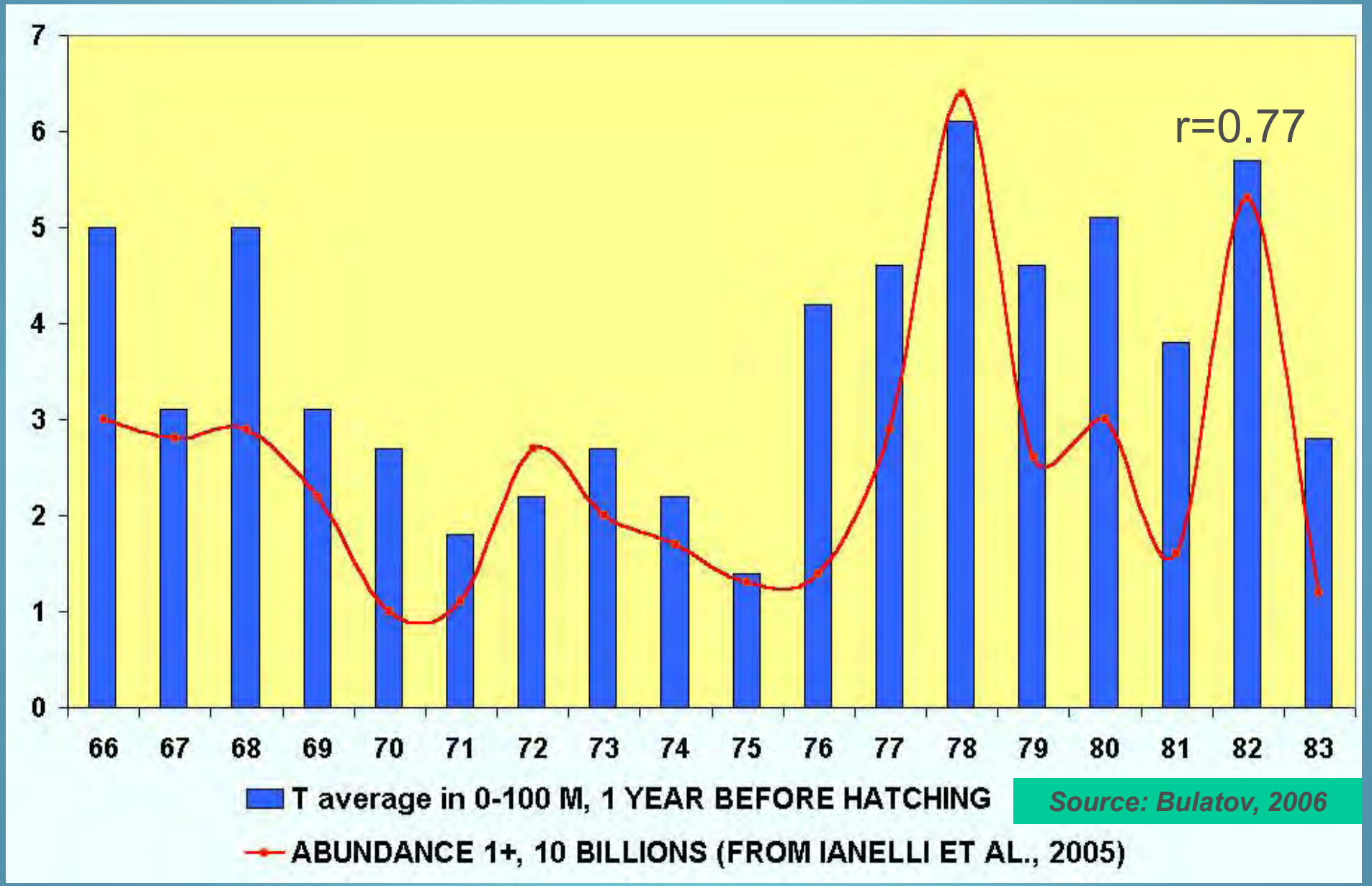
Walleye pollock biomass (GOA+BS+OS, 10 mill.MT) anomalies and PDO dynamics in 1979-2011



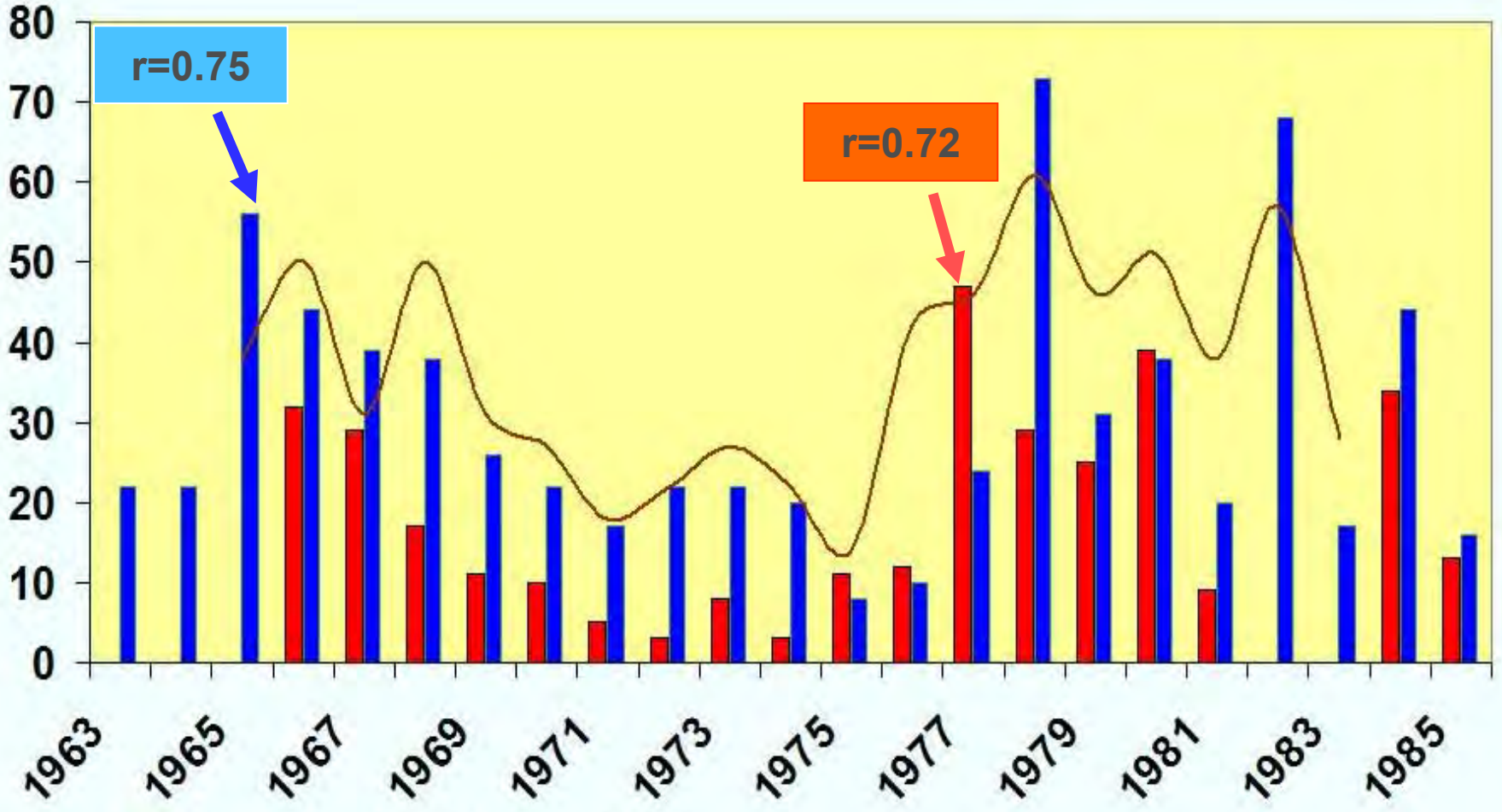
PDO IN APRIL-JUNE VS AVERAGE WATER T IN 0-100 M LAYER IN JULY SOUTHEASTERN BERING SEA, IN 1966-1984



Average temperature and 1+ year pollock abundance in the eastern Bering Sea

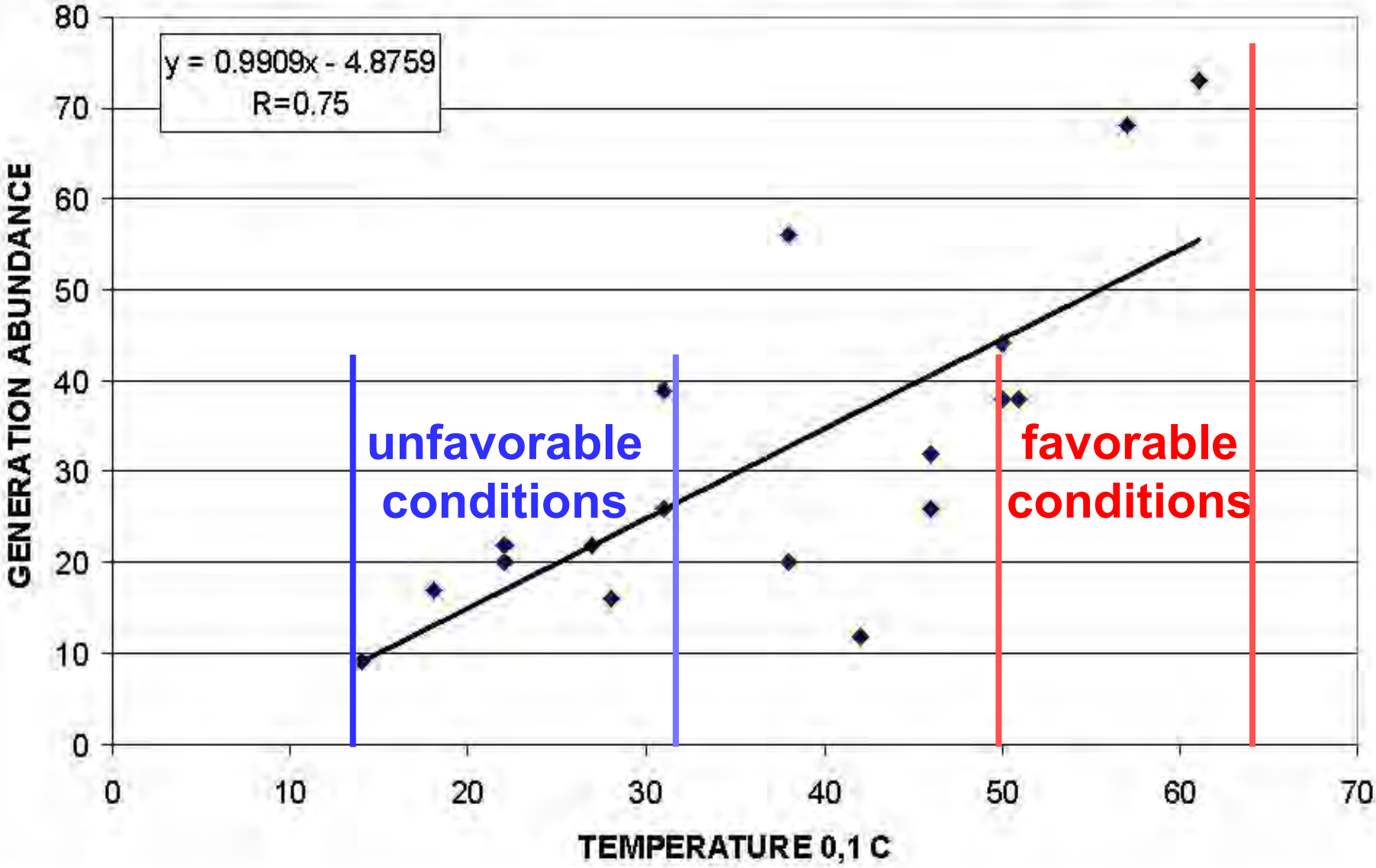


Average water temperature and abundance of 5 years pollock, 100 million

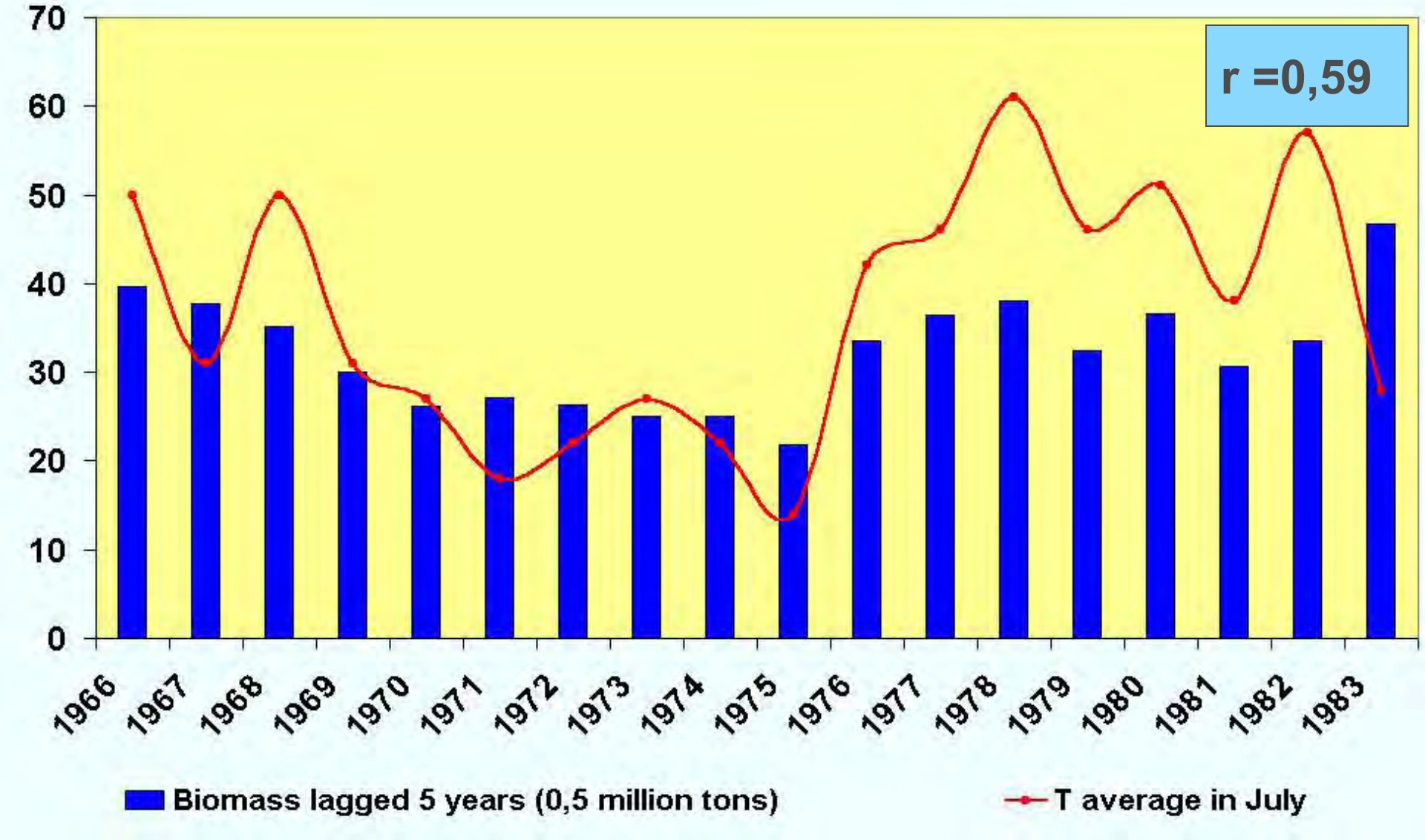


Source: Bulatov, 2006

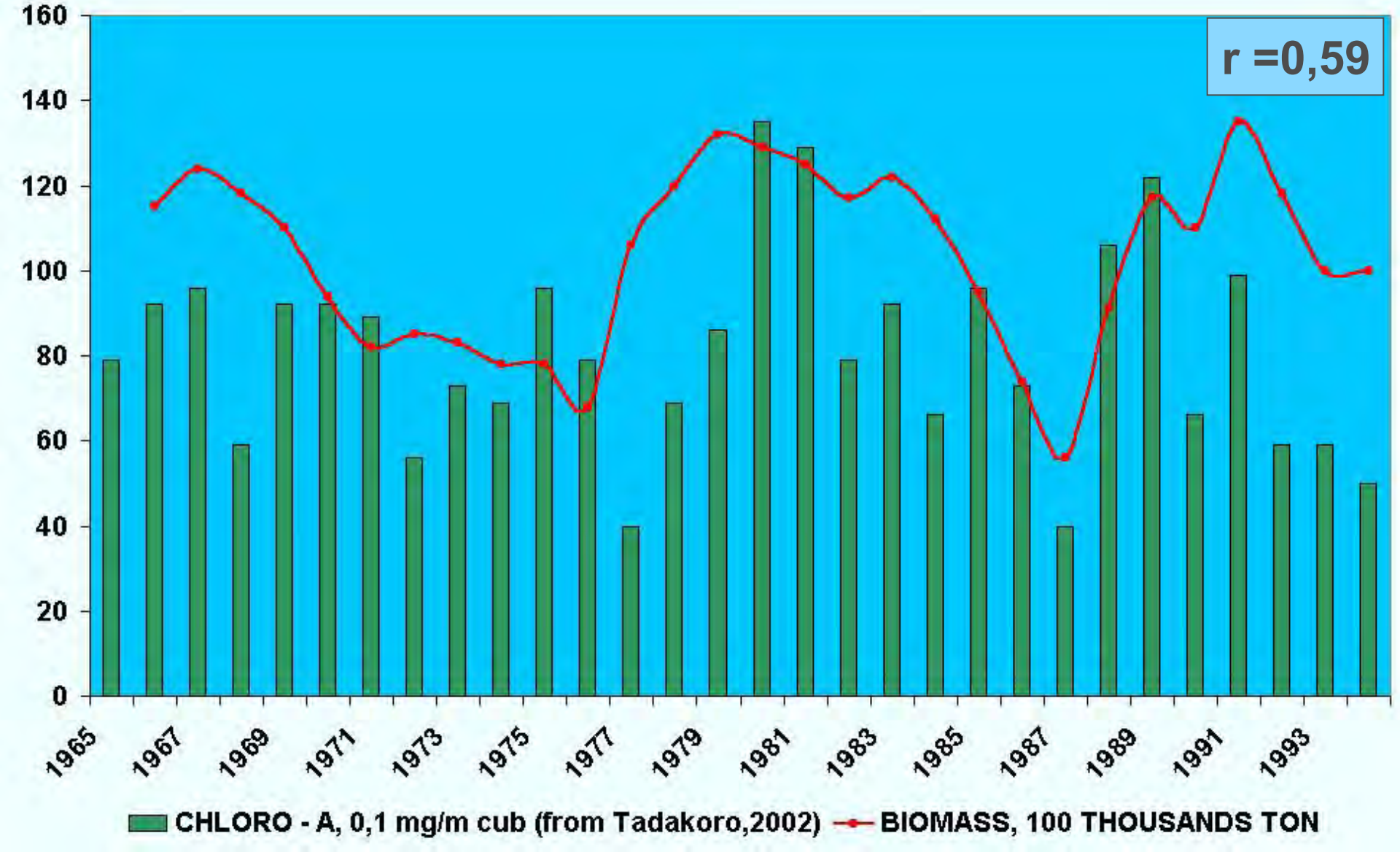
Relationship between average water temperature in 0-100 m layer and numbers of 5 years pollock in the Bering Sea

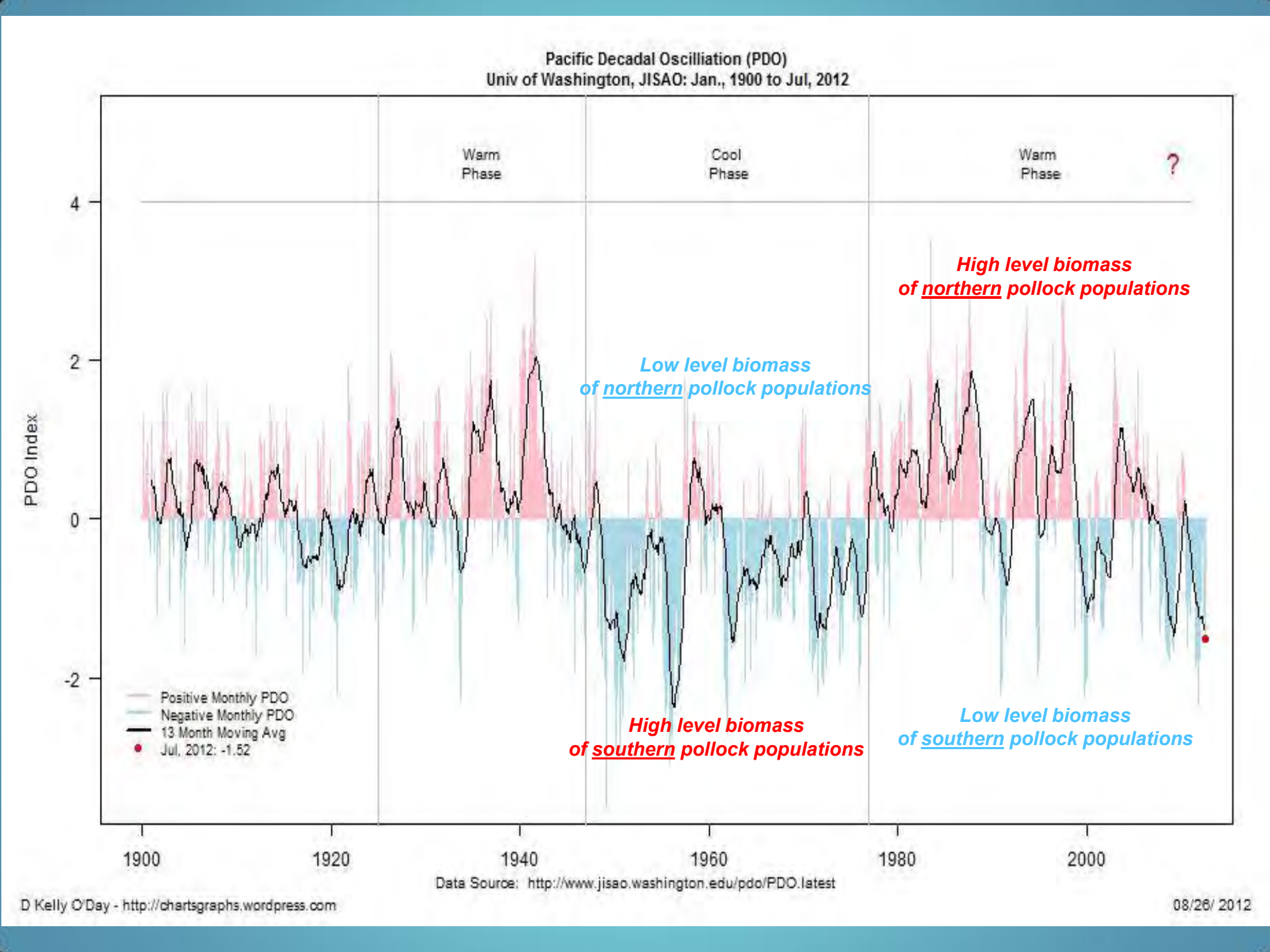


AVERAGE WATER TEMPERATURE (0,1 C) IN JULY AND FISHABLE POLLOCK BIOMASS (LAGGED 5 YEARS) IN THE EASTERN BERING SEA

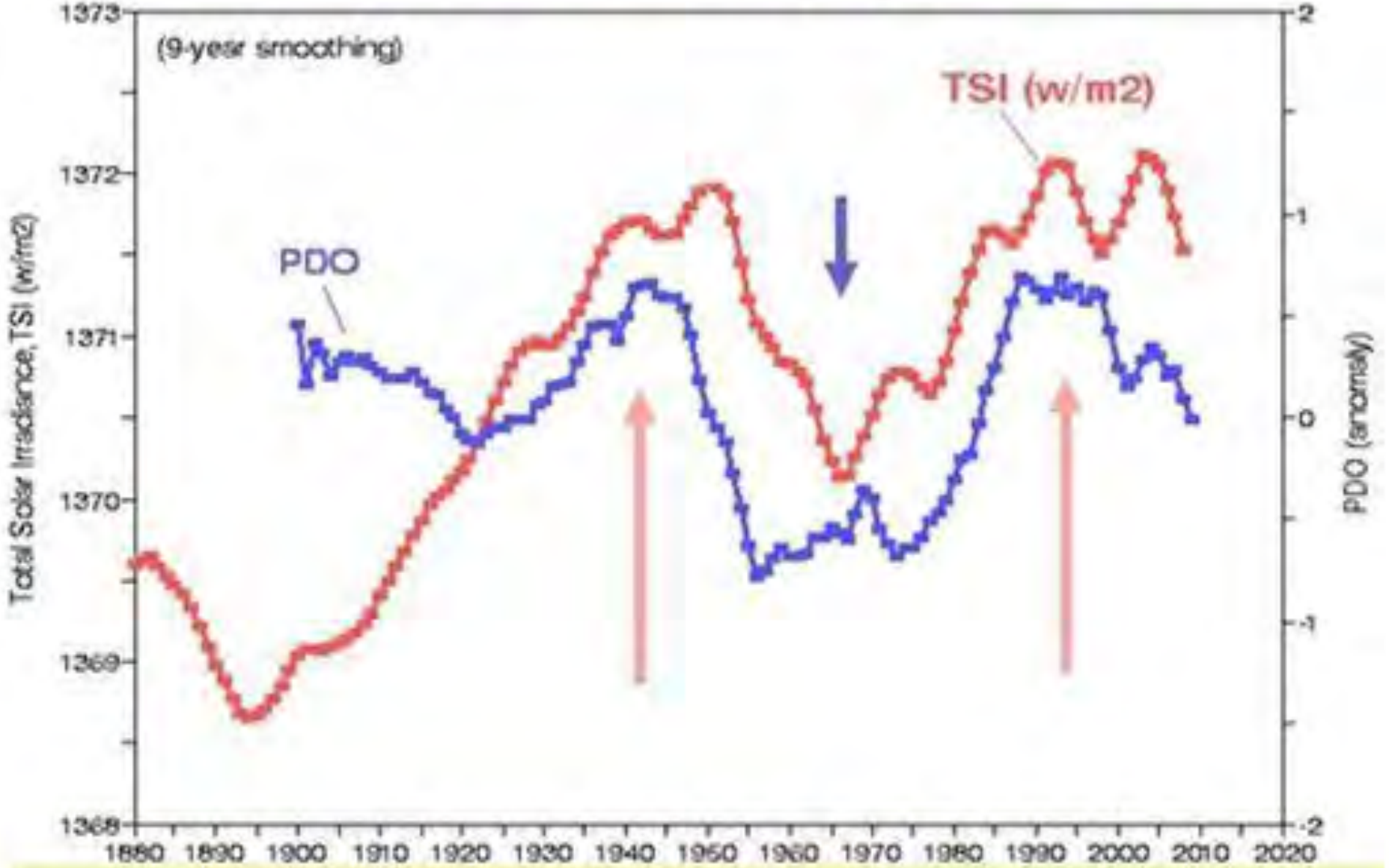


RELATIONSHIP BETWEEN CHLOROPHYLL A CONCENTRATION AND POLLOCK BIOMASS (4 YEARS LAGGED) IN THE EASTERN BERING SEA




Pacific Decadal Oscilliation (PDO)
Univ of Washington, JISAO: Jan., 1900 to Jul, 2012
Warm Phase
Cool Phase
Warm Phase
?
High level biomass of northern pollock populations
Low level biomass of northern pollock populations
High level biomass of southern pollock populations
Low level biomass of southern pollock populations
PDO Index
4
2
0
-2
1900
1920
1940
1960
1980
2000
Positive Monthly PDO
Negative Monthly PDO
13 Month Moving Avg
Jul, 2012: -1.52
Data Source: http://www.jisao.washington.edu/pdo/PDO.latest
D Kelly O'Day - http://chartsgraphs.wordpress.com
08/26/ 2012

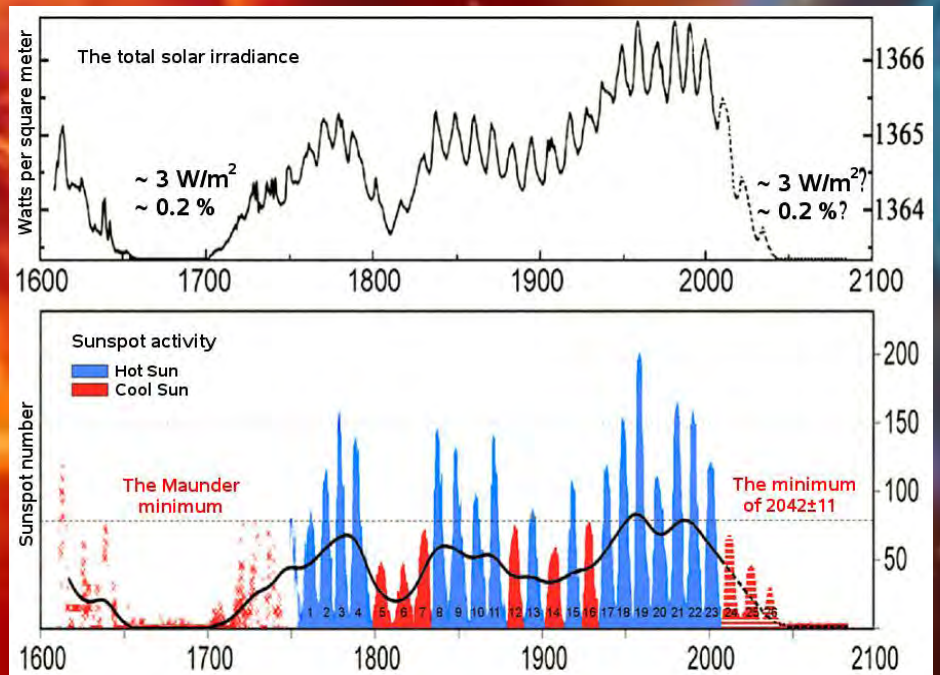
Comparative dynamics of Pacific Decadal Oscillation (PDO) and Total Solar Irradiation (TSI), 1880-2008

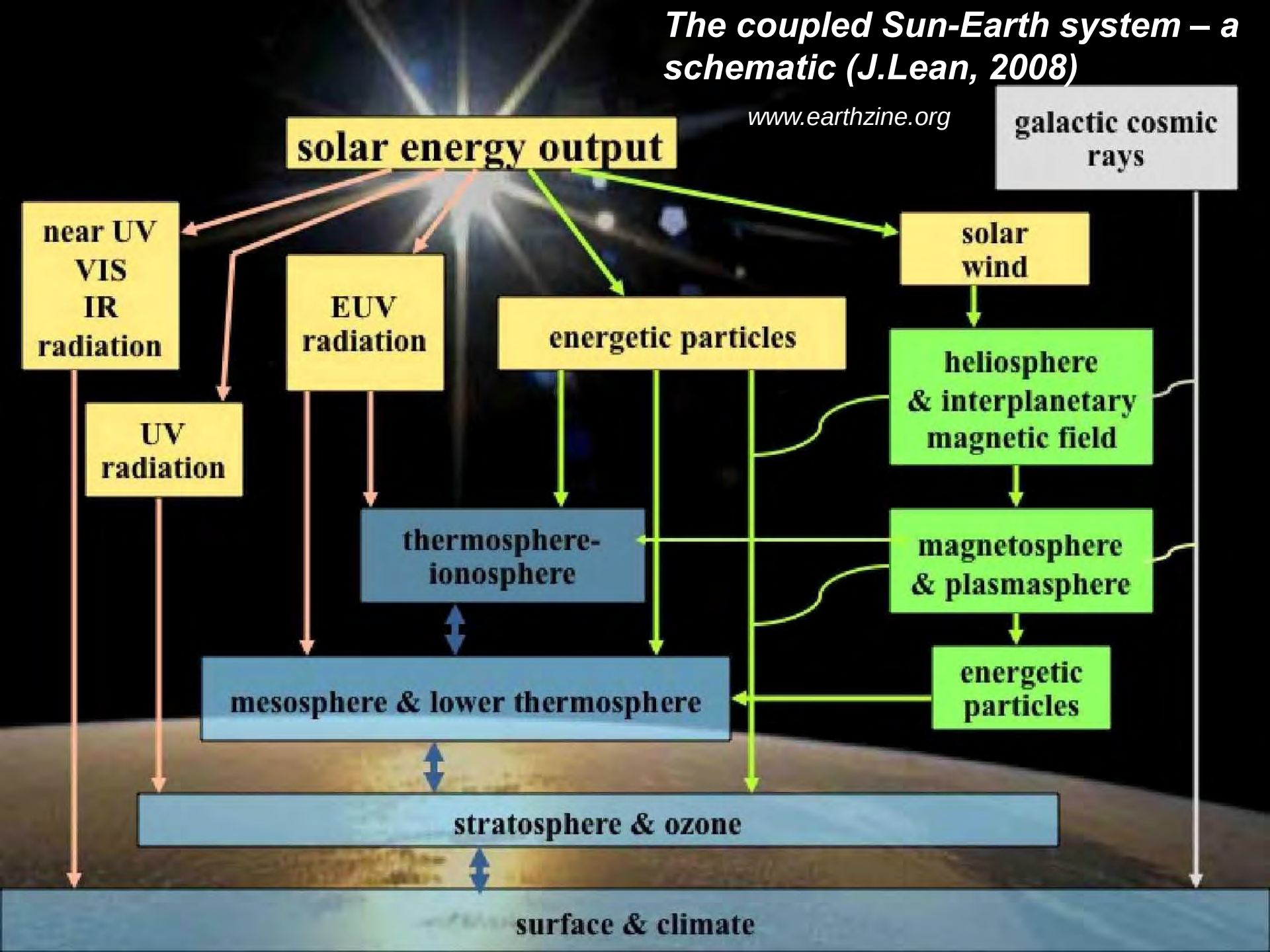


PDO- TSI - Hoyt/Willson

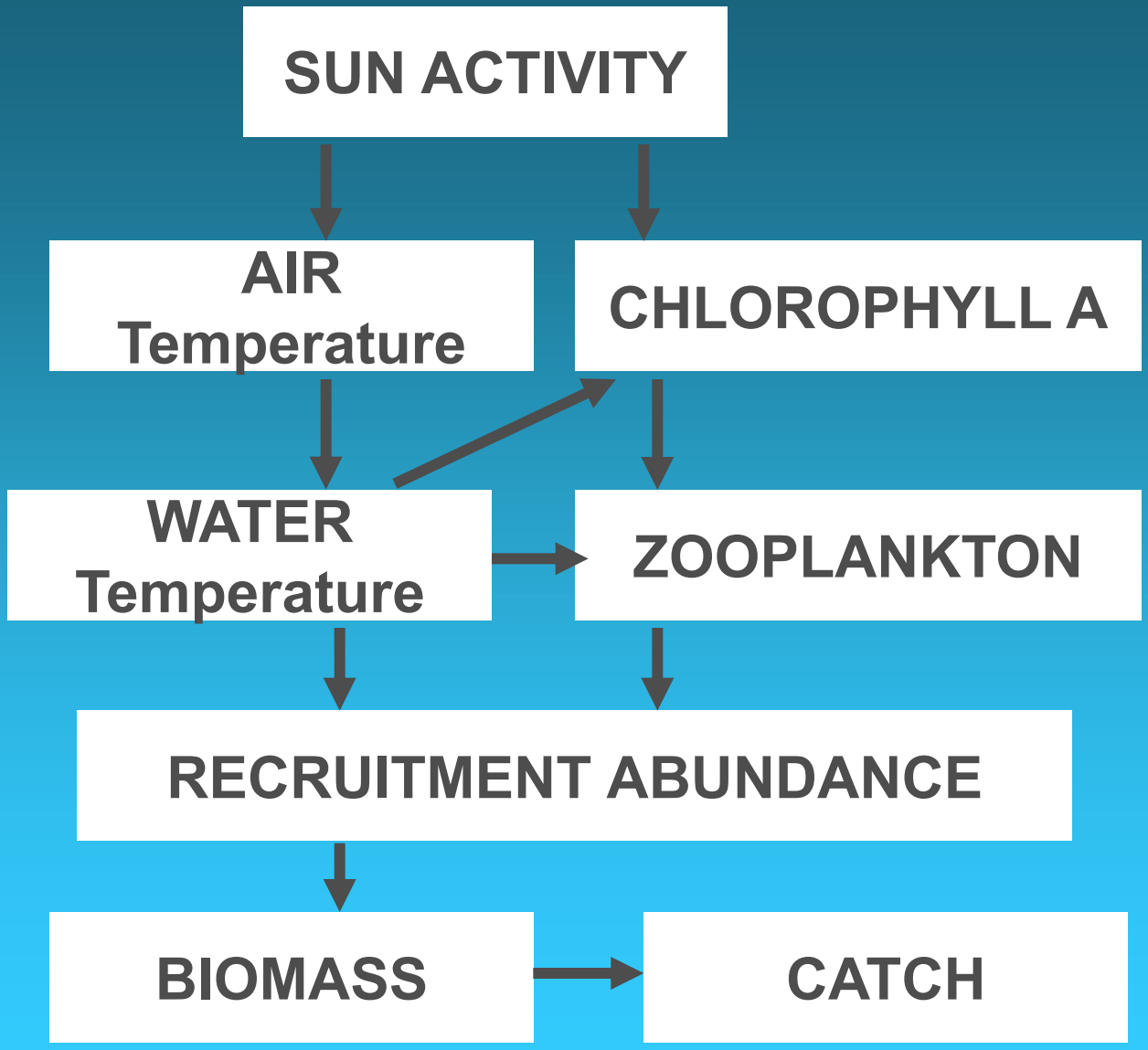
DYNAMICS OF THE TOTAL SOLAR IRRADIANCE (TSI) AND SUNSPOT ACTIVITY IN 1600-2000 AND FORECAST UP TO 2080

TSI occurs as a result of fluctuations in the radius of the Sun with an amplitude of up to 250 km in the 11-year cycle

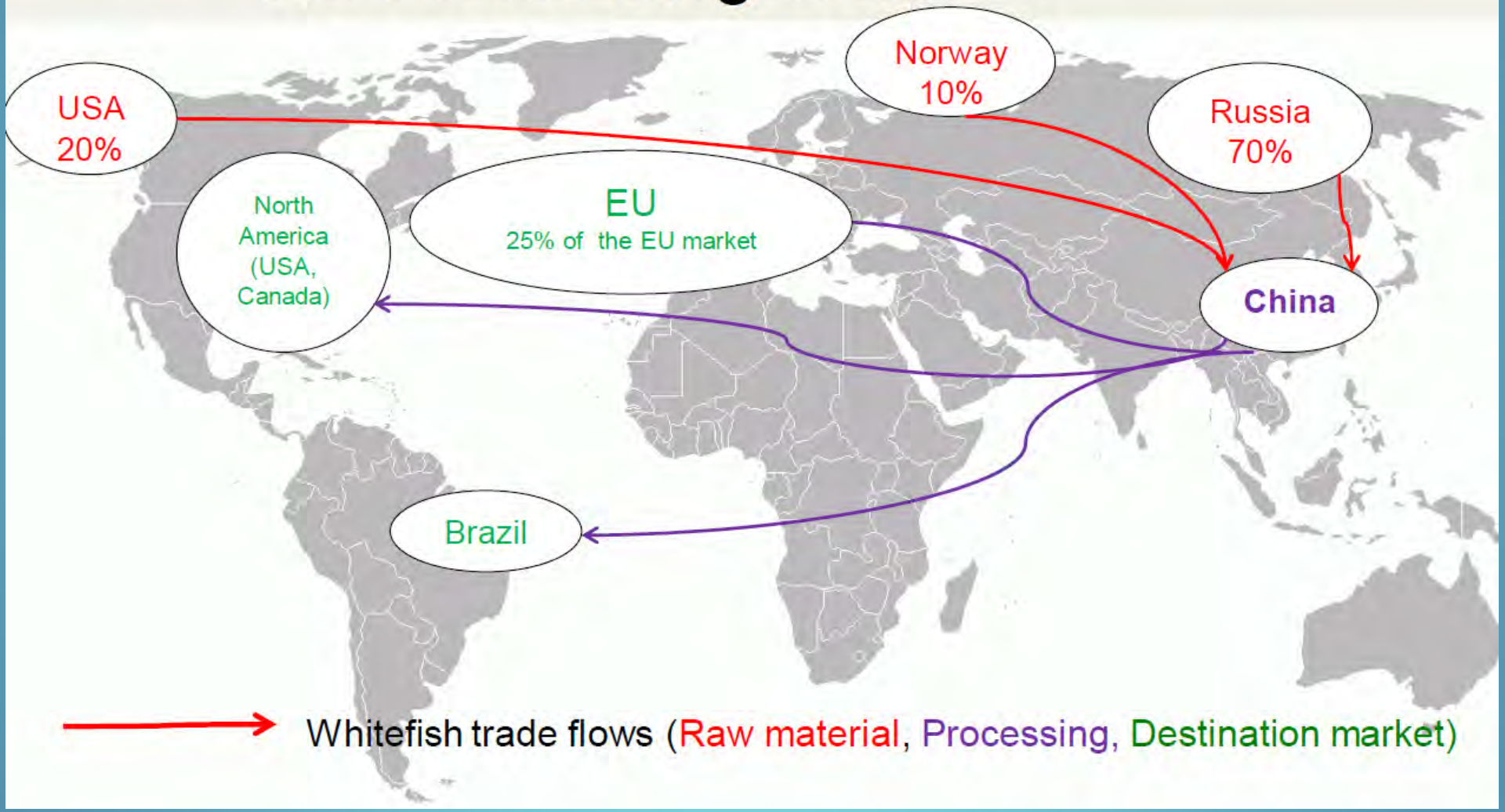



The coupled Sun-Earth system – a schematic (J.Lean, 2008)
www.earthzine.org
solar energy output
galactic cosmic rays
near UV VIS IR radiation
EUV radiation
energetic particles
solar wind
heliosphere & interplanetary magnetic field
UV radiation
thermosphere-ionosphere
magnetosphere & plasmasphere
energetic particles
mesosphere & lower thermosphere
stratosphere & ozone
surface & climate

FROM SUN TO CATCH



Global Alaska Pollock and Cod Re-Processing Trade



Source: Tatjana Gerling, 2012

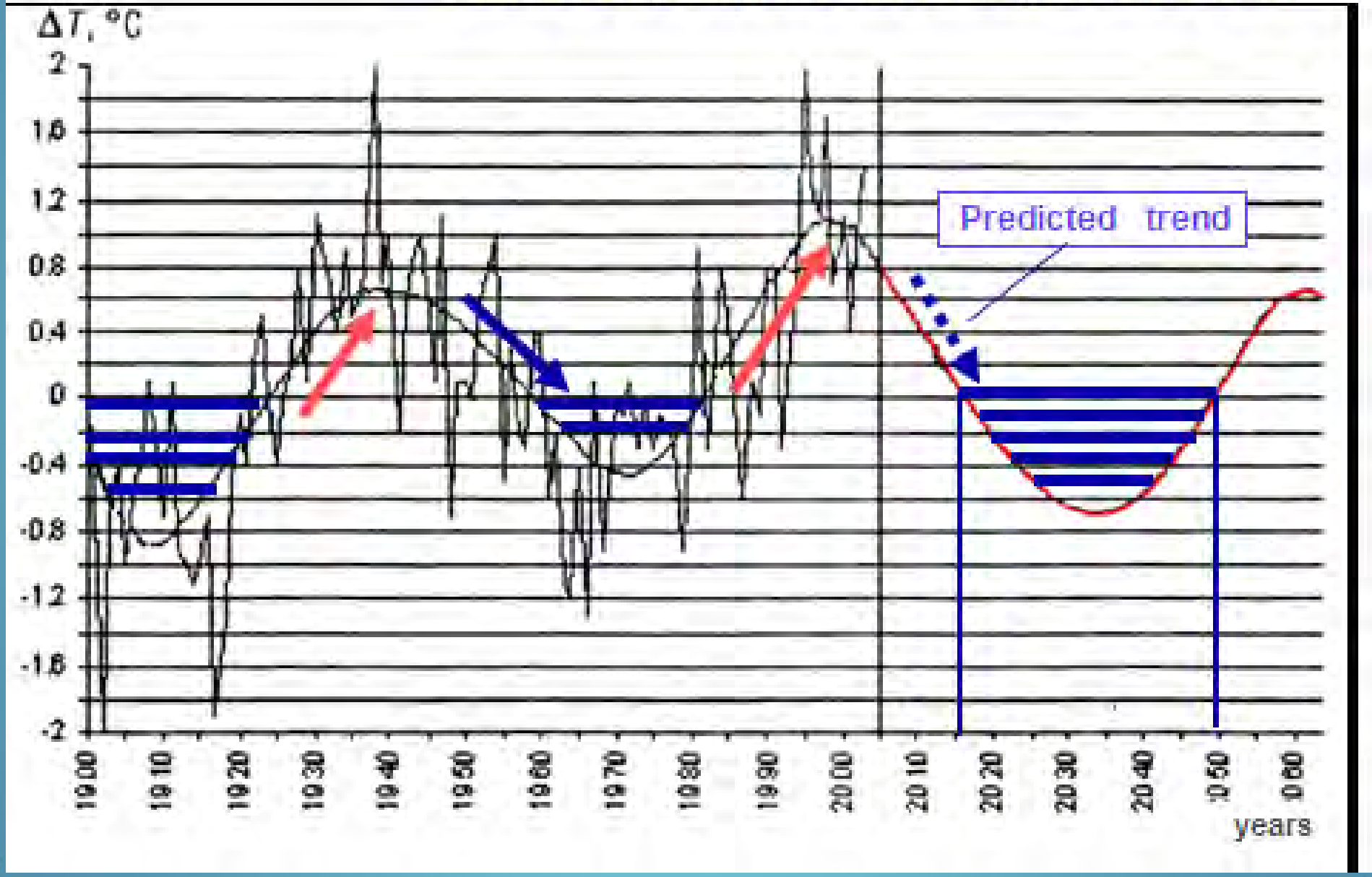
"If the cycles continue as in the past,
the current warm cycle should end soon
and global temperatures should
cool slightly until about 2035,
then warm about 0.5°C from ~2035 to ~2065,
and cool slightly until 2100.

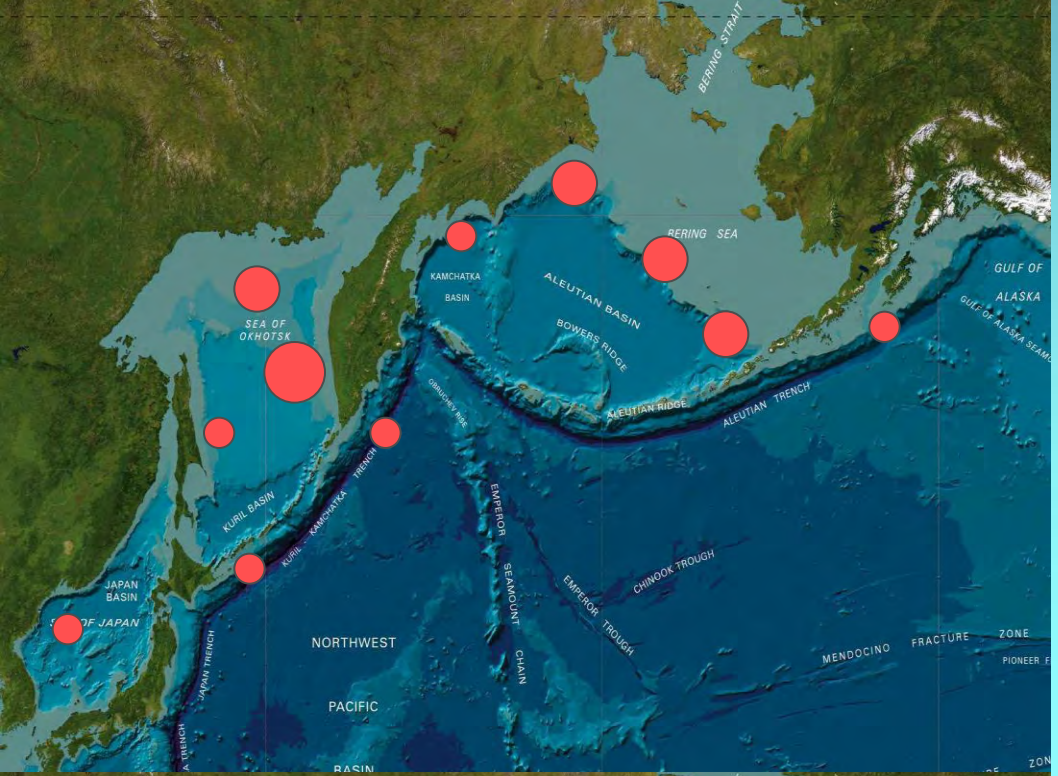
The total increase in global warming
for the century should be ~0.3 °C,
rather than the catastrophic warming of
3- 6°C predicted by the IPCC."

Source: Easterbrook, 2010

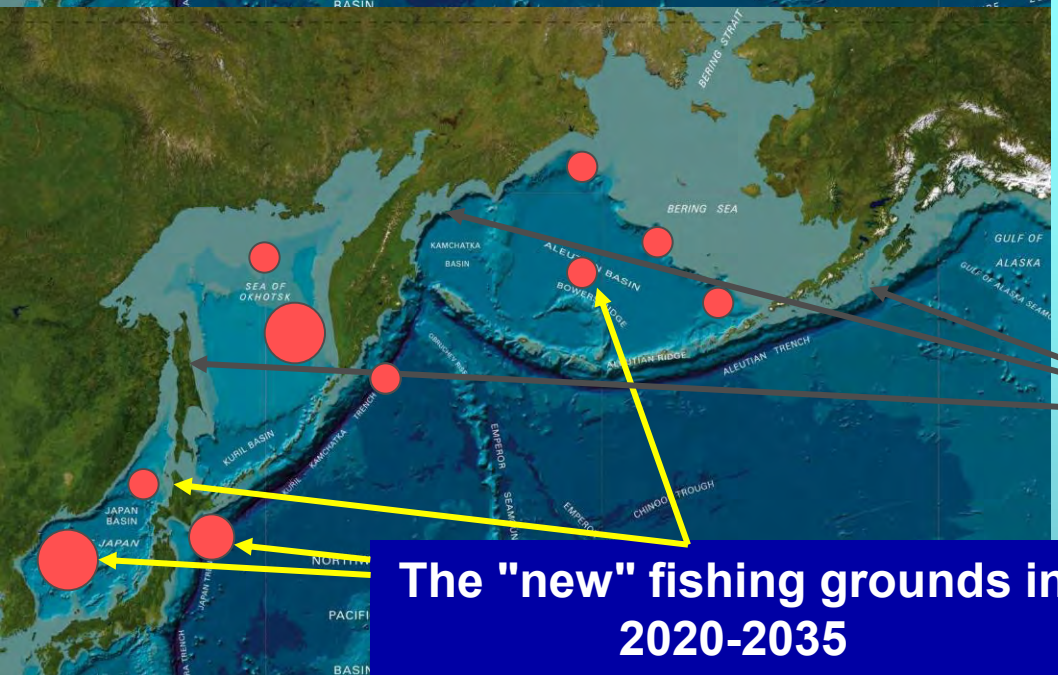
Arctic air surface temperature 1900-2005 and its probable long term trend according to prediction of Russian Arctic and Antarctic Research Institute (AARI)

From : Frolov et al., 2009. "Climate Change in Eurasian Arctic Shelf Seas. Centennial Ice Cover Observations. Praxis Publishing Ltd, Chichester, UK. 164p. "





The main fishing grounds in 1990-2010



The possible fishing grounds in 2020-2035

"disappiared" fishing grounds in 2020-2035

The "new" fishing grounds in 2020-2035

Walleye pollock biomass forecast up to 2050

REGION	2015 (Average T) -2035	2035 (Min T) - 2050
GULF OF ALASKA	VERY LOW BIOMASS	SHARPLY INCREASING BIOMASS
EASTERN BERING SEA	DECREASING OF BIOMASS	SHARPLY INCREASING BIOMASS
NORTH & WEST BERING SEA	VERY LOW BIOMASS	SHARPLY INCREASING BIOMASS
EASTERN SEA OF OKHOTSK	DECREASING OF BIOMASS	SHARPLY INCREASING BIOMASS
NORTH & WEST SEA OF OKHOTSK	VERY LOW BIOMASS	SHARPLY INCREASING BIOMASS
SEA OF JAPAN & PACIFIC COAST	SHARPLY INCREASING BIOMASS	VERY LOW BIOMASS

Conclusions

According to temperature forecast, expected in the 2015-2030 climate cooling, leading to a significant reduction of stocks of northern populations of walleye pollock in Gulf of Alaska and the Bering Sea.

In the Sea of Okhotsk walleye pollock stocks have stabilized at a low level, and in the Sea of Japan and the Pacific coast of Japan will increase significantly southern populations of walleye pollock in the 2020-2040.

The change in temperature can lead to changes in the global supply of pollock to the world market, such as: reducing the U.S. share, the preservation of Russia's share, a sharp increase in the share of Japan, North and South Korea.

Painting of the frozen Thames in 1663 by Jan Grifier