Jellyfish of the Far Eastern Seas of Russia: Composition, spatio-temporal variations and significance for ecosystems and economics

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Photo: O. Ivanov


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OUTLINES

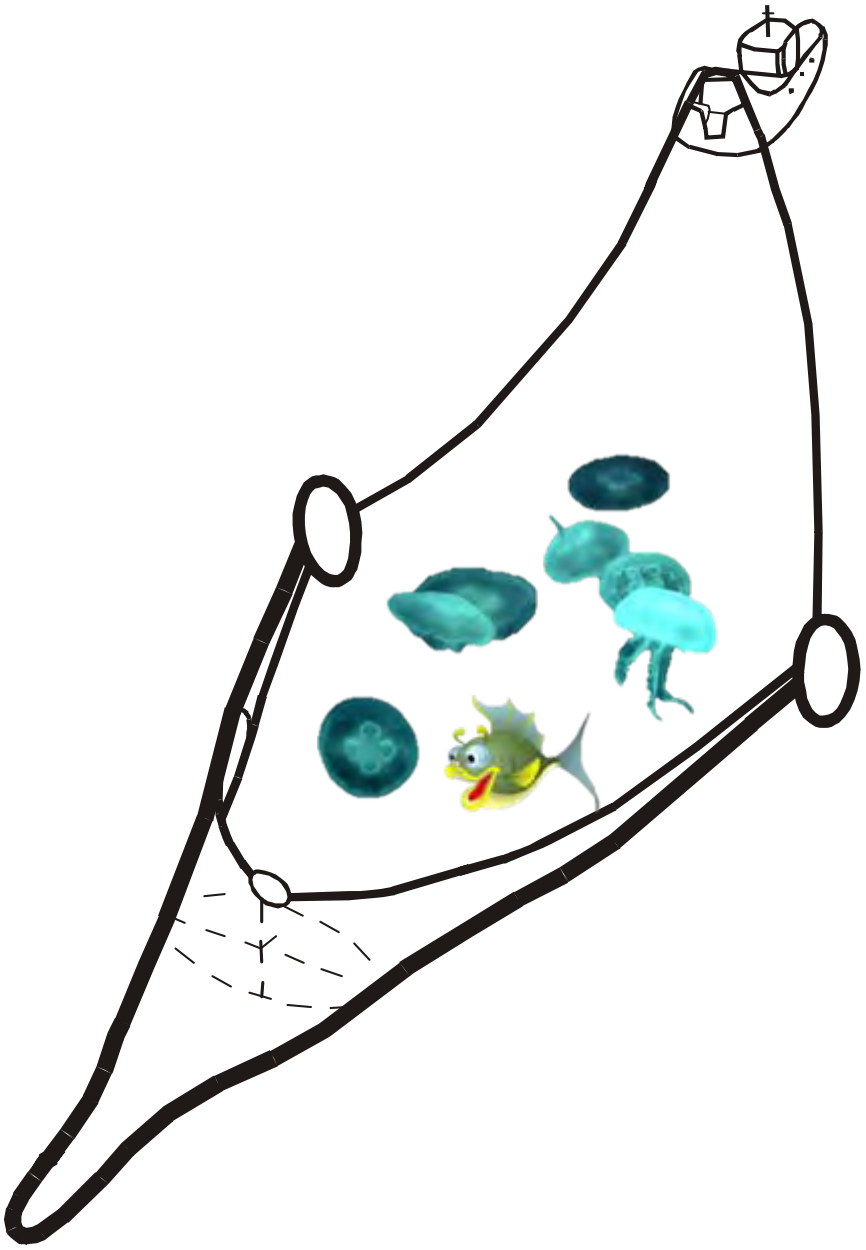
Jellyfish of the Far Eastern Seas (FESs) of Russia

- **Species composition**
- **Spatial distribution**
- **Biomass trends**

- **Small-sized jellyfish distribution and biomass**

- **Comparison with other regions of the World Ocean**

- **Significance of jellyfish blooms in the FESs for ecosystems and economics**



Materials and methods

Trawl surveys

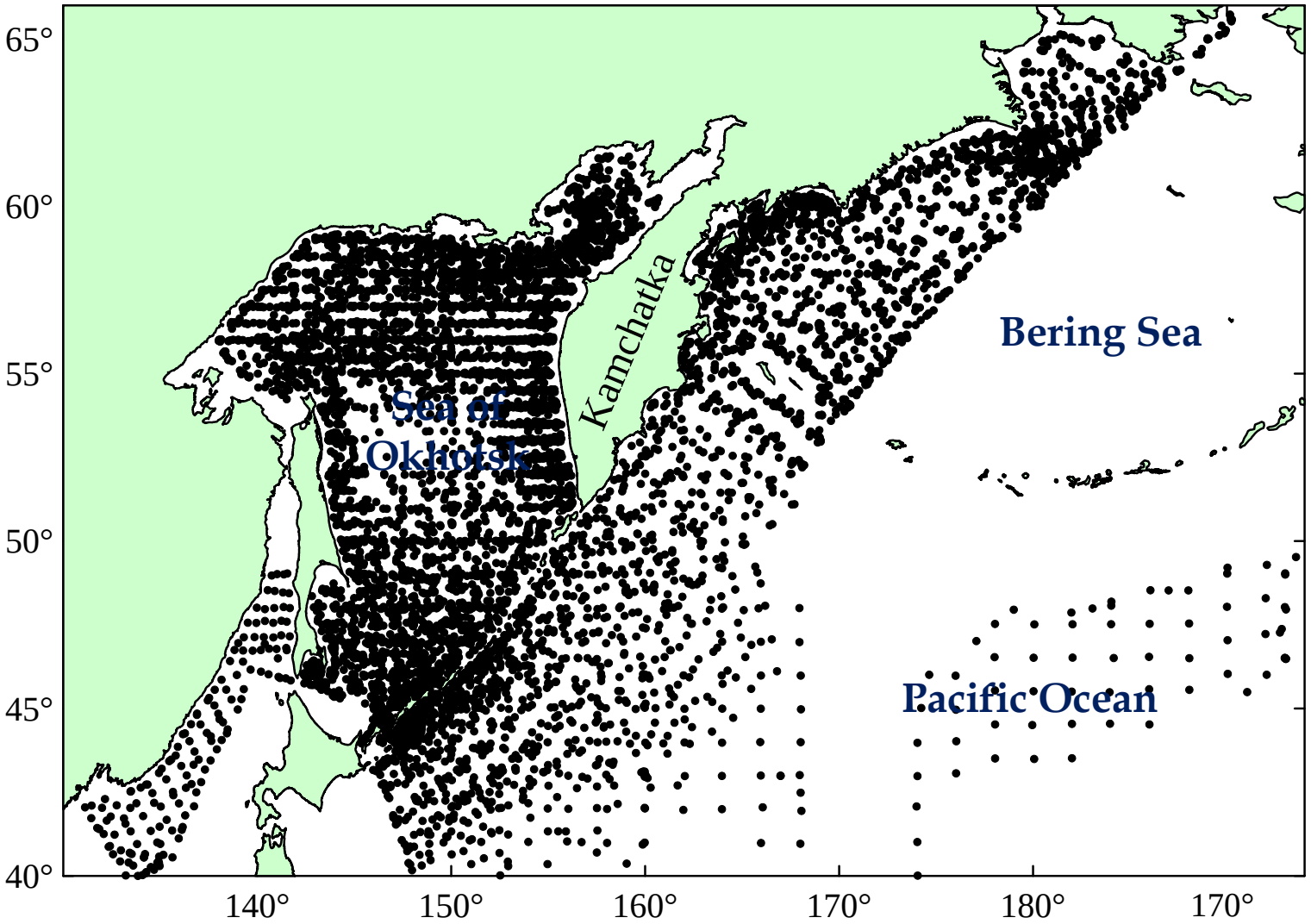
1990-2011

51 surveys

More than 10,000 trawl operations

Big-sized (> 1 cm) jelly

Studied area covered more than 7 mln square km

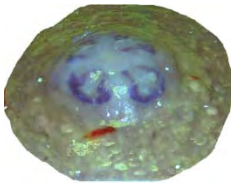


Species composition

SCYPHOZOA

Aurelia limbata

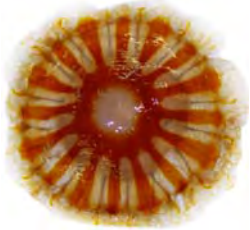
Aurelia labiata



Aurelia aurita

Cyanea capillata

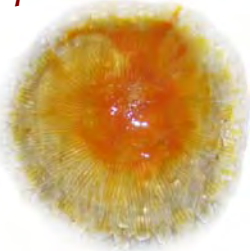
Chrysaora melanaster



?Chrysaora pacifica

Atolla wyvillei

Phacellophora camtschatica



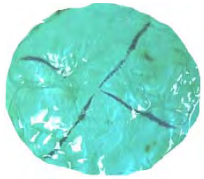
Periphylla periphylla

HYDROZOA

Aequorea sp.

Calycopsis nematophora

Staurophora mertensii

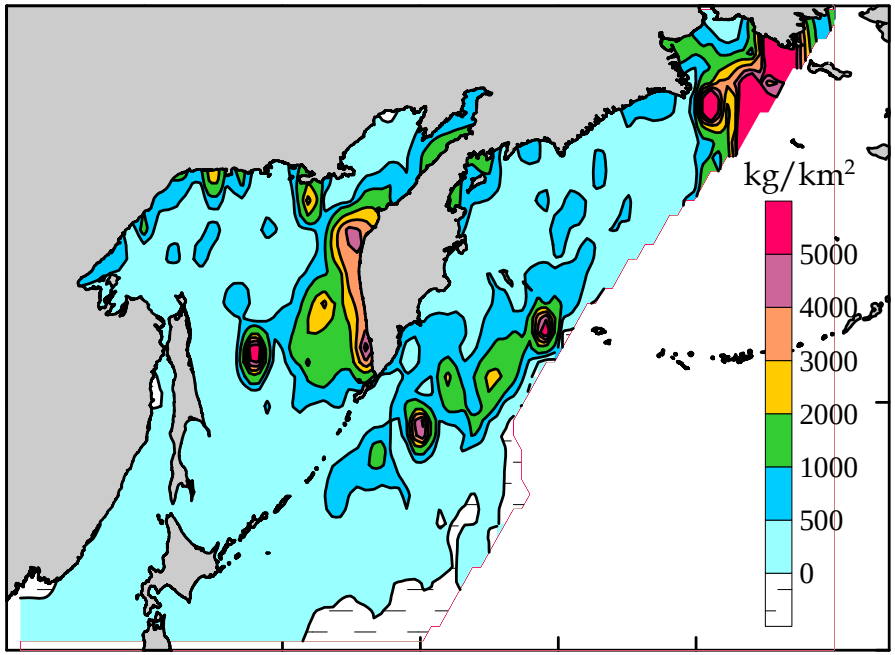


Tima sachalinensis

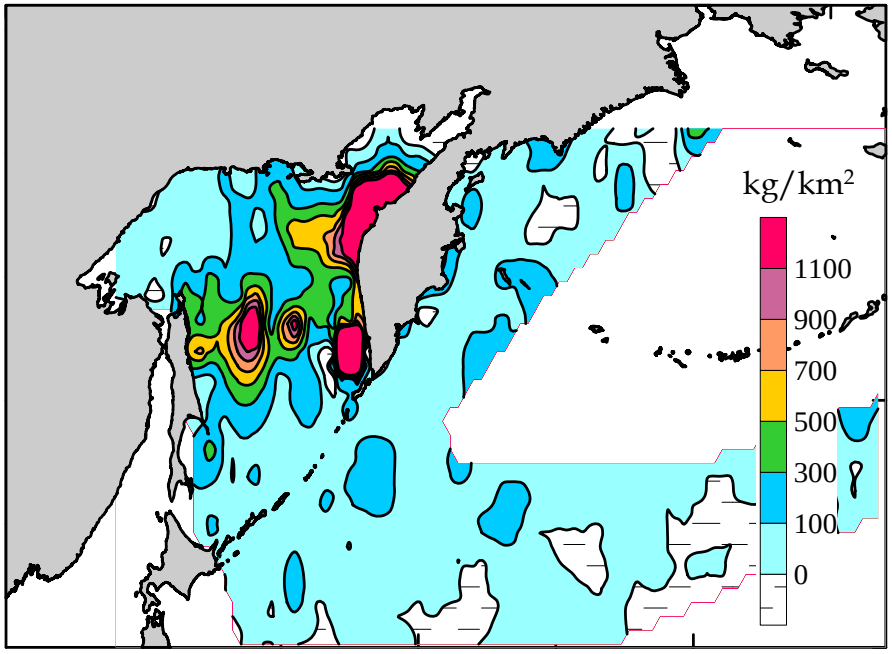
Ptychogena lactea

Distribution of jellyfish biomass, 1990-2011

Summer and autumn

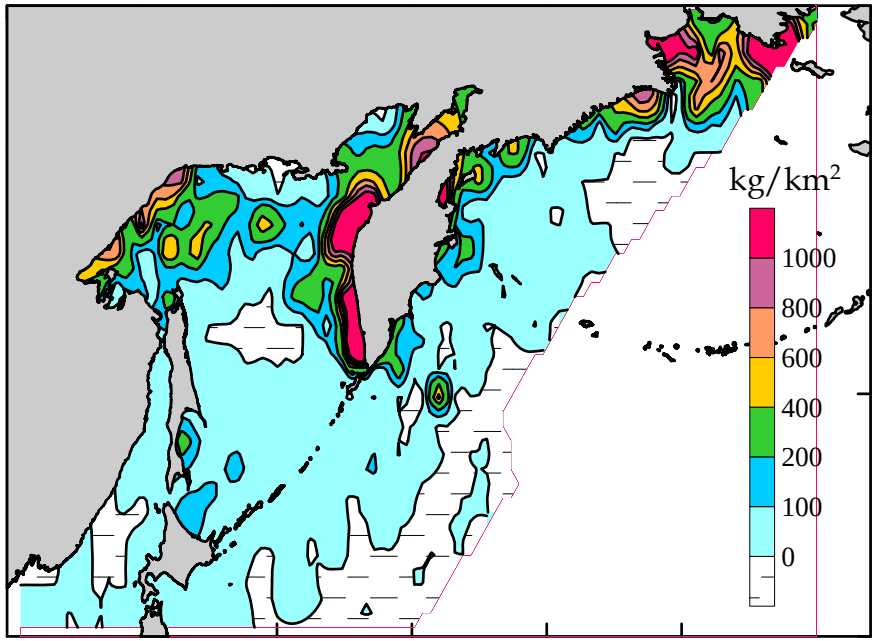


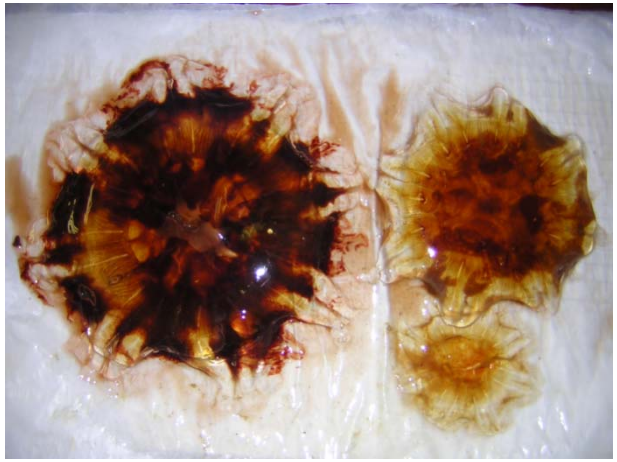
Winter and spring



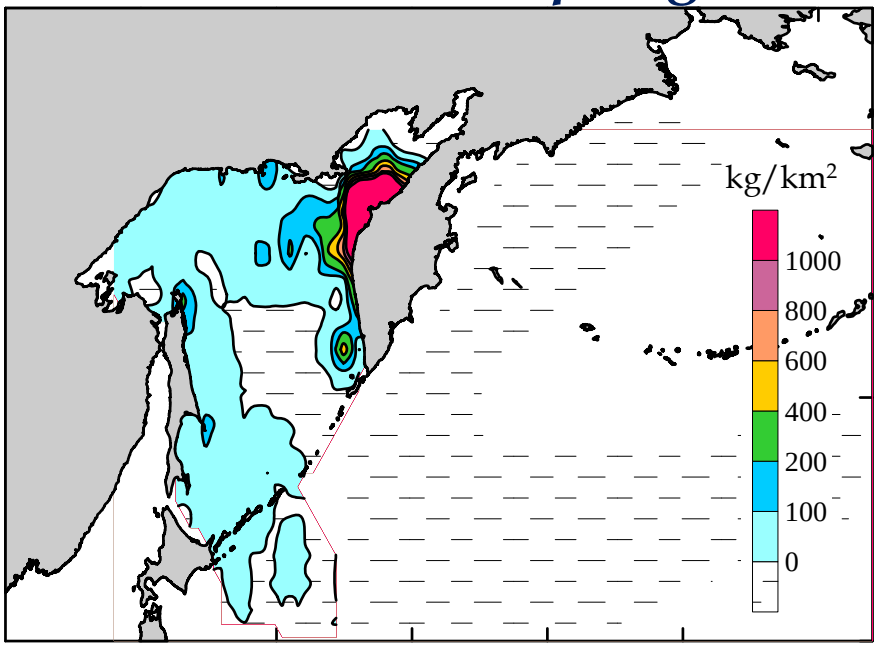
Distribution of *Cyanea capillata* biomass

Summer and autumn





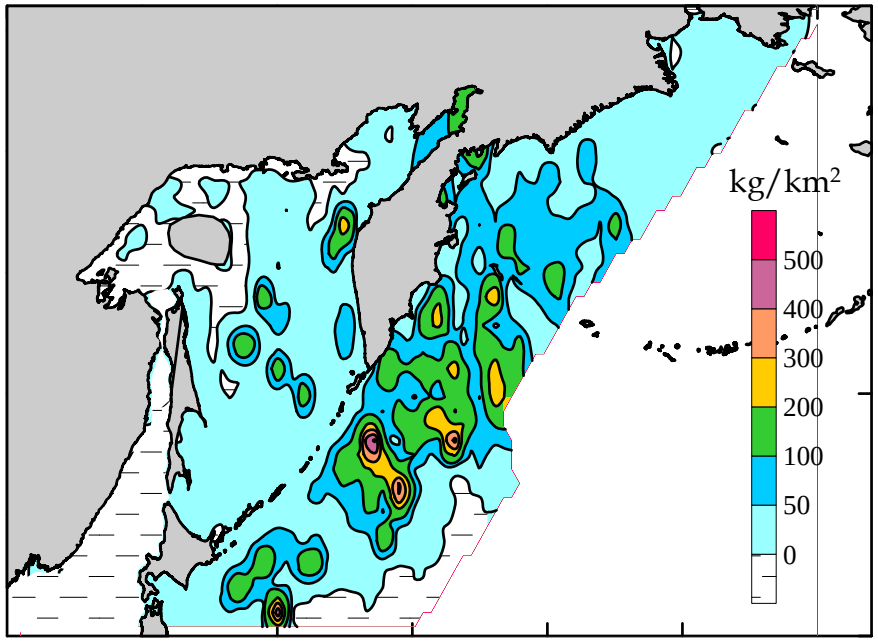
Winter and spring

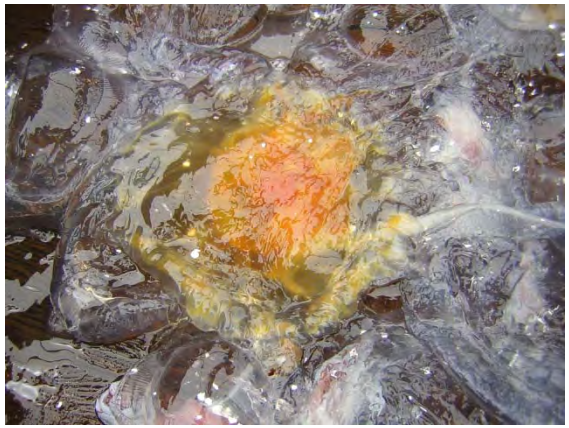


Aurelia, Chrysaora and Ptychogena had similar distribution patterns

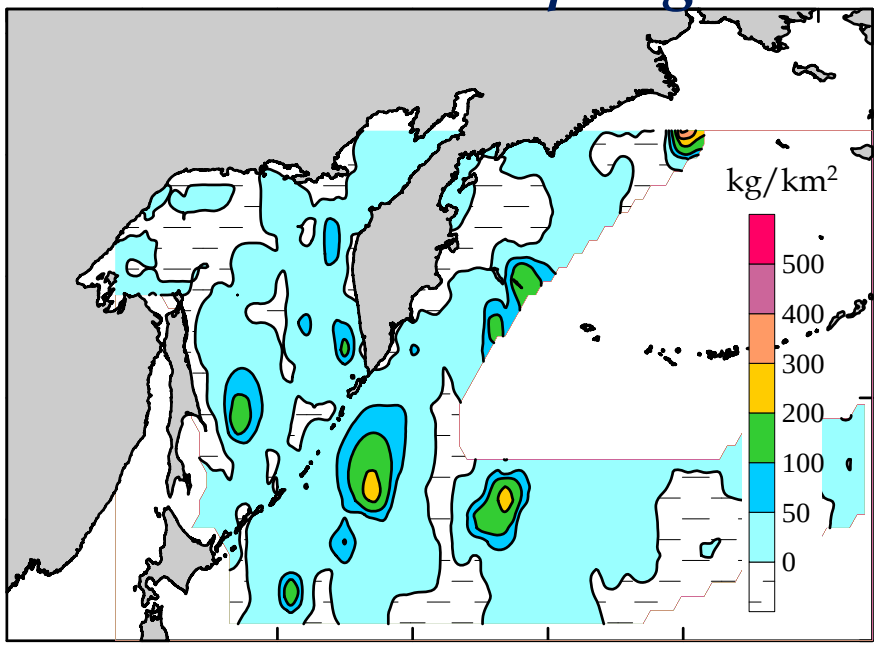
Distribution of *Phacellophora camtschatica* biomass

Summer and autumn



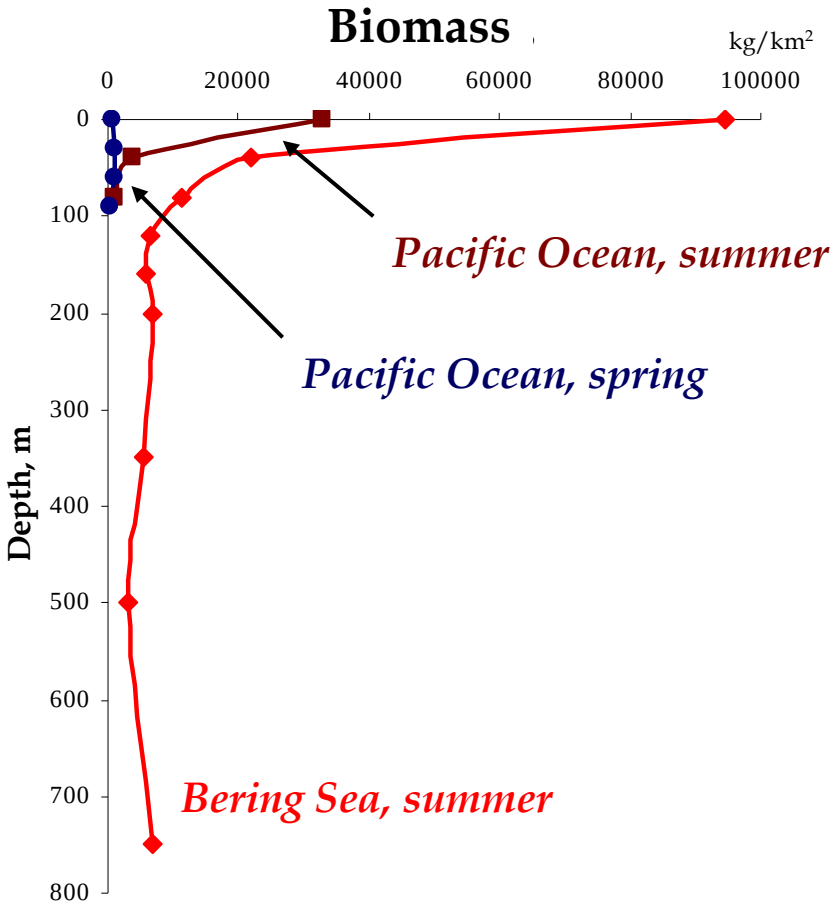


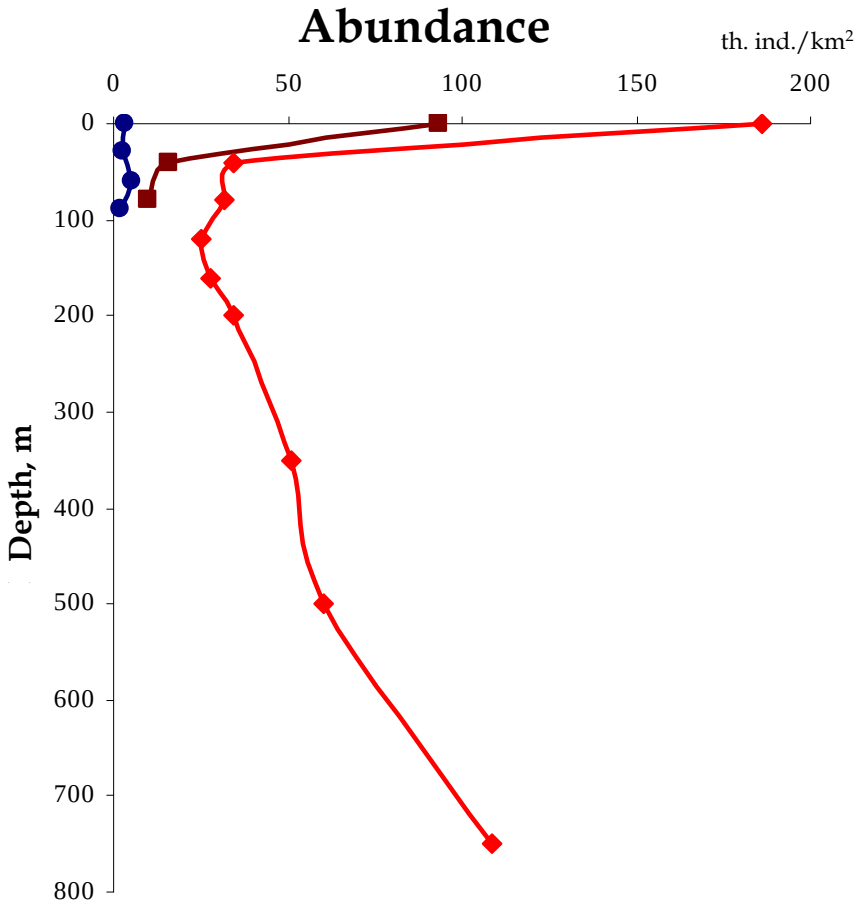
Winter and spring



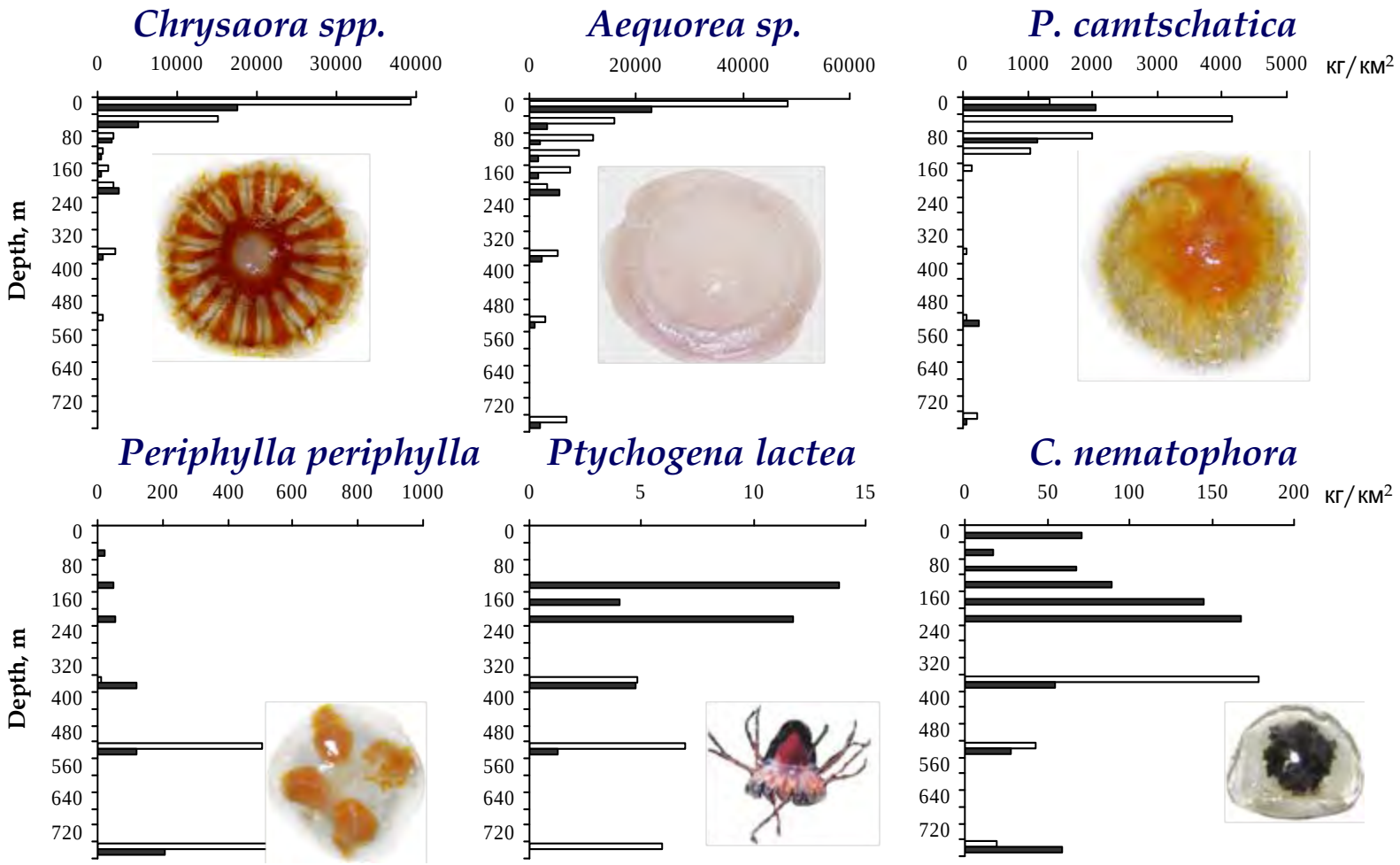
Aequorea, Calycopsis and Periphylla had similar distribution patterns

Vertical distribution of jellyfish biomass and abundance

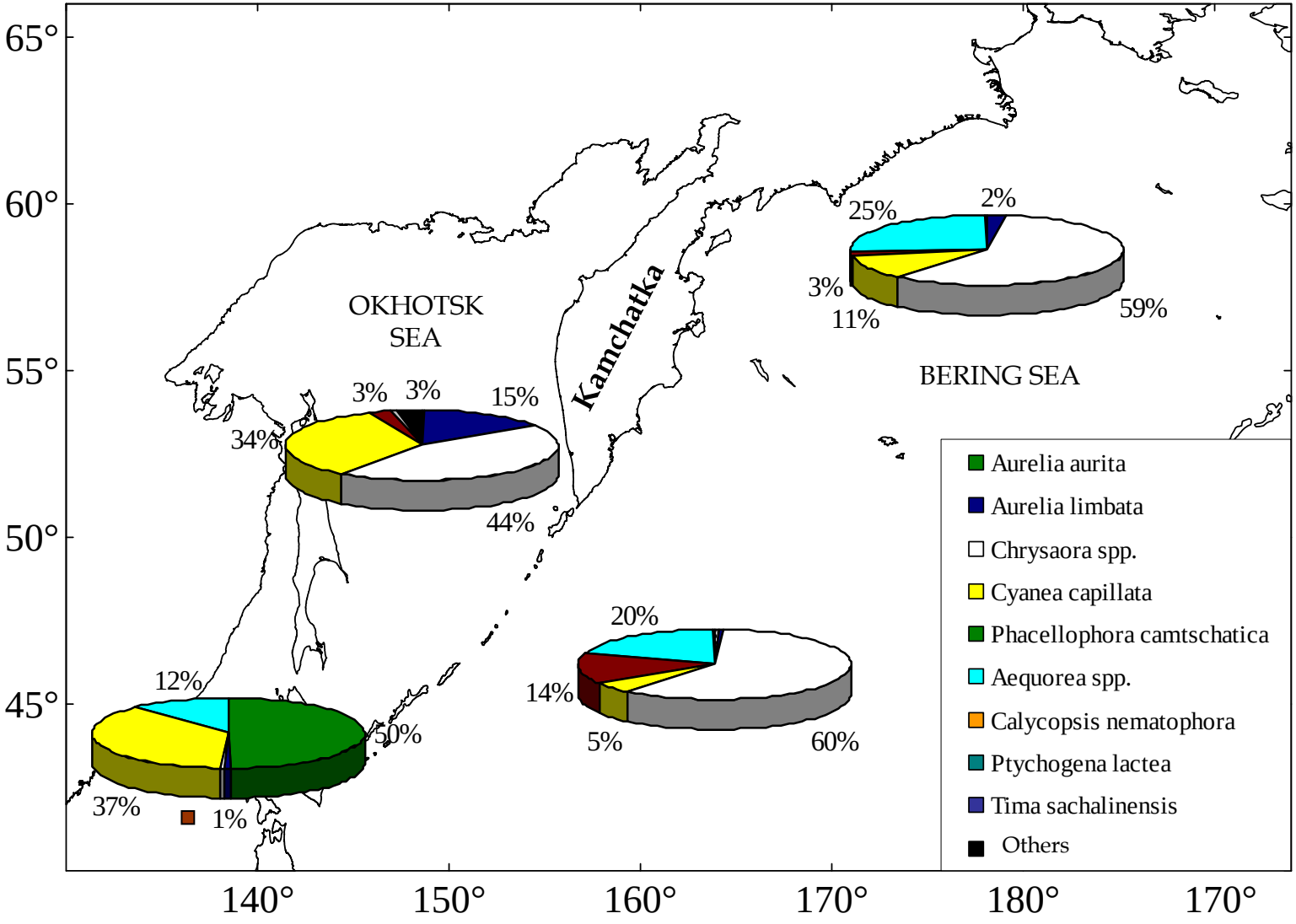




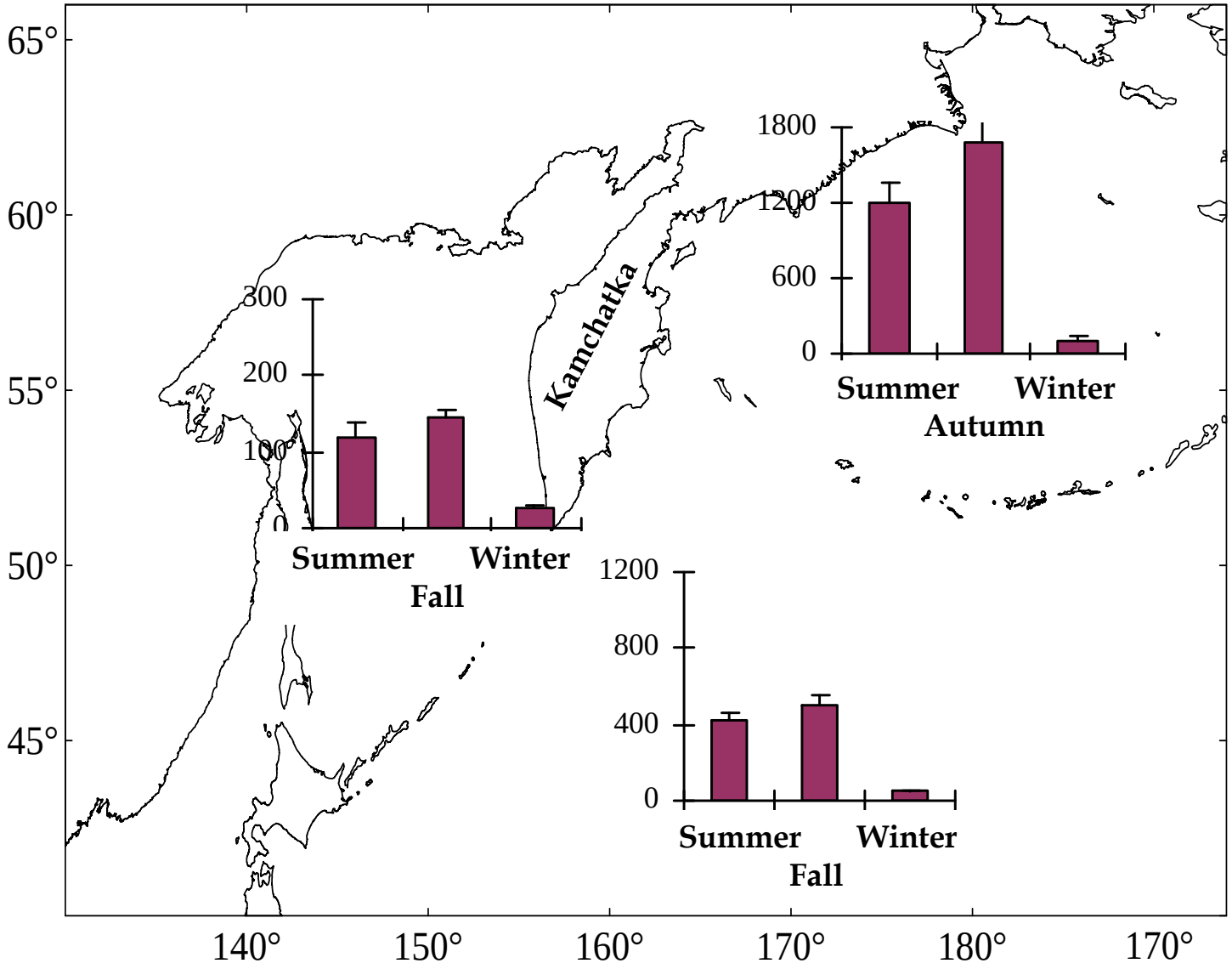
Vertical distribution of jellyfish biomass at daytime (white columns) and nighttime (black columns) in the Bering Sea



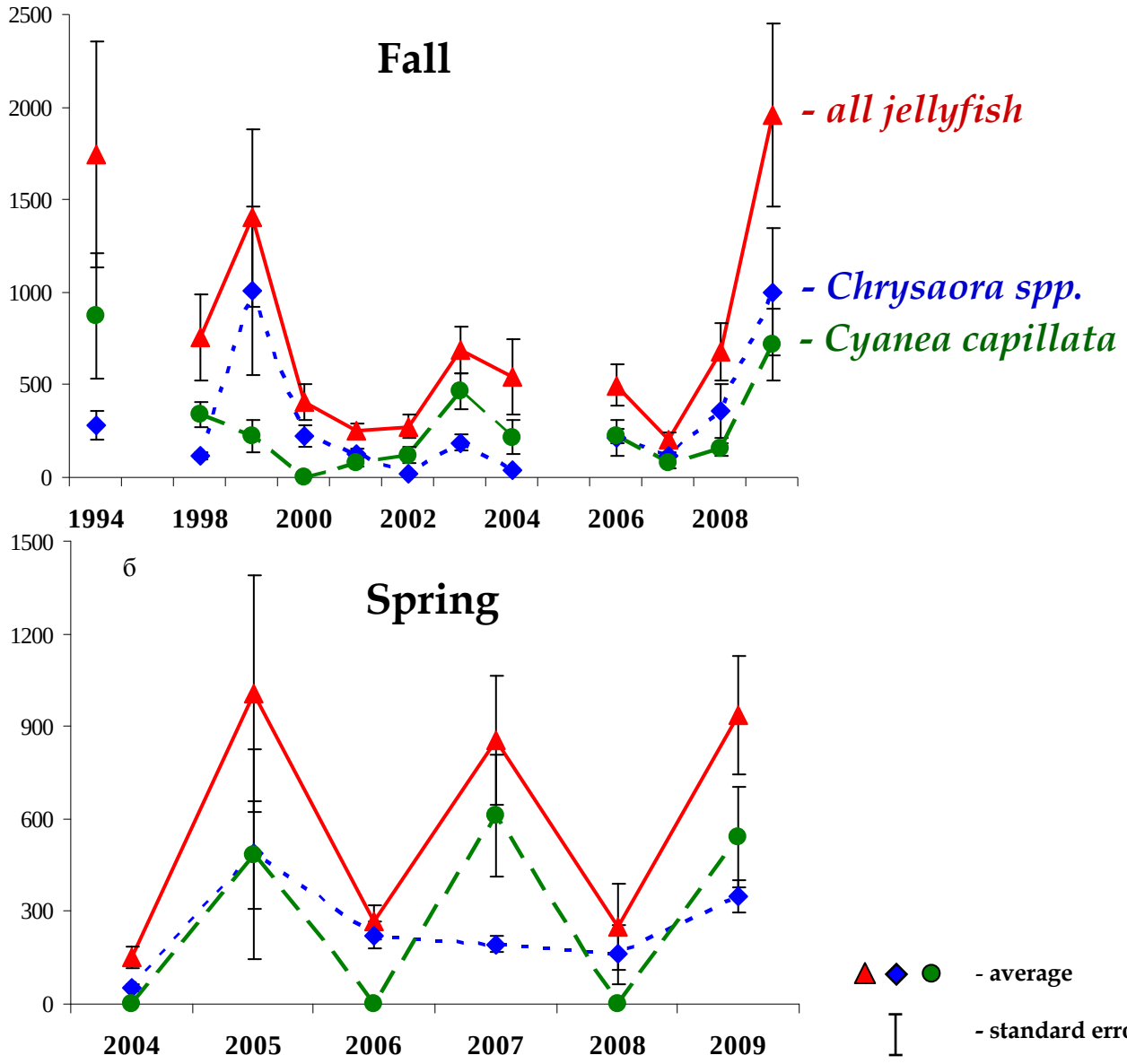
Percentage composition (in terms of biomass) of jellyfish species in the epipelagic layer



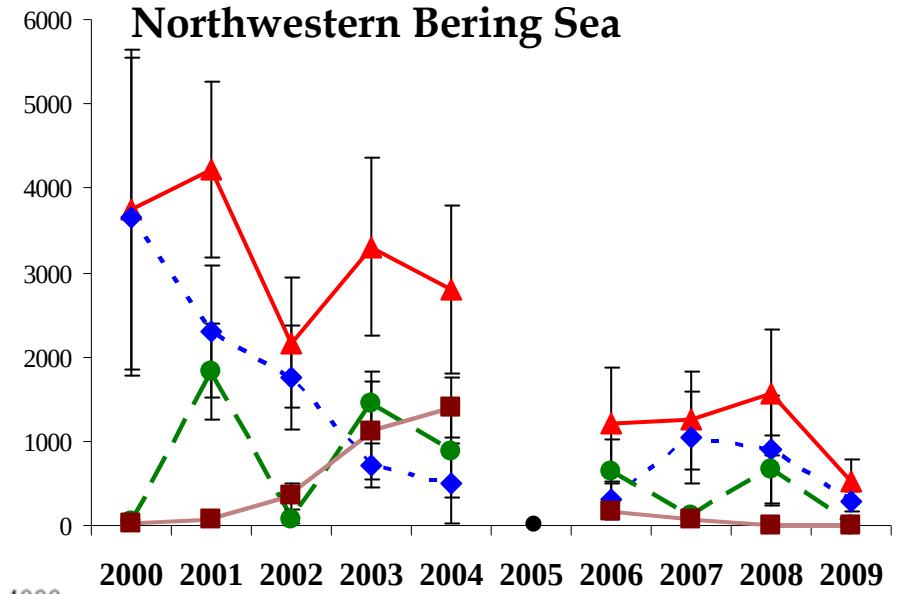
Seasonal changes of jellyfish biomass (kg/km^2)

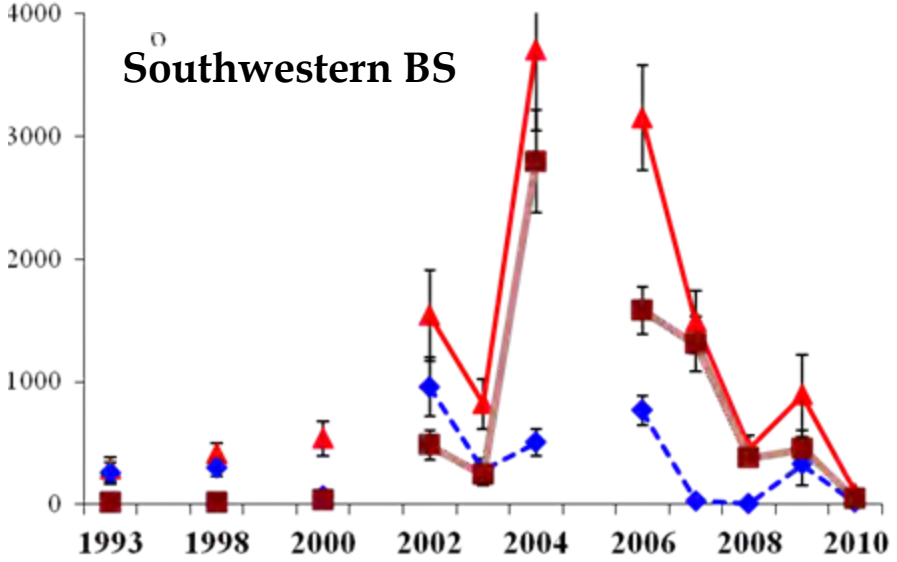


Annual changes of jellyfish biomass (kg/km^2) in the Okhotsk Sea



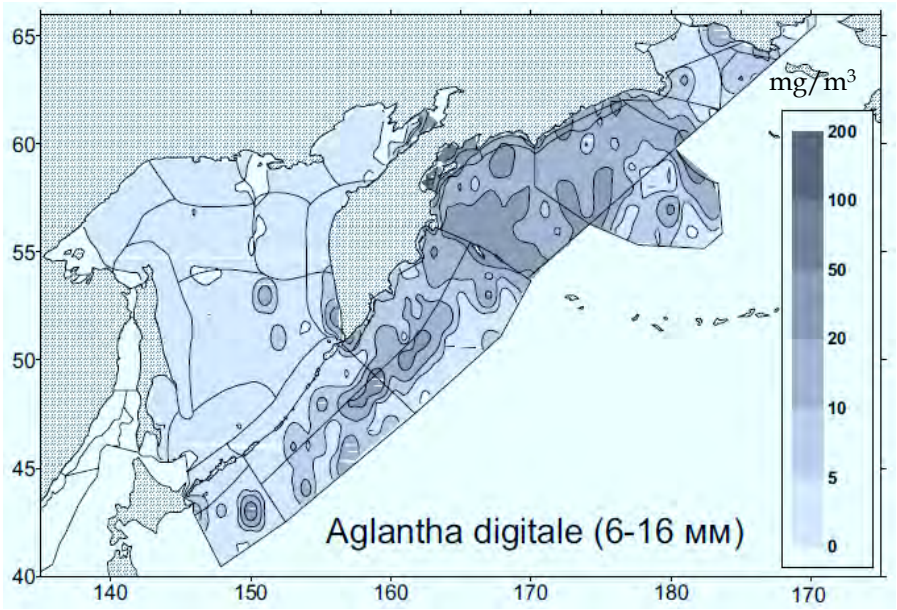
Annual changes of jellyfish biomass (kg/km^2) in the Okhotsk Sea in fall

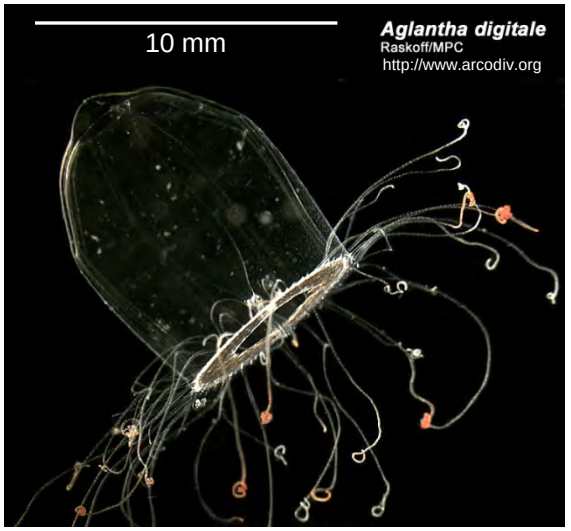


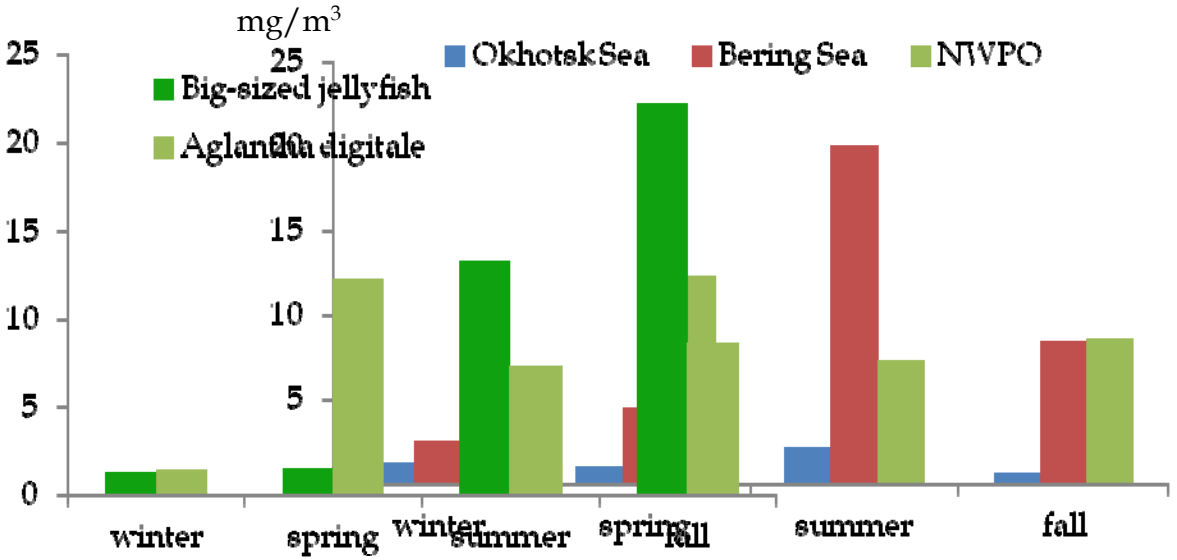


- *all jellyfish*
- *Cyanea capillata*
- *Aequorea spp.*
- *Chrysaora spp.*

Distribution of *Aglantha digitale* biomass
(Volkov 2007)

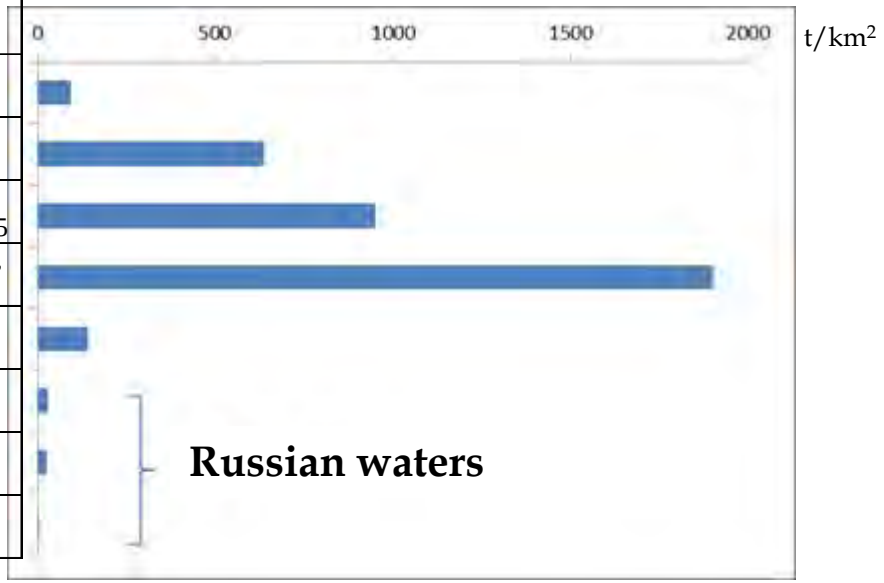






Examples of jellyfish blooms in the some regions of the World Ocean

Region	Biomass		Year	Species	Reference
	t/km^2	mln t			
Eastern Bering Sea	90-100	50-100	1999	*Chrysaora melanaster*	Brodeur et al., 2002
South-Eastern Japan Sea	640	329	2009	*Nemopilema nomurai*	Uye, 2011
Black Sea	900-1000	400	1984	*Aurelia aurita*	Shushkina, Arnautov, 1985
Black Sea	1900	800	1989	*Mnemiopsis leidyi*	Kovalev et al., 1999
Eastern Atlantic, Benguela current	140	12	2003	*Aequorea forskalea, Chrysaora hysoscella*	Lynam et al., 2006
Japan Sea, Amursky and Ussuriysky Bays	30	0.1	2010	*Rhopilema asamushi*	Sedova L.G., unpub. data
Eastern Okhotsk Sea	25	-	2001	*Aurelia limbata, Chrysaora spp.*	Chetvergov et al., 2002
North-Western Bering Sea	4	0.5	2000	*Chrysaora melanaster*	our data



Some Russian fishermen have turned to harvesting jellyfish for Chinese market

Amursky Bay, Japan Sea, 2010

Photo&video: Maxim Shapovalov

CONCLUSIONS

- *The highest concentrations of jellyfish occur in the northwestern Bering Sea, eastern Okhotsk Sea and Pacific waters off Kamchatka*
- *In comparison with many other regions of the World Ocean, jellyfish biomass in the Far-Eastern Seas is relatively low*
- *Jellyfish outbursts do not significantly influence marine ecosystems, fisheries and tourism*

- *In northwestern Japan Sea, jellyfish outbursts are profitable for fishermen because of the great demand of jellyfish for Chinese market*

ACKNOWLEDGMENTS

I thank all my colleagues who collected and processed data on jellyfish during the surveys in the Far Eastern Seas in 1990-2011: Vyacheslav Shuntov, Igor Melnikov, Vladimir Radchenko, Alexander Starovoytov, Igor Glebov, Sergey Loboda, Alexey Khoruzhiy, Elena Strezhneva, Vladimir Sviridov, Evgeniy Ovsyannikov and many others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