Changes in the movement and distribution of western gray whales between known feeding areas in 2002-2007

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Main areas of work for photo-identification and Benthos studies in feeding grounds of the ochotsk-korean gray whale (WGW) population of the NE Sakhalin Island

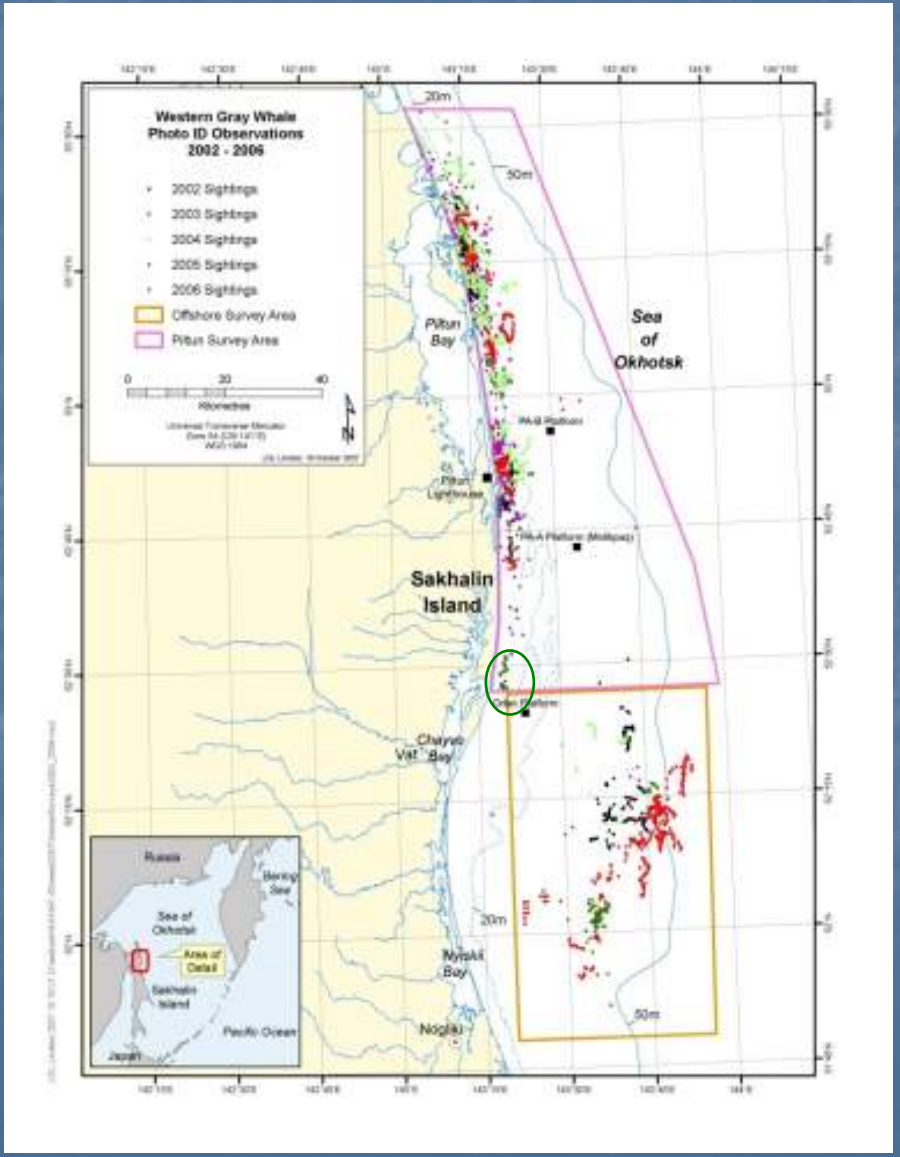
Marine mammal observations begin when the main vessel departs from Vladivostok & end when the vessel returns to port.

Piltun feeding area -- shallow inshore area, published feeding area for WGWs.

Offshore feeding area -- recently discovered (Maminov, Yakovlev, 2001), area>20km from shore.

Chaivo section was surveyed in 2006 after a large group of gray whales was found there.

Dedicated surveys and bethnic work are also conducted in these areas.



IBM Photo-ID

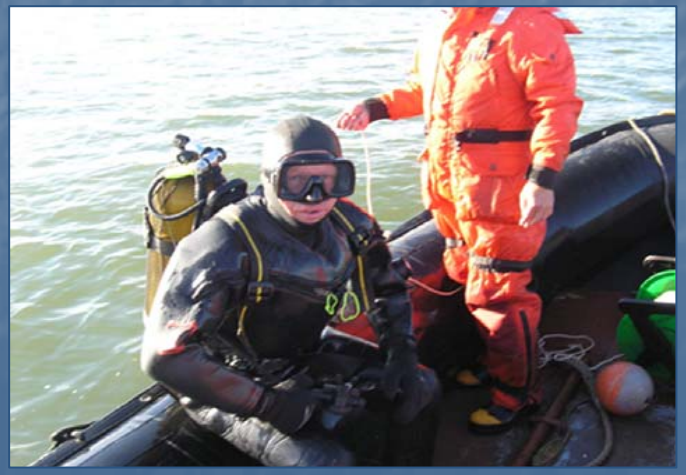
Professor Bogorov SV

Academic Oparin SV

Field work conducted from two vessel platforms (in turn): Zodiac deployed from vessel

Photo-ID Team in Zodiac

BENTHOS STUDIES IN FEEDING GROUNDS OF THE OKHOTSK-KOREAN GRAY WHALE (WGW) POPULATION



Field methods

- Observations from main ship to locate whales and note their distribution
- Zodiac launch prepared when whales sighted from ‘mother’ ship. Photo-ID team deployed.
- Whales photographed from different aspects
- GPS position, direction and distance to the whale, whale behavior, depth, temperature, wind speed, etc. are recorded
- Transfer of the data to the vessel for subsequent benthic sampling and subsurface video surveys
- Data collected is uploaded to a data base and backed-up onto external drives and DVD disks

Number of whales identified 2002-2007, Sakhalin Island shelf

Year	# of whales (total for the year)	From 2002	From 2003	From 2004	From 2005	From 2006	# of new whales for the year	# of whales of previous years not met during the current year	# of whales in the catalogue
A	B=C+D+E+F+G+I	C	D	E	F	G	I	J	H=B+J
2002	45(1)*						45(1)		45(1)*
2003	82	35					47		92(1)*
2004	95(1)*	39	32(1)				24	21(1)	116(2)*
2005	117(1)*	41	39(1)	18			19	18(1)	135(2)*
2006	120(6)*	42	37	15	14		12(6)	27(1)	147(7)*
2007	126(5)	40	39	16	10	7	14(5)	35(6)	161(11)

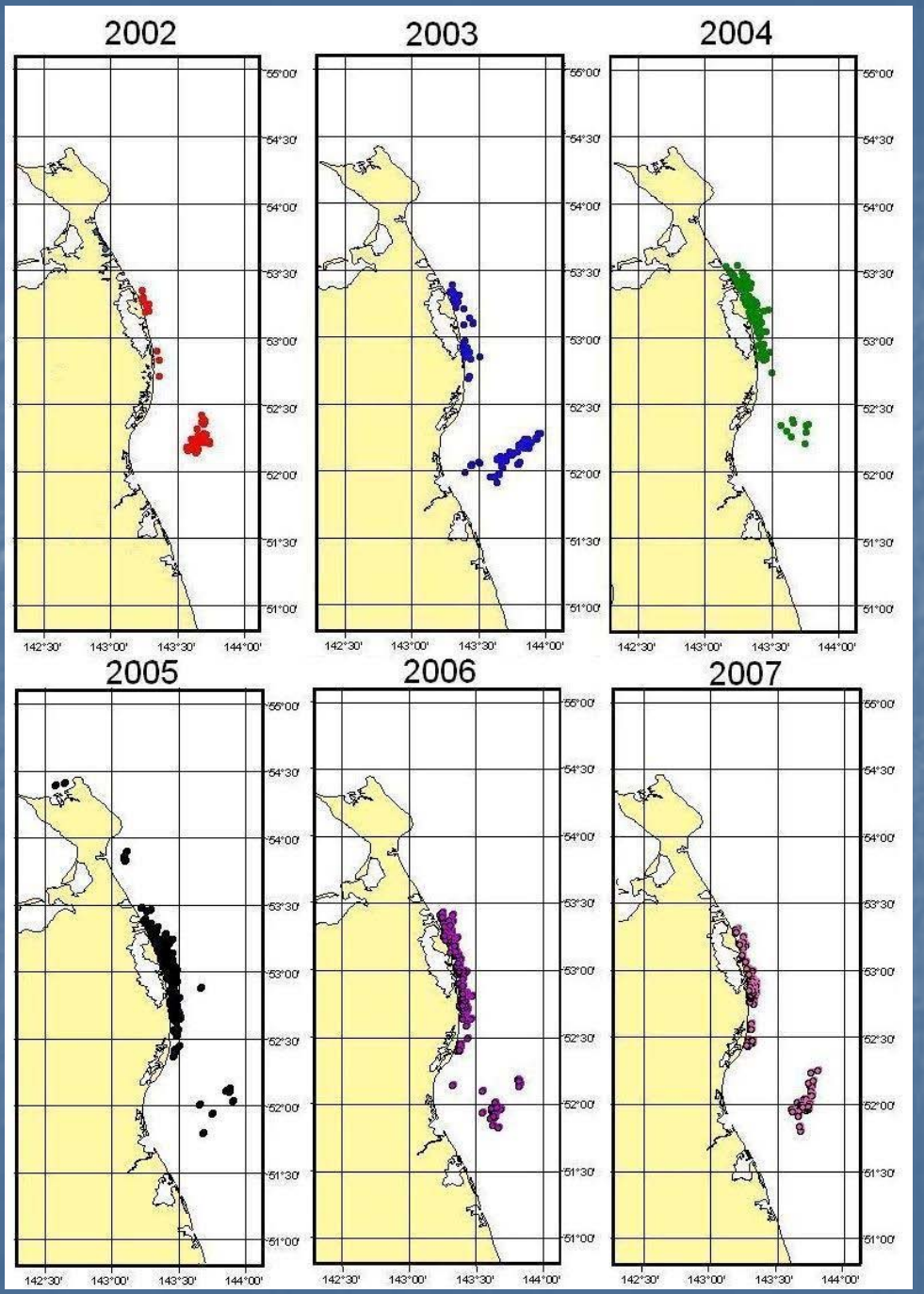
* The values in brackets show the number of whales with temporary number TEMP00#. This number is assigned to a whale with no reliable image available on the right side. These animals are recorded in the annual catalogue, but are not included into the general catalogue.

Description of Collected Benthic Materials in 2002 and 2006-2007.

Area	Van Veen bottom grab 2002	Van Veen bottom grab 2006	Van Veen bottom grab 2007	Diving collections 2007
	Stations/samples			
Piltun Area	60/180	60/198	60/188	12/48
Offshore Area	48/144	48/144	48/144	0
Intermediate Area	14/46	0	14/142	0
Chayvo Area	0	9/27	15/62	0
Whale feeding sites	93/279	37/111	89/274	20/80
Total	**215/649**	**154/459**	**226/740**	**32/128**
Underwater TV, Epibenthic net, Bongo plankton net, Hydrologic probe (S‰, T).				
Sediment: Particle size, Organic carbon, 10 TM, PH, pesticides, phenols.				
Animals: TM, Isotopic analysis – 56 sample, Lipid analysis – 108 sample.				

Bottom Van Veen grab samples were collected using a standard grid and at whale feeding sites. There were also scuba diving stations at depths of 12 m or less in the whale feeding areas.

Photo-Identification Surveys of Western Gray Whales off North-Eastern Coast of Sakhalin Island During the Month of September for all Study Years (2002-2007), plots show whale sightings.



- During the six years of photo-ID effort, use of the Offshore feeding area by gray whales varied in intensity.
- In 2002 and 2003, there were significantly more animals in the area as compared to 2004 and 2005.
- More whale groups were observed in the Offshore feeding area in 2006-2007 compared to 2004 and 2005

WGW movement between feeding areas during each of the six years of photo-ID 2002 to 2007

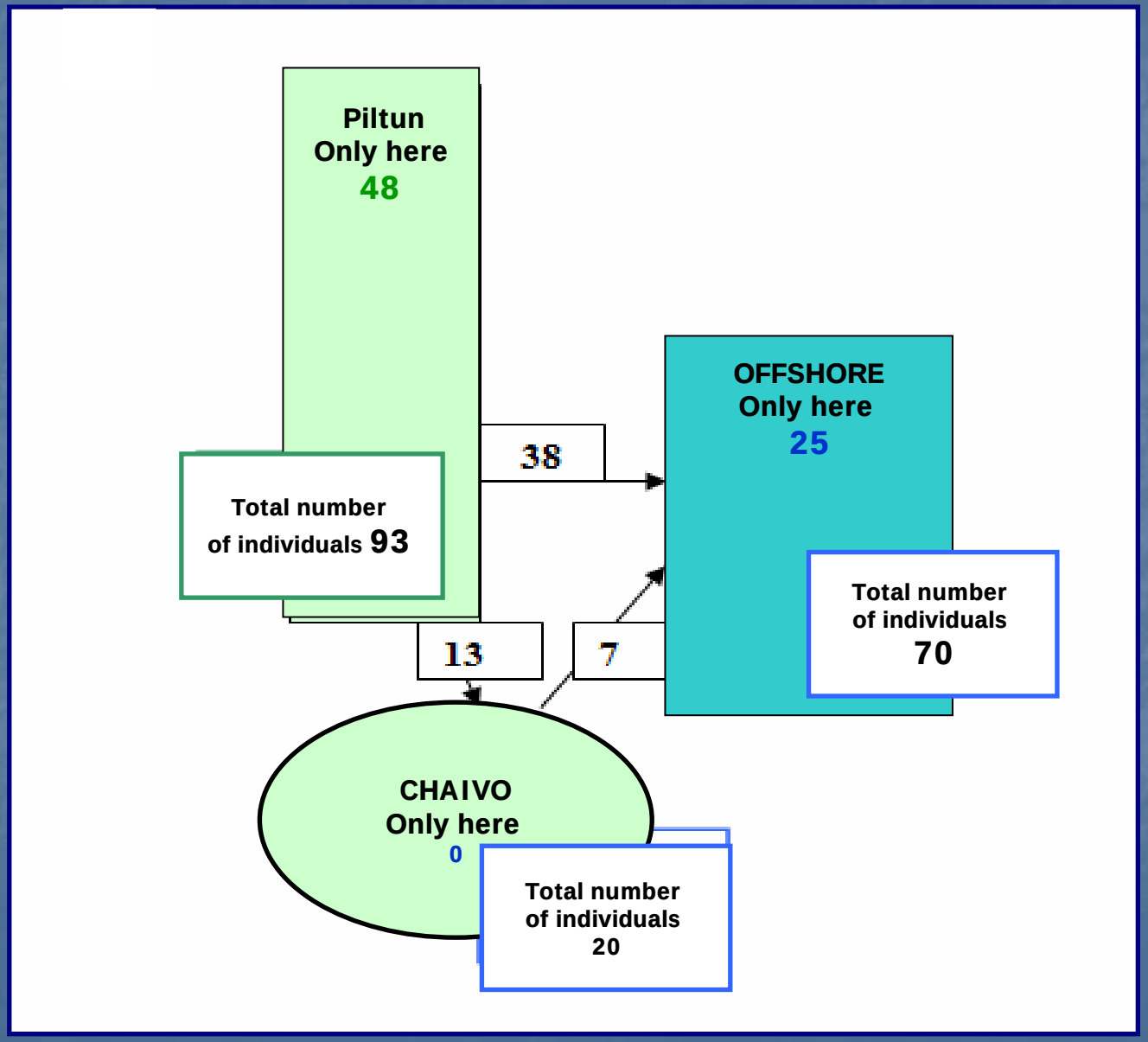
Year	Number of whales identified in Piltun area	Number of whales identified in Offshore area	Number of whales identified in two areas: Piltun/Off	Number of whales identified in Chaivo area	Number of whales identified in different areas: Chaivo/Piltun (Chaivo/Offshore)	Number of whales identified in northern areas	Number of whales identified in different areas: Chaivo/Piltun/ Offshore
2002	12(11)	35(34)	1			-	-
2003	51(47)	35(31)	4			-	-
2004	95(89)	7(1)	6			-	-
2005	115(112)	7(2)	5			5(1)	4
2006	105(67)	33(14)	16	28(7)	19(1)		2
2007	**93(48)**	**70(25)**	**38**	**20(0)**	**13(0)**		**7**

Only in Piltun

Only in Offshore

Only in Chaivo

WGWs movements between feeding areas during the 2007 field season



BENTHOS AT WGW FEEDING SITES:

PILTUN AREA

OFFSHORE AREA

Major prey taxon:

Amphipods *Monoporeia*

Amphipods *Ampelisca*

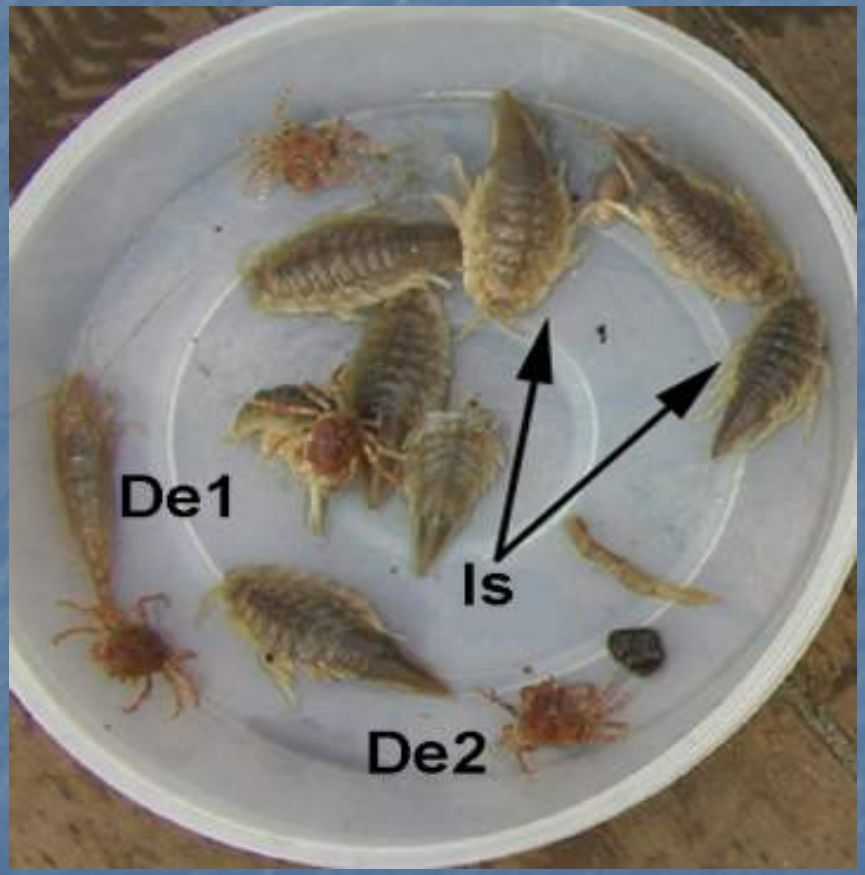
The pollution and sediment control on benthic stations

Sediment Analysis: Particle size, Organic carbon.
Pollution Control: Content 10 Heavy metals (*Al, As, Ba, Cd, Cr, Cu, Fe, Hg, Pb, Zn*), Petroleum Hydrocarbons (PH), Pesticides, Phenols.

Area	**PH**, mg/g dry weight	∑**DDT,** ng/g dry weight
Piltun Area, 2002-2007	0-0.03(0.007)	1,3-4,2 (1,31)
Offshore, 2002-2007	0,004-0,016 (0,008)	0.4–4.8 (0.59)
Amur Bay (Sea of Japan) in published data	0.03–2.72	4.4–14.8 (7.59)

In 2002-2007 in Piltun and Offshore areas the concentration of pollution did not exceed background values

BENTHOS AT WGW FEEDING SITES:
PILTUN AREA



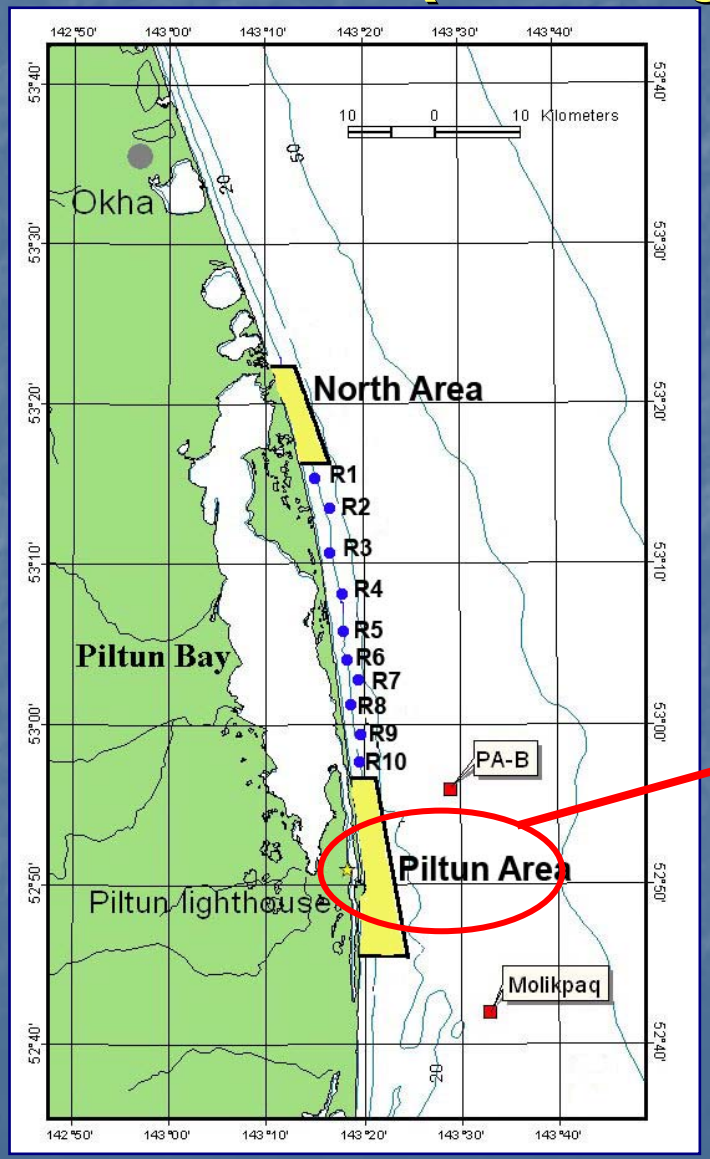
Isopods

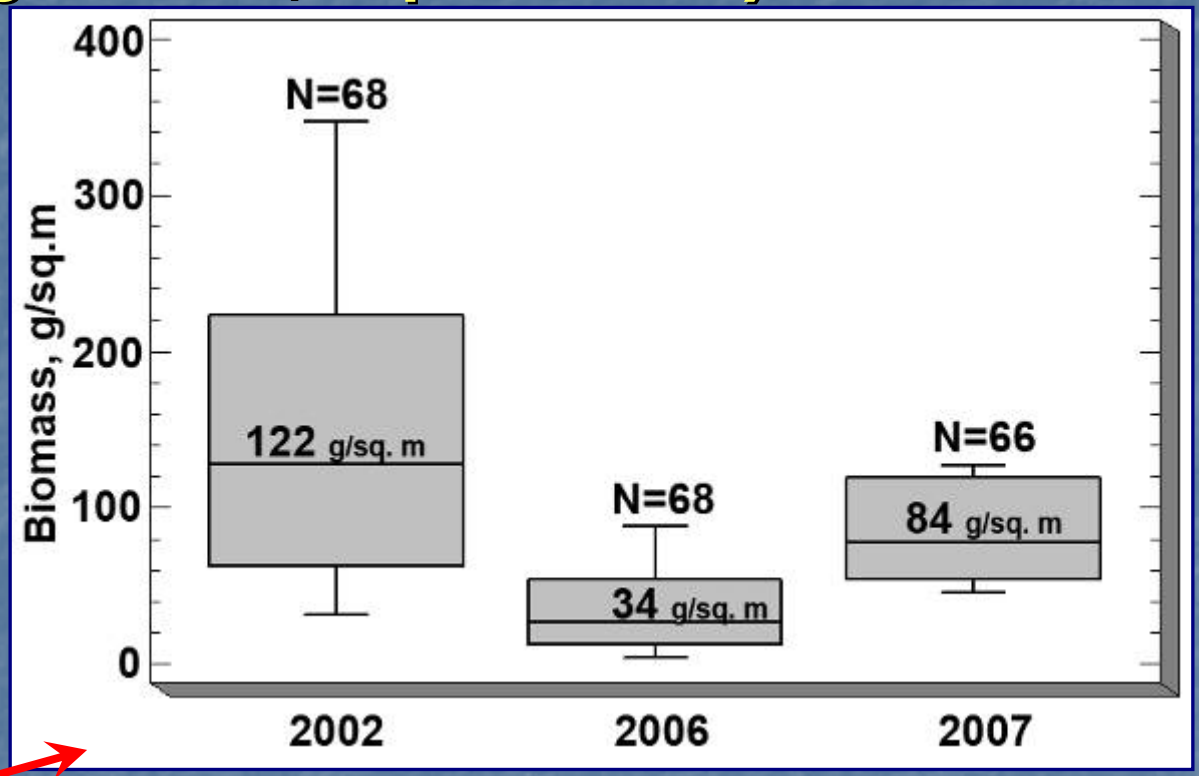
Amphipods *Monoporeia*

Crustaceans (amphipods, isopods) are of greatest interest for assessing food supplies for gray whales in the Piltun area.

AMPHIPODS BIOMASS (g/sq. m) IN THE PILTUN AREA : 2002, 2006-2007

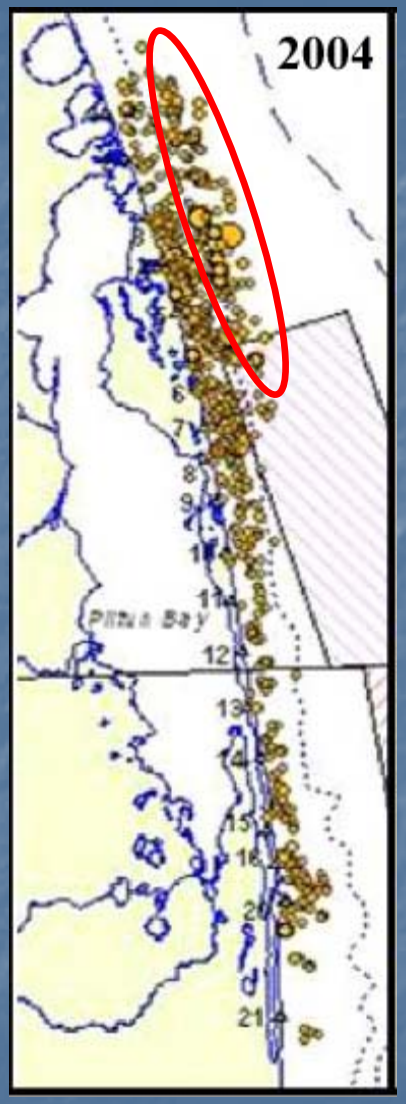
(Piltun lighthouse, depth <20 m)

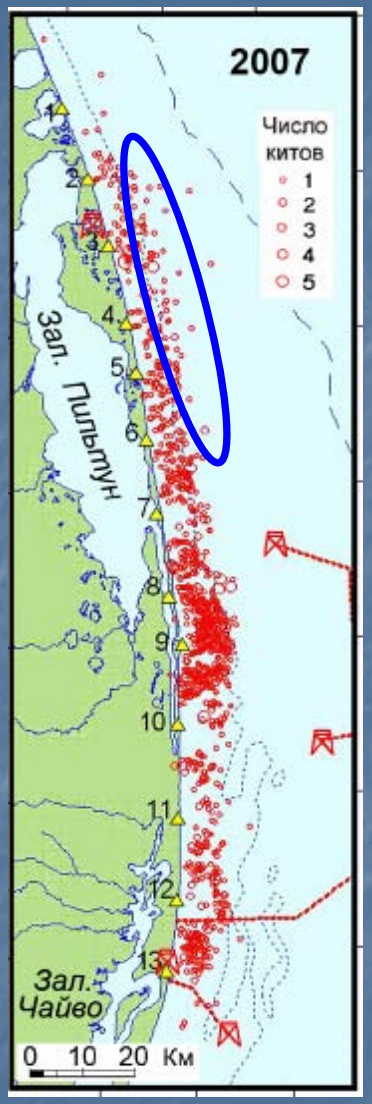




An decrease in the abundance of the amphipod *Monoporeia* in the south coincided with shore- and vessel-based observations of decreases in the number of foraging whales in the southern section of the area.

PILTUN AREA: FOOD ITEMS (the depth > 20 m)





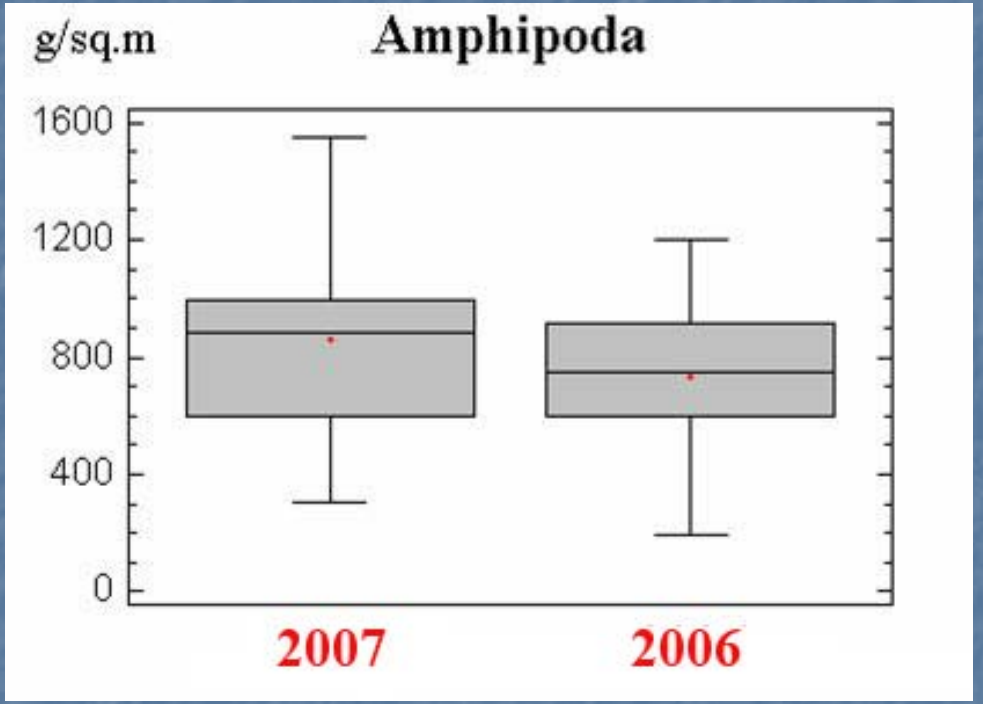
The appearance of the sand lance coincided with a decrease in the number of whales in the Offshore area, and the appearance of foraging whales in the northern Piltun area at depths greater than 20 m.

In 2006-2007 in the northern part of the area, the frequency of occurrence of the sand lance decreased from 40-60% to 20-25%. Accordingly the number of foraging whales is decreased in this area.

AMPHIPODS BIOMASS (g/m²) IN THE OFFSHORE AREA: 2007 and 2006

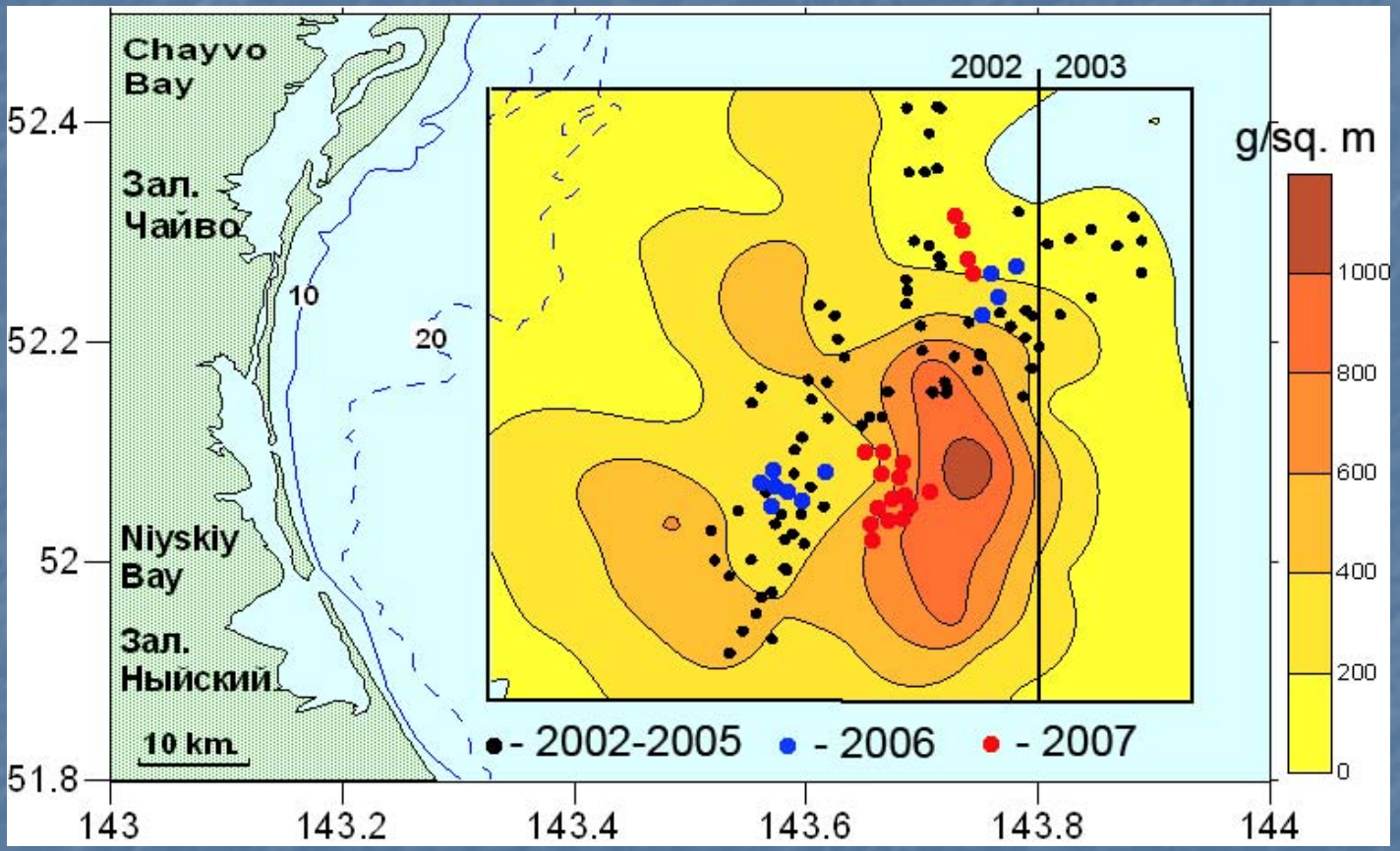
PARAMETER	2007	2006*
Amphipods Biomass	**857,7**	**735,6**
Standard deviation	312,0	269,1
Minimum	280,5	196,03
Maximum	1231,4	1197,2
Number of stations	30	30

*** - not the statistical significance of biomass differences for 2006 and 2007**



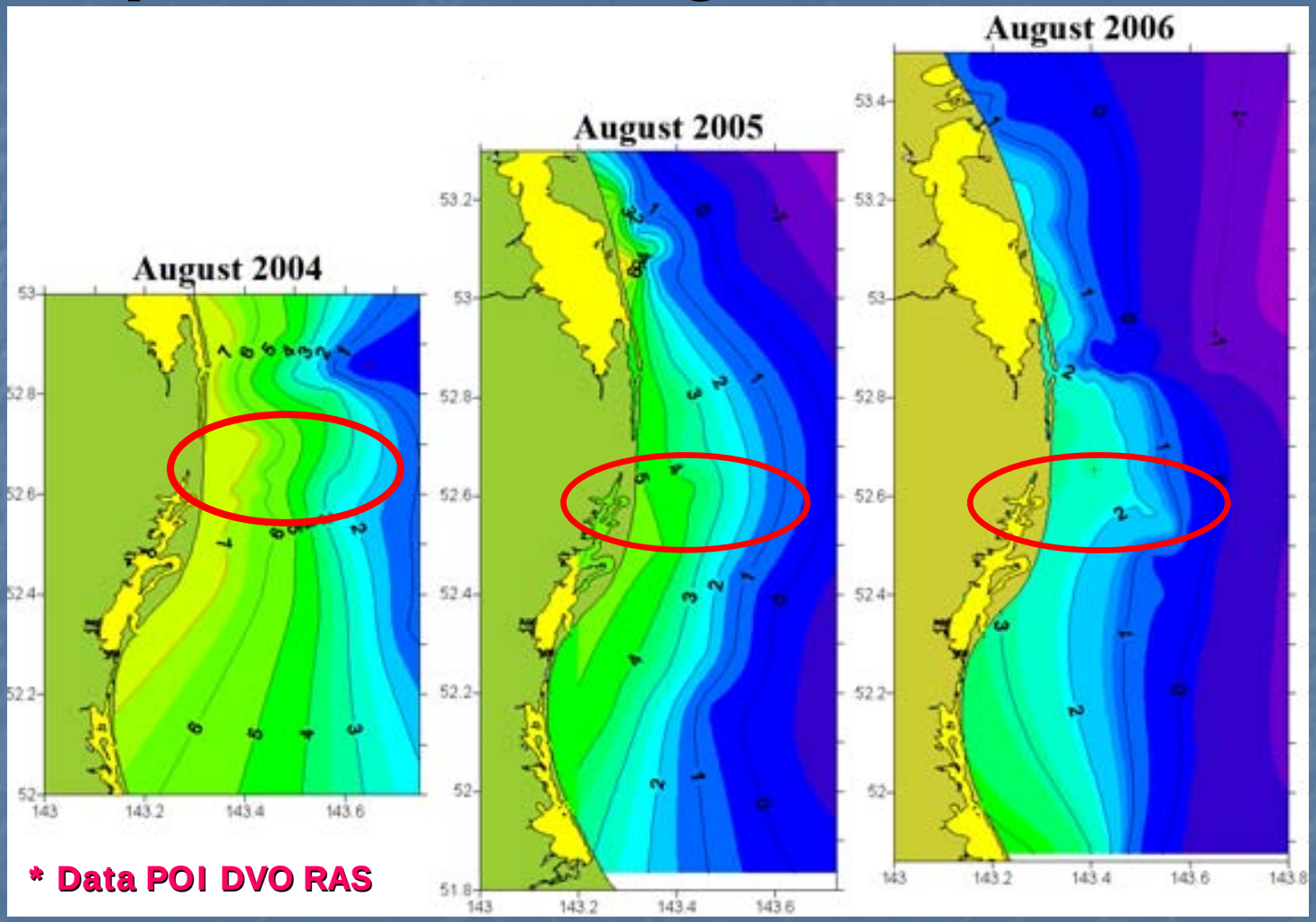
In the Offshore area the biomass of forage benthos was stable, and no major year-to-year variations were observed; whales fed in a depth range of 41-53 m every year in a zone of high abundance of major prey: amphipods *Ampelisca*.

LOCATIONS OF WGW FEEDING SITES IN RELATION TO AMPHIPODS BIOMASS (g/m²): OFFSHORE AREA, 2002-2007



The gray whales forage in the Offshore area primarily at sites with ampeliscid biomass more then 300 g/m² approximately the same zones in 2007 as they did in 2002 and 2006

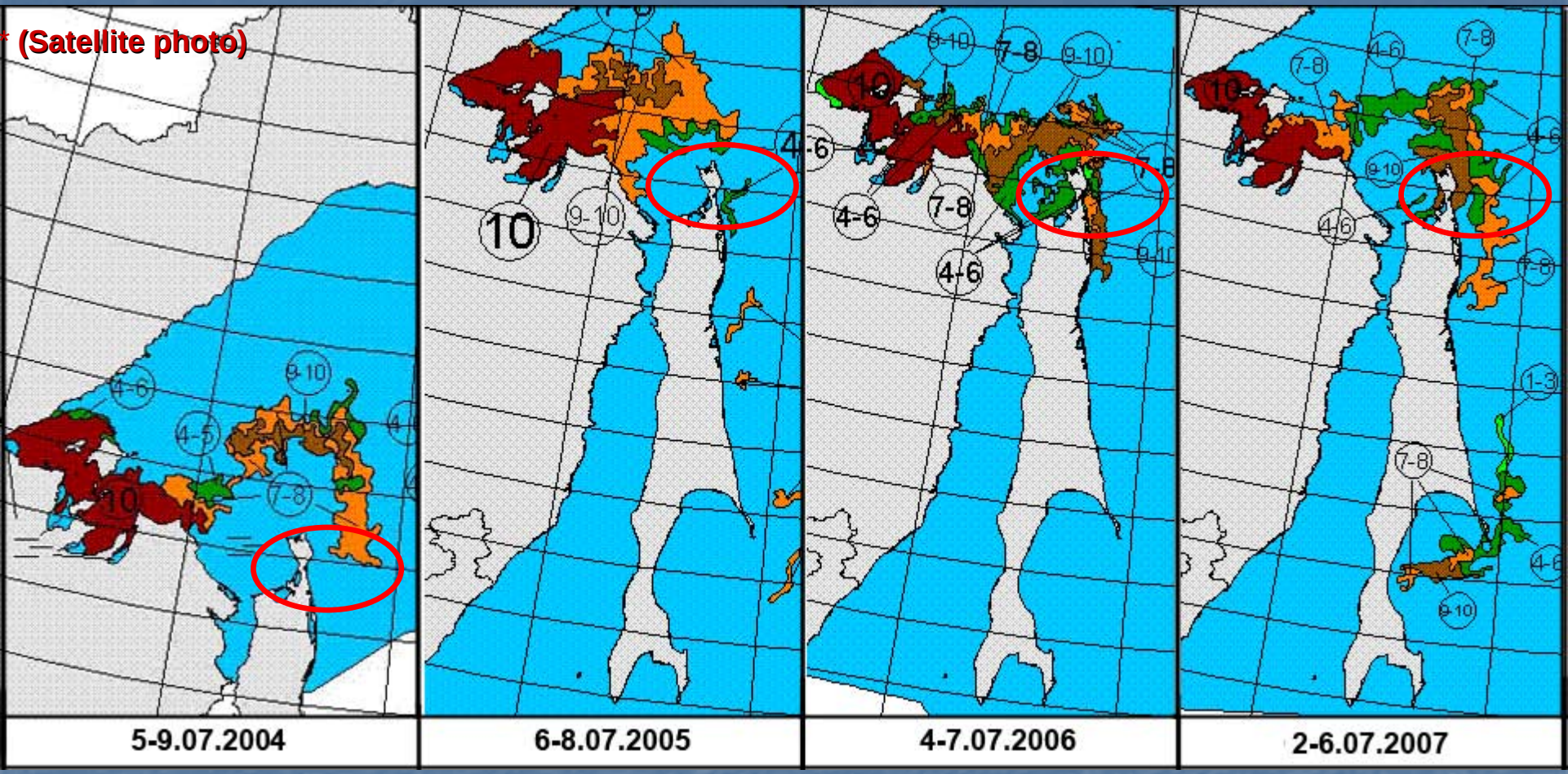
Distribution of bottom water temperature of August, 2004–2006*



Hydrological and climatic conditions in summer 2006 were characterized by lower bottom temperatures compared to 2004-2005, and the anomalous duration of the ice cover.

Distribution of the ice field, 2004-2007*

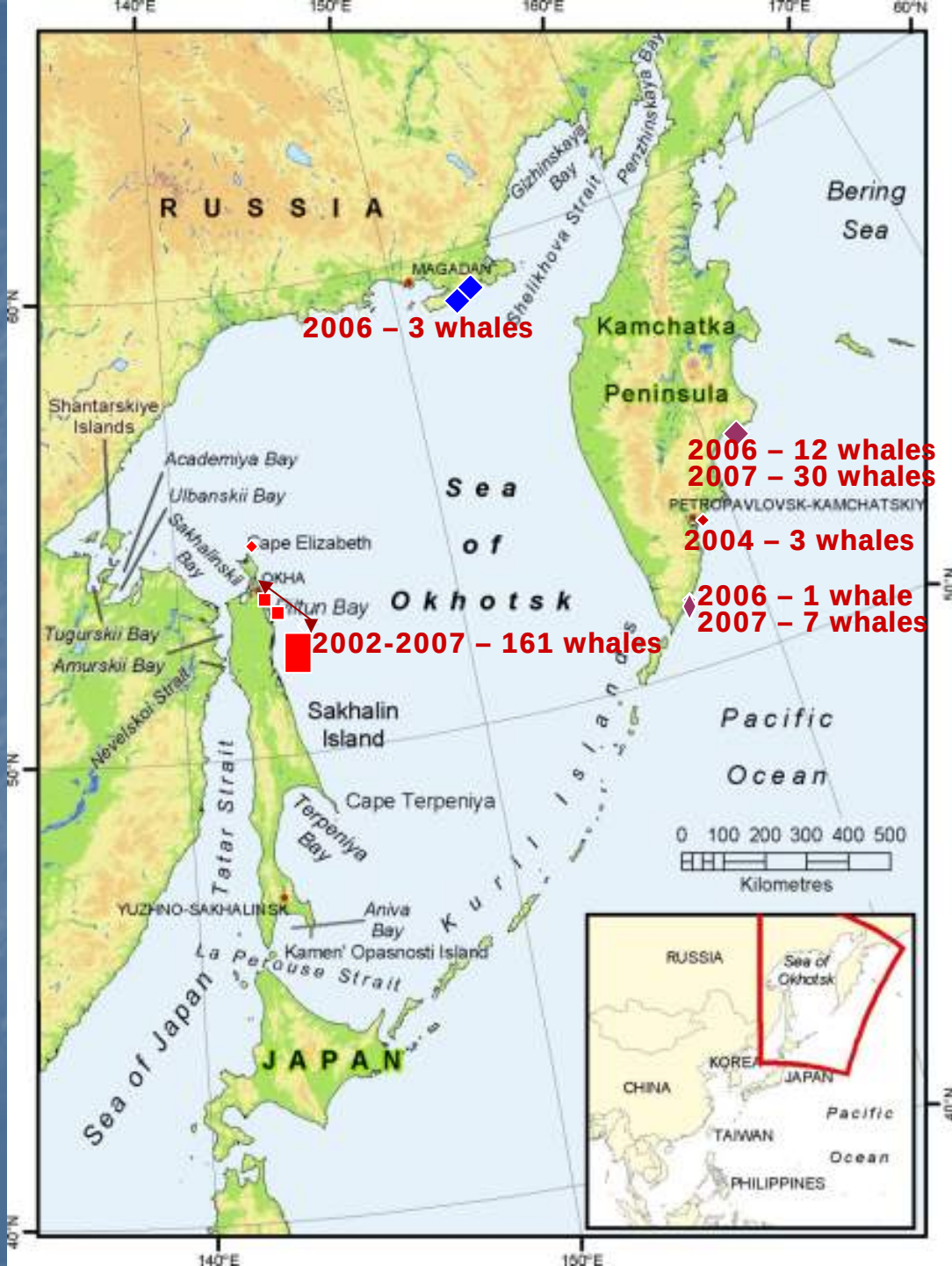
The position of the ice edge during the first ten days of June each year.



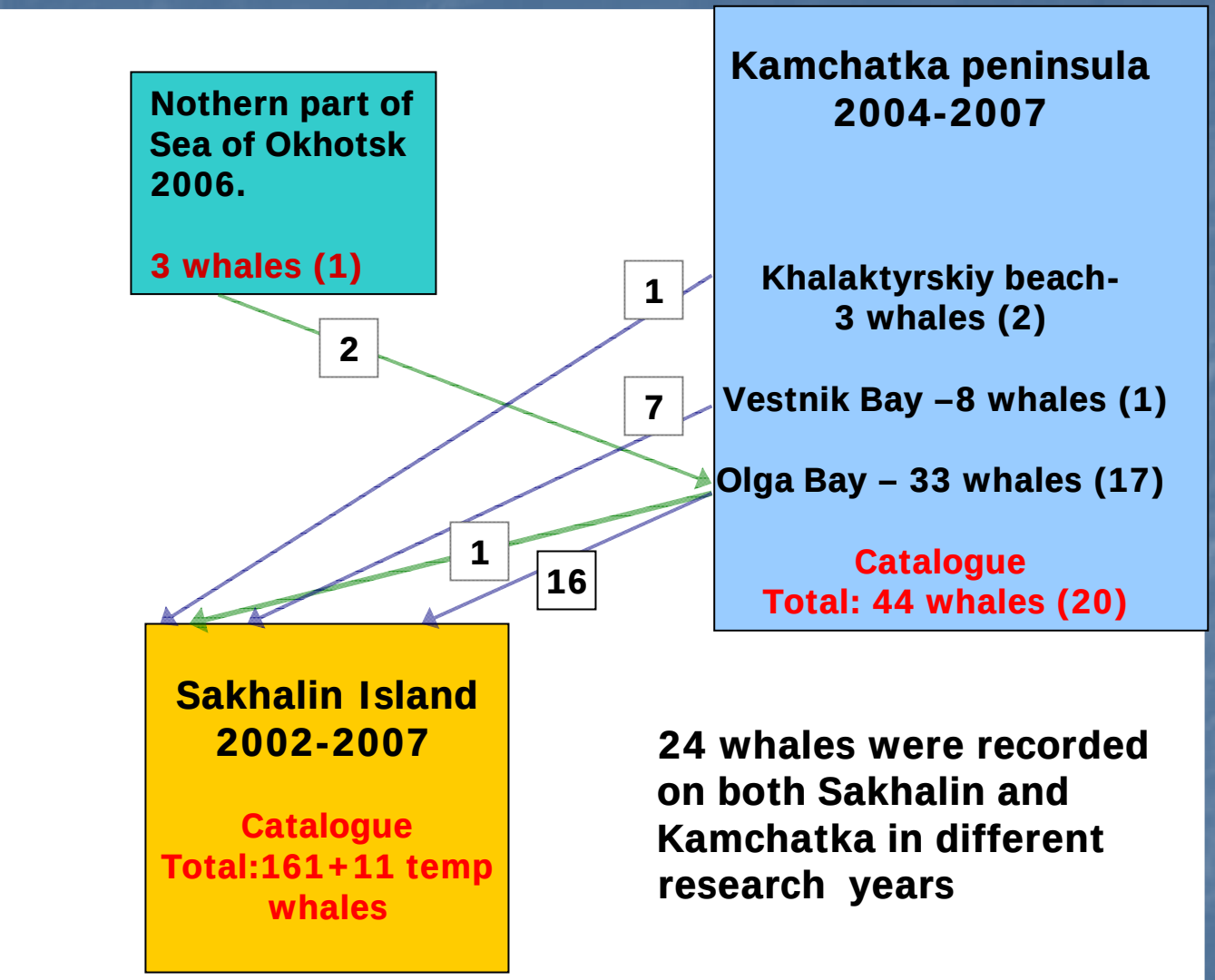
According to these satellite monitoring data, the northeastern Sakhalin coastal zone was free of ice in June 2004 and 2005. However, the area was covered in 10-point ice almost to the mouth of the Piltun lagoon in early June 2006. In June 2007, ice remained near the Chayvo lagoon, but there was open coastal water from the Piltun lagoon northward.

Photographing of gray whales in the Sea of Okhotsk and in south-eastern shelf of Kamchatka Peninsula

Over the past few decades, researchers have become aware of the presence of gray whales in coastal waters off SE Kamchatka during the summer-autumn and early winter months. Photo-identification studies conducted off Kamchatka in 2004, 2006 and 2007 have shown that the western population during the feeding season is not confined to offshore Sakhalin alone



Sighting of WGWs in various geographical regions



Shifts in the gray whale distribution feeding areas within and between feeding seasons are considered to be at least partly a reaction to seasonal changes in the distribution and abundance of prey.

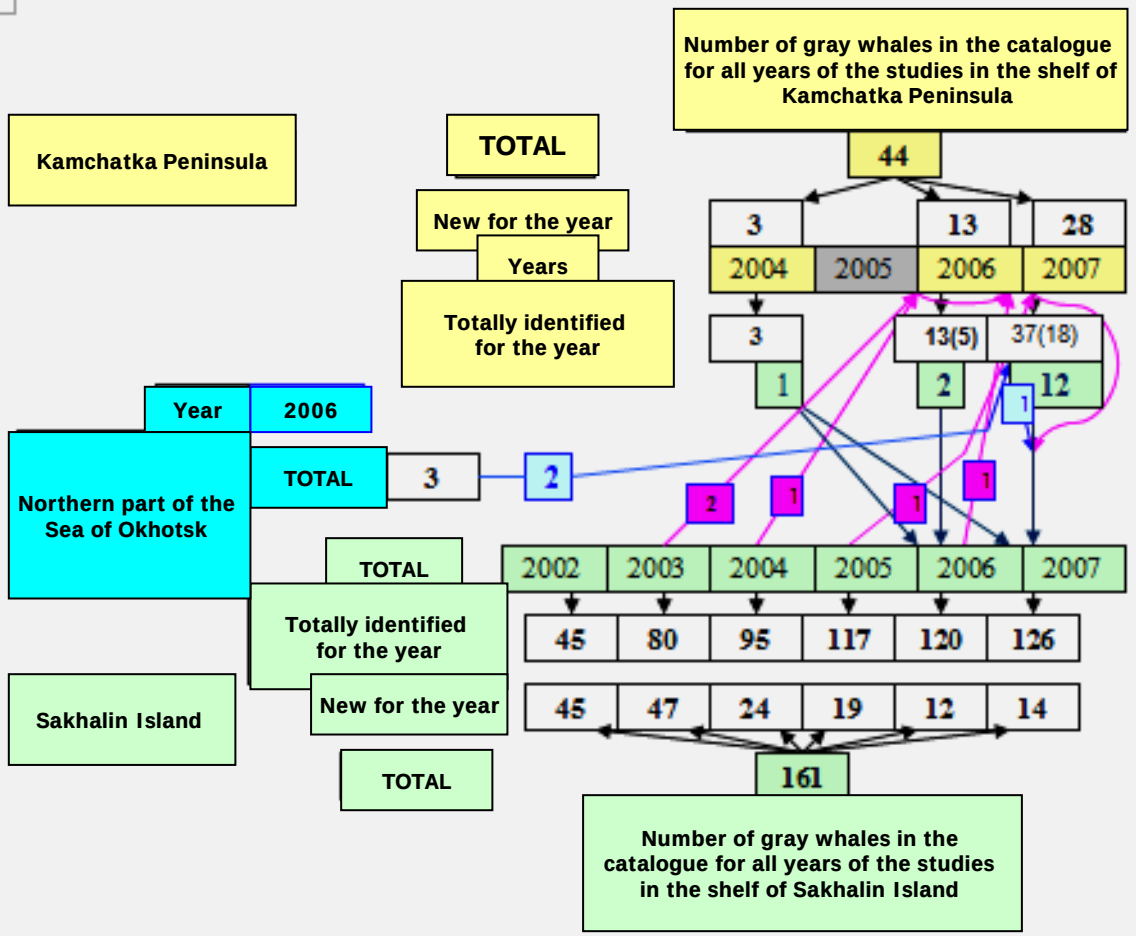
*The numbers in brackets show the number of whales recorded only in this region

CONCLUSION

- Individual whales move between known areas during the feeding season and between years.
- The changes in the extent and consolidation of sea ice in the Sea of Okhotsk may affect the seasonal distribution and geographic boundaries of habitats and migration paths.

Thank you

Finding western gray whales in various regions in the Far East



Legend

Movement of whales registered both in the shelf of Sakhalin Island and in the shelf of Kamchatka Peninsula

Movement of whales first registered as calves in the shelf of Sakhalin Island in various years

Movement of whales first registered as calves in the shelf of Sakhalin Island in various years