Marine mammals as bioindicators of persistent toxic substance (PTS) contamination in Russian Subarctic marine ecosystems

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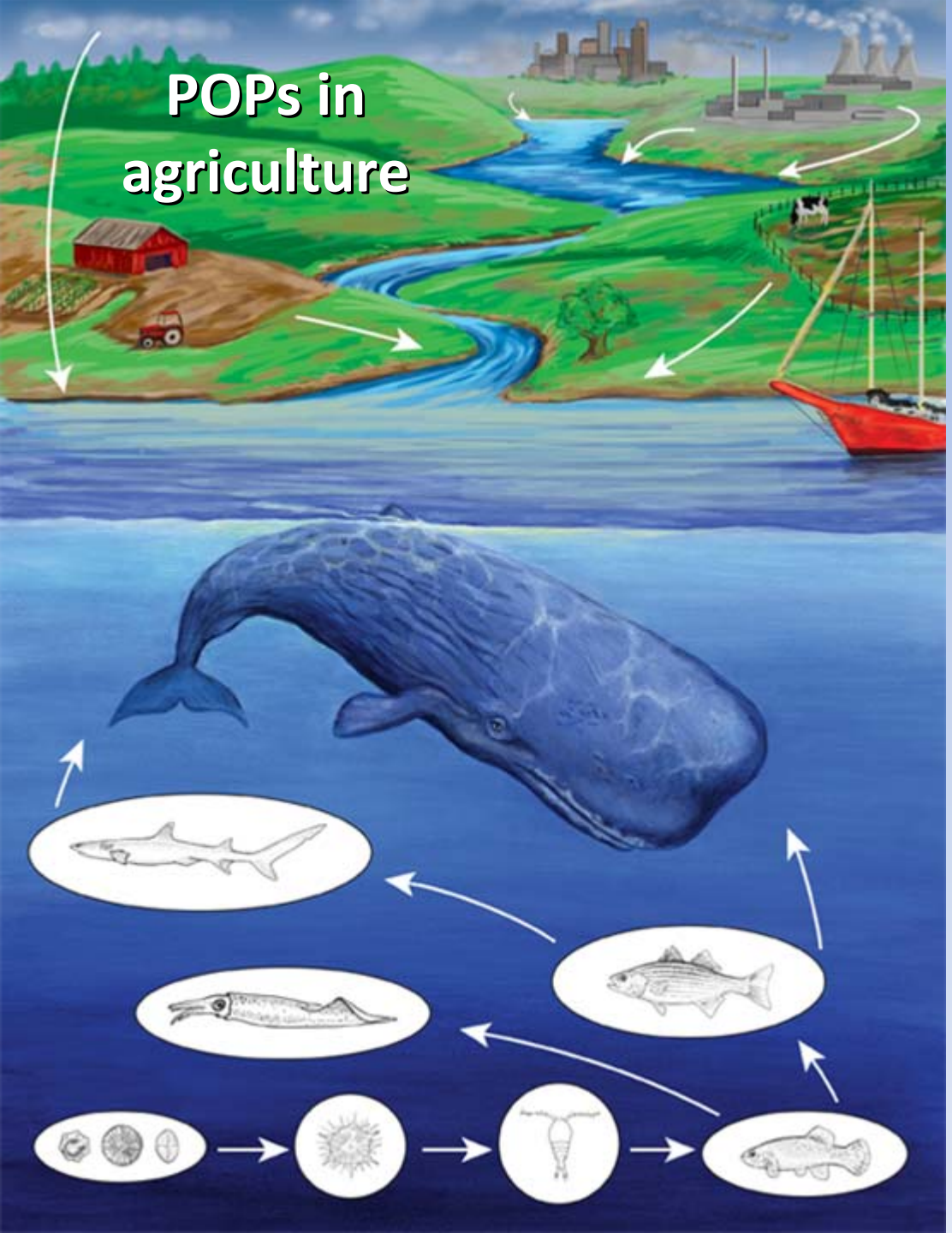
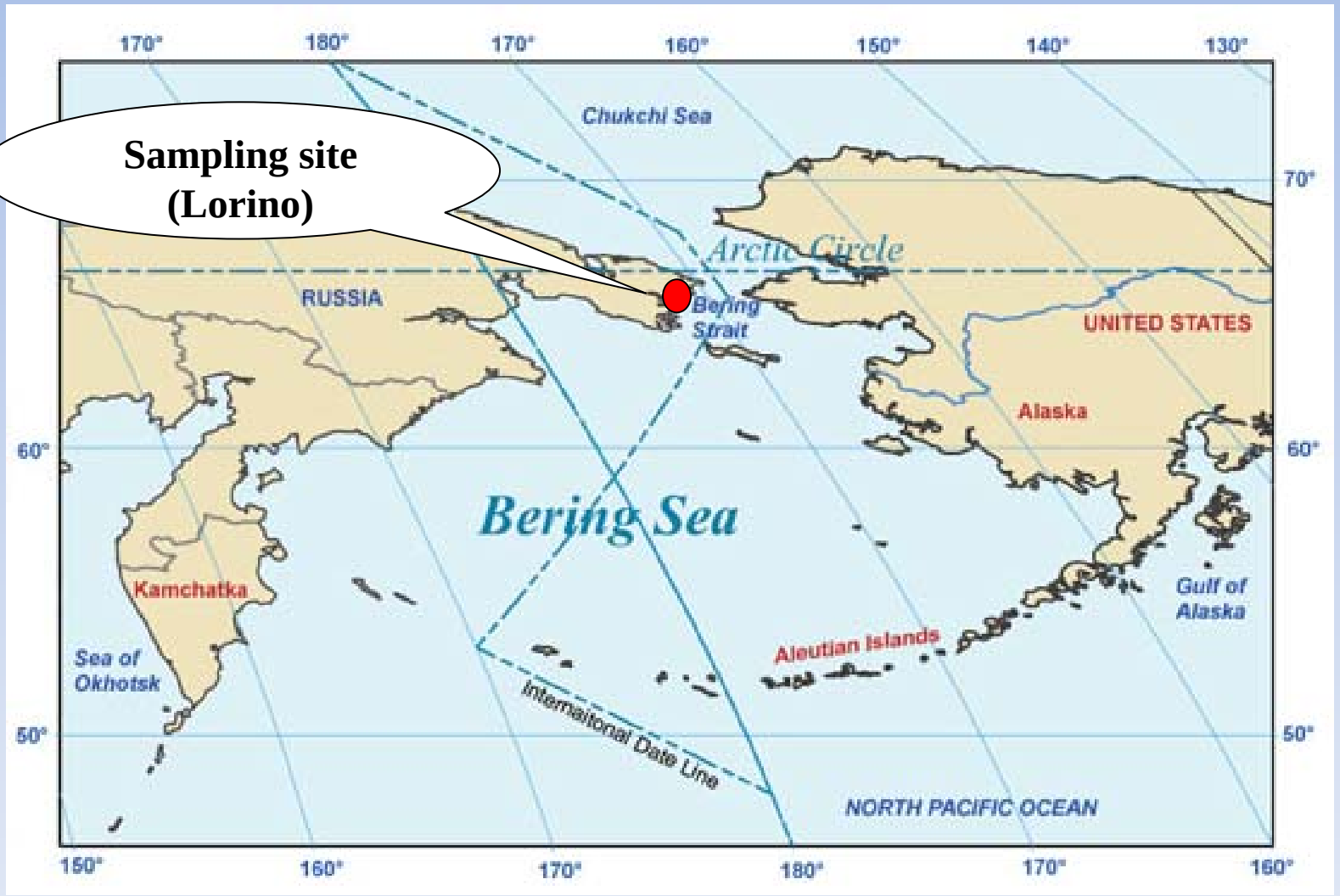


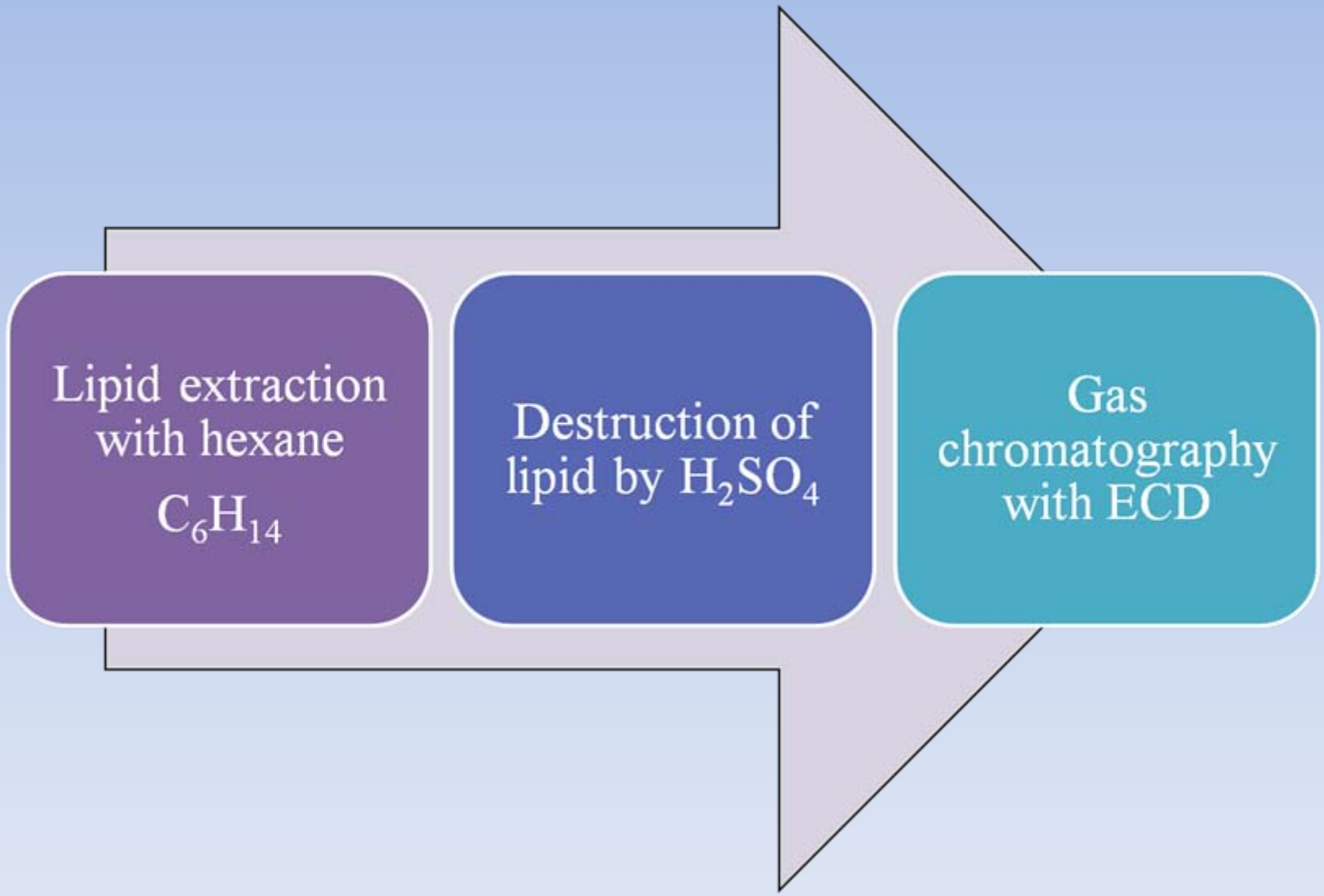
Marine mammals are the top of the food web, and thus accumulate in their organs various toxic substances. Persistent organic pesticides deposit in the adipose tissue, as they are lipophilic xenobiotics.

***Objective*: determine the levels of persistent organochlorine pesticides in the organs of the Gray Whale and Pacific Walrus from the Bering Sea**

They were caught by Chukotka natives in the summer of 2010-2011. *The International Whaling Commission* (IWC) has allowed exclusive harvesting rights for these Chukchi-Californian grey whales to the indigenous peoples of Chukotka and Alaska as a means of supporting their traditional lifestyles.

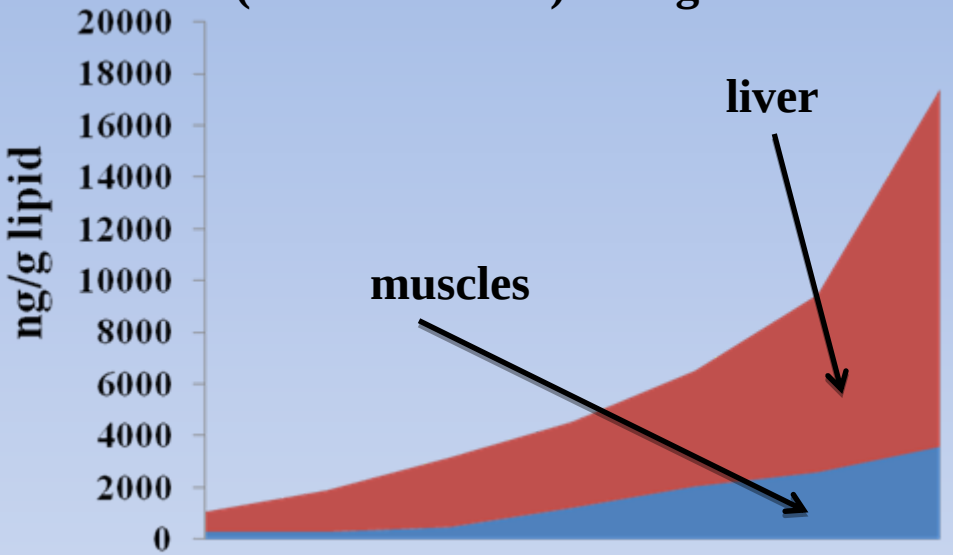


Methods for the pesticides analysis

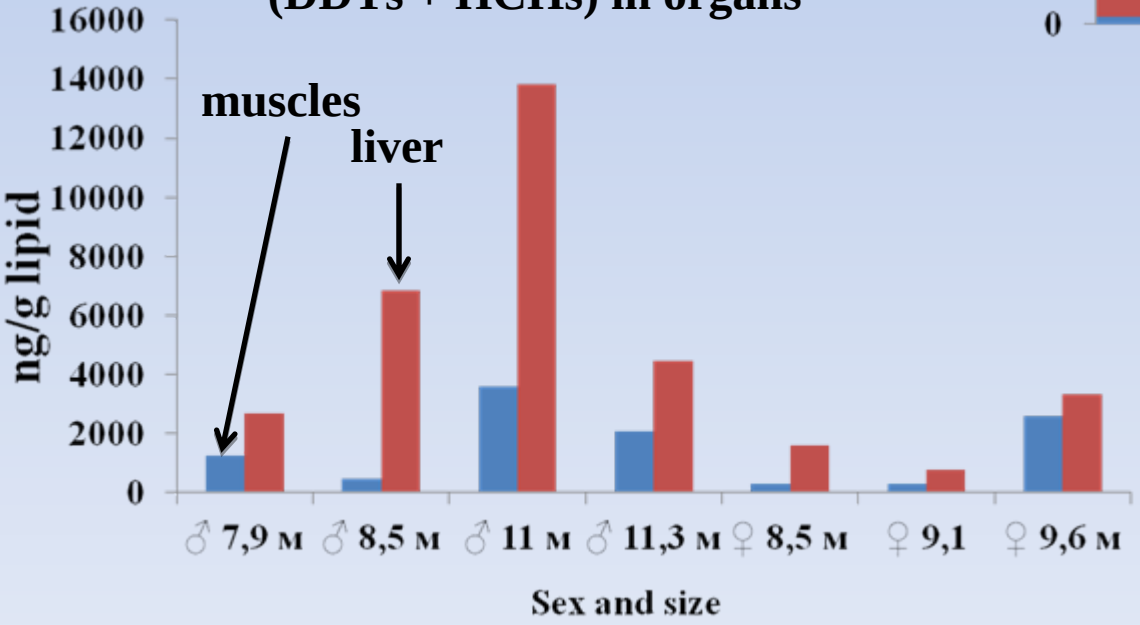


Results. Gray whale

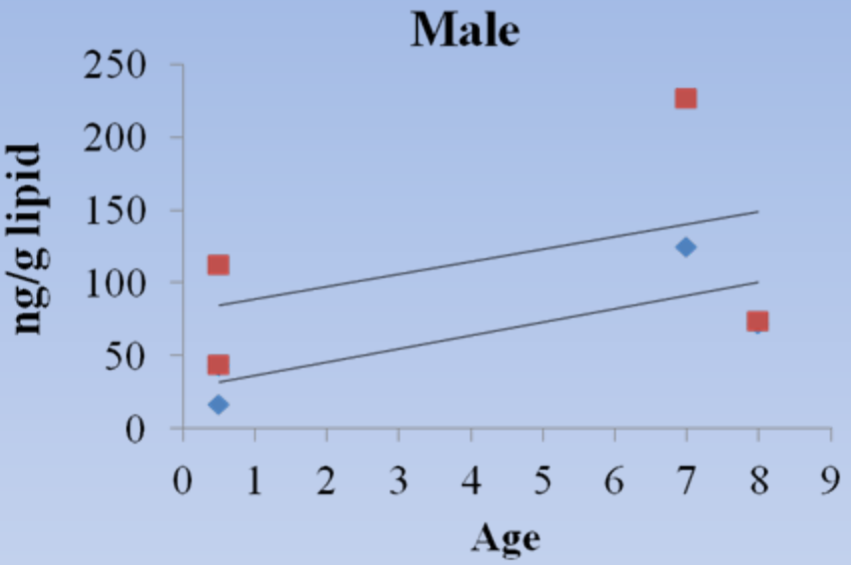
The range of concentrations of POPs (DDTs + HCHs) in organs



Total concentration of POPs (DDTs + HCHs) in organs

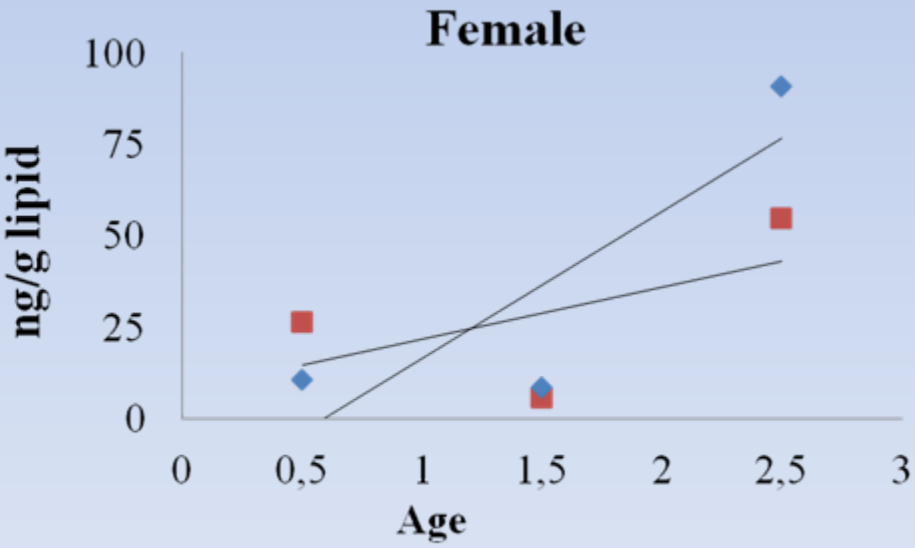


Age-dependent accumulation of POPs in the organs of male and female gray whale



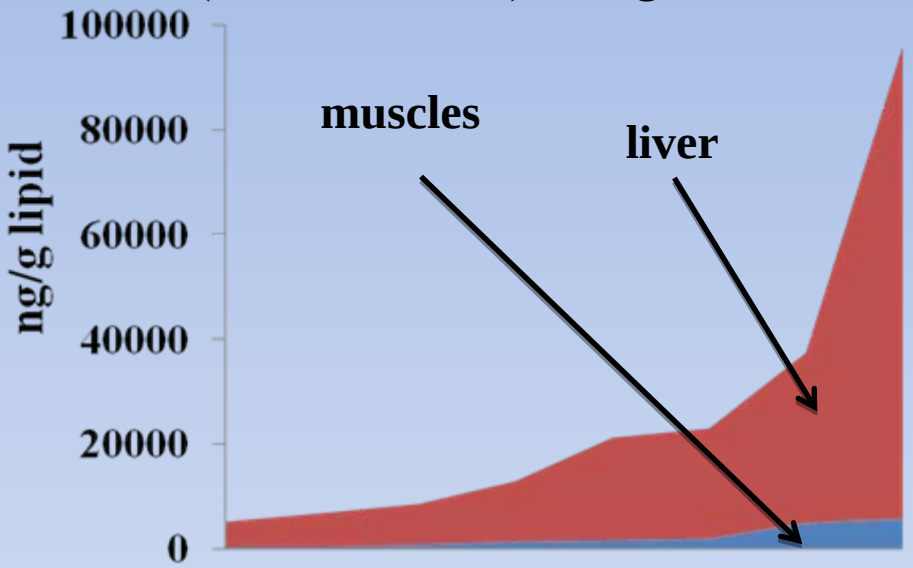
Liver

Muscles

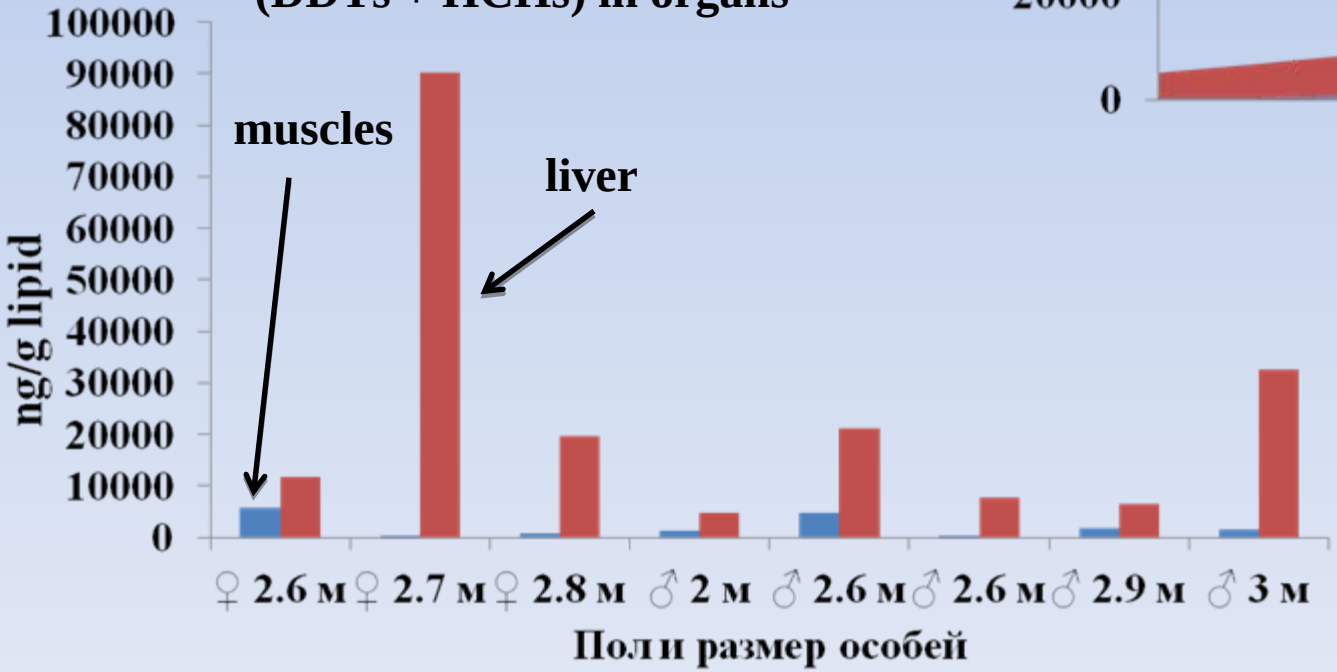


Results. Pacific warlus

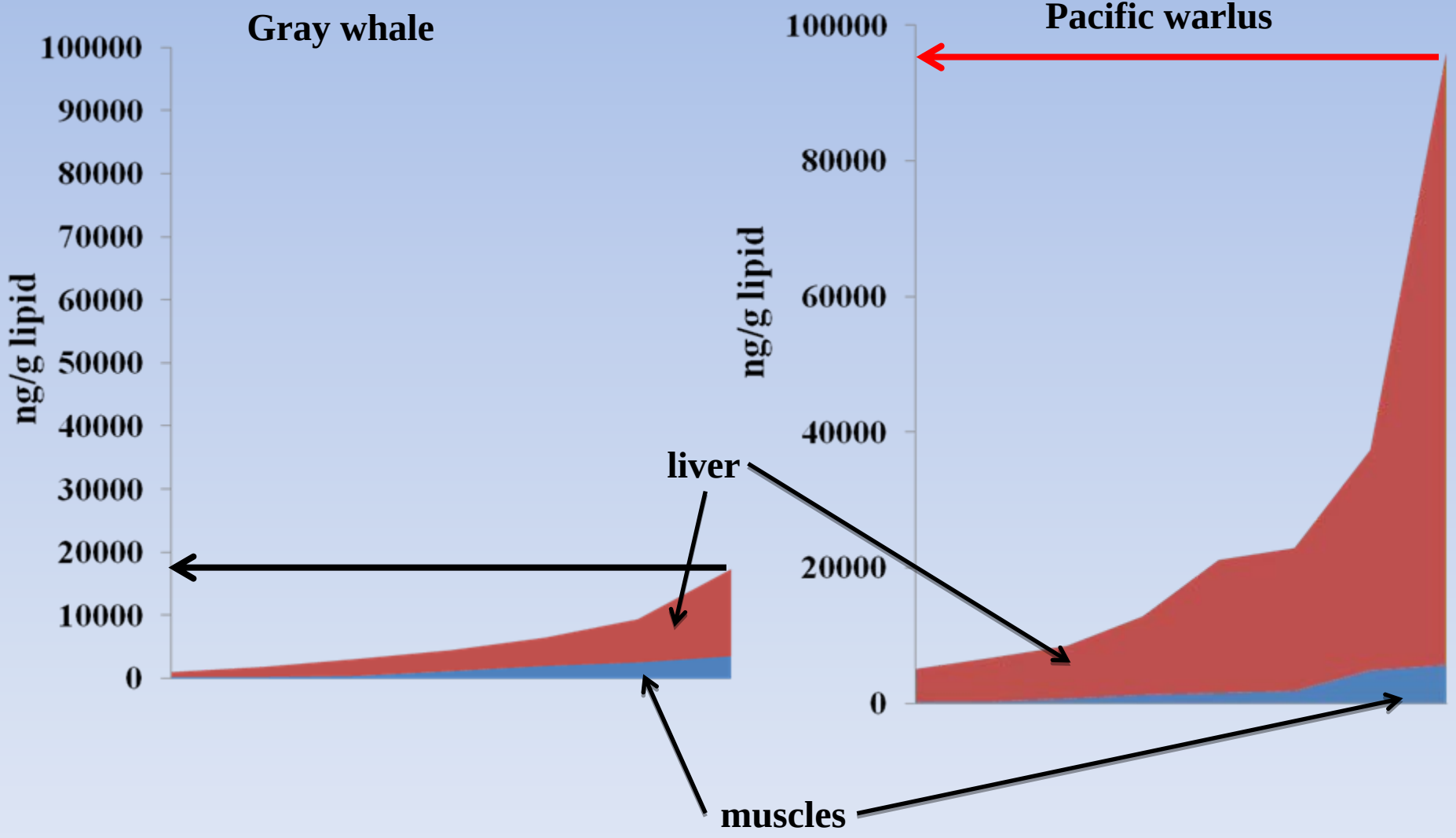
The range of concentrations of POPs (DDTs + HCHs) in organs



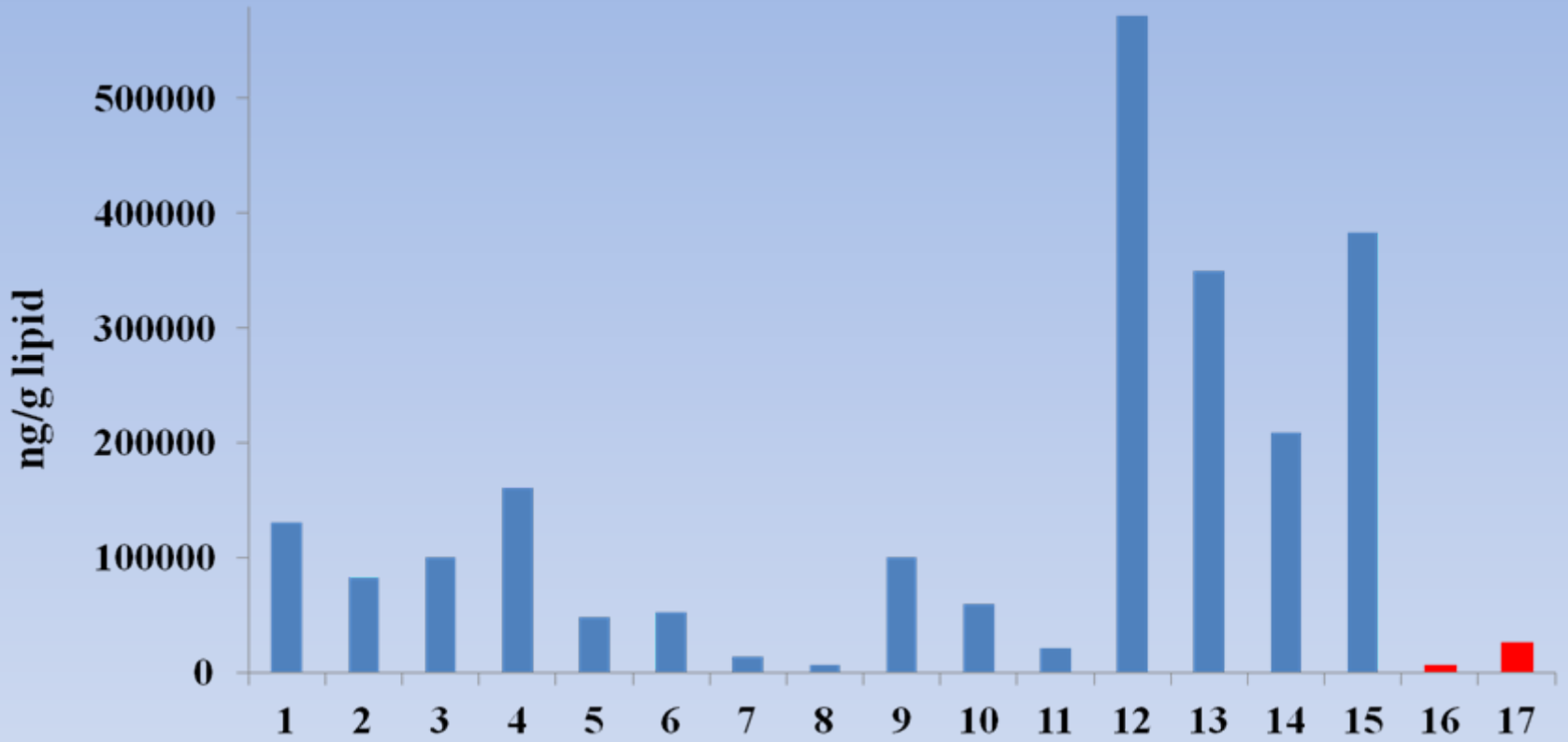
Total concentration of POPs (DDTs + HCHs) in organs



The range of total concentration of POPs in organs in analyzed marine mammals

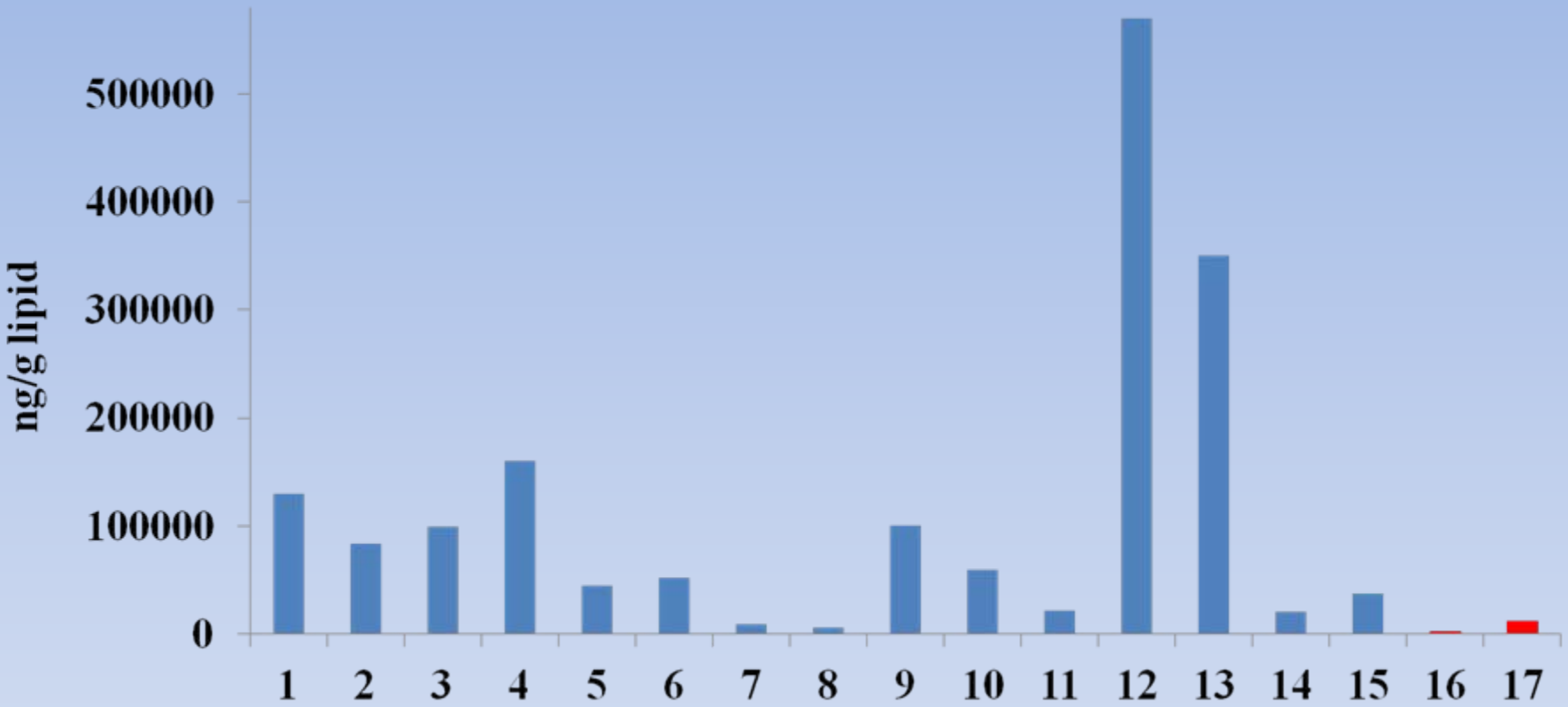


The total concentration of POPs in marine mammals from different areas of World Ocean and analyzed species from the Bering Sea



1 - Striped dolphin (Japan), 2 - Black killer whale (Hawaiian Islands), 3 - Killer whale (California-Alaska. 2006), 4 - Killer whale (California-Alaska. 2007), 5 - Finless porpoises (Korea), 6 - Dugong (Australia), 7 - Finless porpoises (Black sea), 8 - Dolphin (Black sea), 9 - Sea lion (California, San Francisco), 10 – Elephant seal (California), 11 - Harbor seals (California), 12 - Sea lion (California, Monterey), 13 - Harbor seals (California, San Francisco), 14 - Harbor seals (Atlantic ocean), 15 - Common seal (Sea of Japan, Russia), **16 - Grey whale (the Bering sea, Russia), 17 – Pacific walrus (the Bering Sea, Russia)**

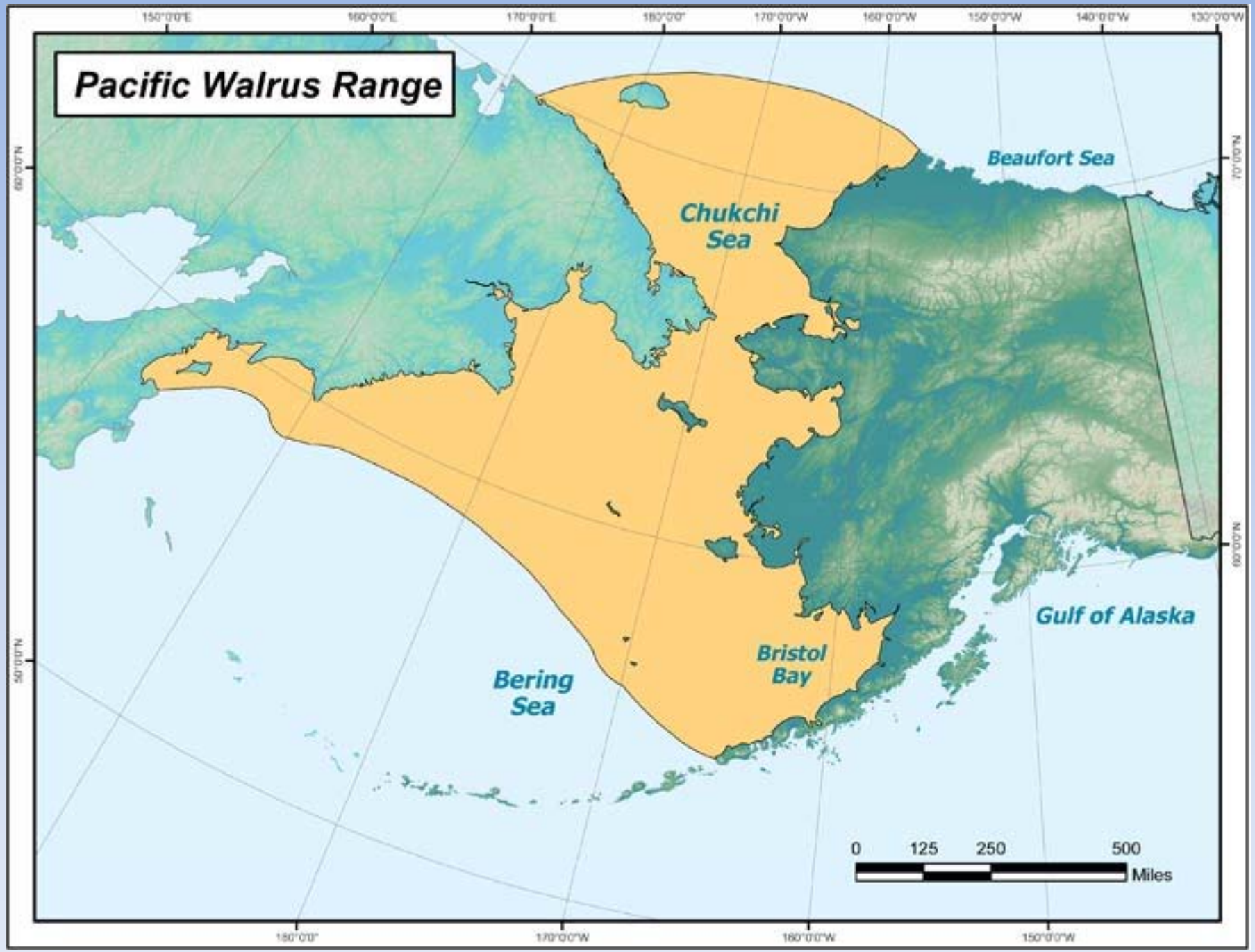
The total concentration of DDTs in marine mammals from different areas of World Ocean and analyzed species from the Bering Sea



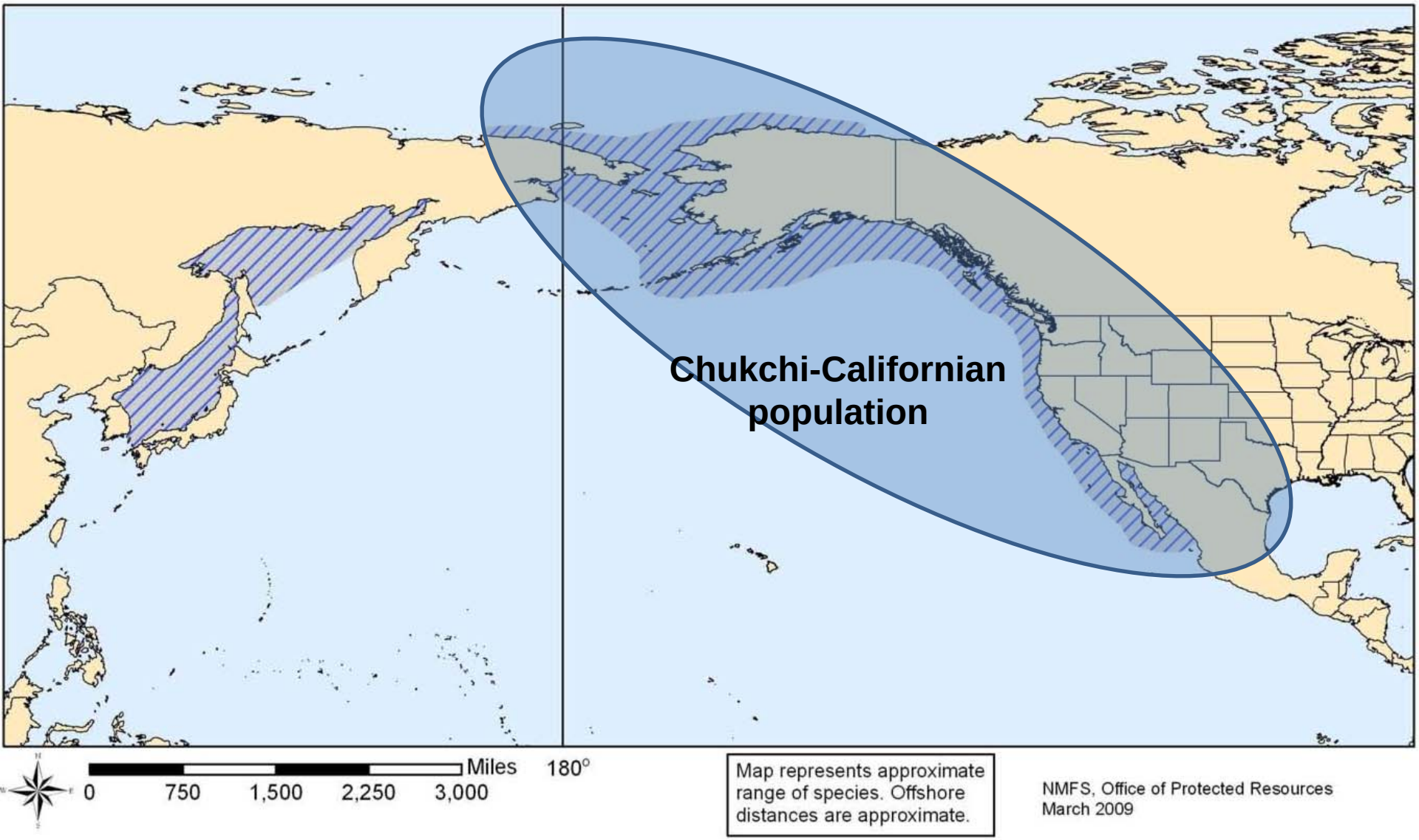
1 - Striped dolphin (Japan), 2 - Black killer whale (Hawaiian Islands), 3 - Killer whale (California-Alaska. 2006), 4 - Killer whale (California-Alaska. 2007), 5 - Finless porpoises (Korea), 6 - Dugong (Australia), 7 - Finless porpoises (Black sea), 8 - Dolphin (Black sea), 9 - Sea lion (California, San Francisco), 10 – Elephant seal (California), 11 - Harbor seals (California), 12 - Sea lion (California, Monterey), 13 - Harbor seals (California, San Francisco), 14 - Harbor seals (Atlantic ocean), 15 - Common seal (Sea of Japan, Russia), **16 - Grey whale (the Bering sea, Russia), 17 – Pacific walrus (the Bering Sea, Russia)**

The total concentration of HCHs in marine mammals from different areas of World Ocean and analyzed species from the Bering Sea

1 - Striped dolphin (Japan), 2 - Black killer whale (Hawaiian Islands), 3 - Killer whale (California-Alaska. 2006), 4 - Killer whale (California-Alaska. 2007), 5 - Finless porpoises (Korea), 6 - Dugong (Australia), 7 - Finless porpoises (Black sea), 8 - Dolphin (Black sea), 9 - Sea lion (California, San Francisco), 10 – Elephant seal (California), 11 - Harbor seals (California), 12 - Sea lion (California, Monterey), 13 - Harbor seals (California, San Francisco), 14 - Harbor seals (Atlantic ocean), 15 - Common seal (Sea of Japan, Russia), **16 - Grey whale (the Bering sea, Russia), 17 – Pacific walrus (the Bering Sea, Russia)**


Pacific Walrus Range
Beaufort Sea
Chukchi Sea
Gulf of Alaska
Bristol Bay
Bering Sea
0 125 250 500
Miles

Gray Whale Range

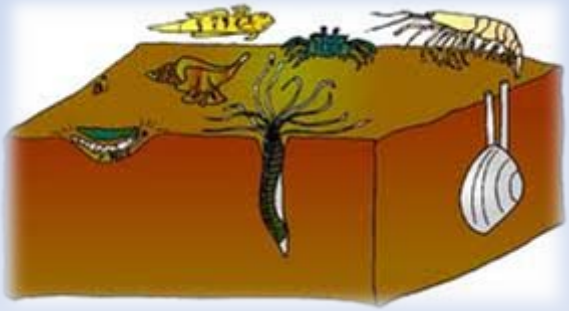


Map represents approximate range of species. Offshore distances are approximate.

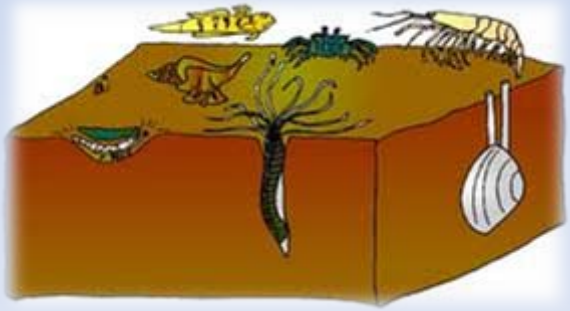
NMFS, Office of Protected Resources
March 2009

Octopus

Fish

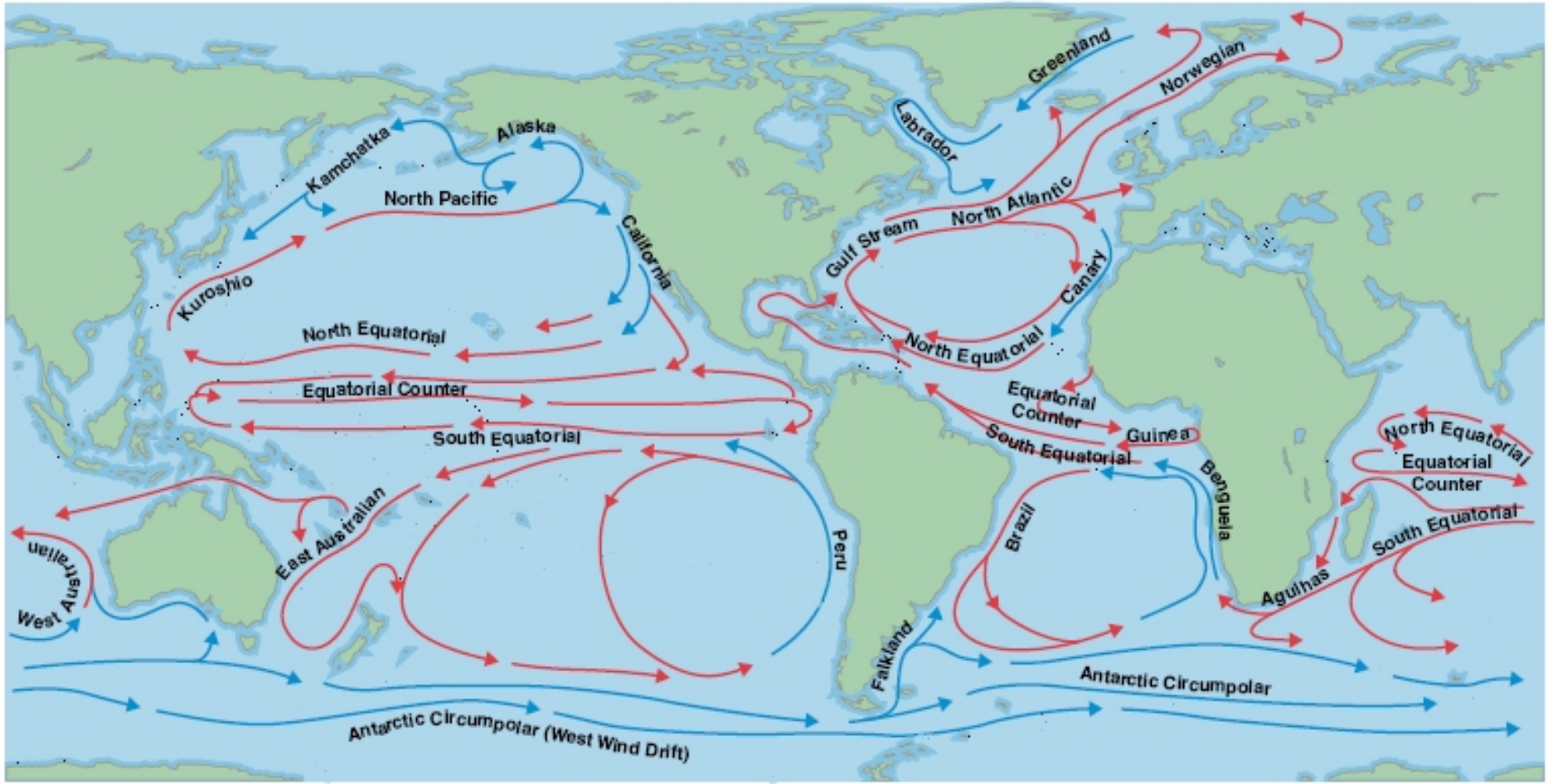


Small benthic organisms



Small benthic organisms

As there is no local pollution, transboundary atmospheric transfer, cool condensations and ocean currents from industrial regions of the western coast of North America can be possible sources of pesticides in the marine environment of the Bering Sea



Conclusion

1. Gray whales of the Chukchi-Californian population and the Pacific walruses of the Bering Sea, as well as organisms of other areas of the World Ocean, accumulate persistent organochlorines in the bodies.

2. The total content of POPs in the gray whales and Pacific walruses confirms the accumulation of lipophilic xenobiotics in marine ecosystems in organisms of higher trophic levels.

3. In the bodies of mammals the amount of isomers of HCH prevails over the amount of DDT and its metabolites.

4. Higher concentrations of POPs are observed in large adults compared to younger individuals smaller in size, reflecting the accumulation of pesticides with the age.

5. Accumulation of POPs is more active in the liver than in the muscles.

6. The total average concentration of POPs in the bodies of the gray whale and Pacific walrus is lower than that of other marine mammals from the urbanized coast of the World Ocean. With the absence of local sources of pesticides in the Russian part of the Bering Sea possible factors of pesticide accumulation are atmospheric transfer, cold concentration and oceanic currents.

Thank you!!!