

The role of mesopelagic fishes in ecosystem vertical mixing in the north western Pacific



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Data selection from TINRO-Center RDB:

Autumn

stations in the Bering Sea – 231

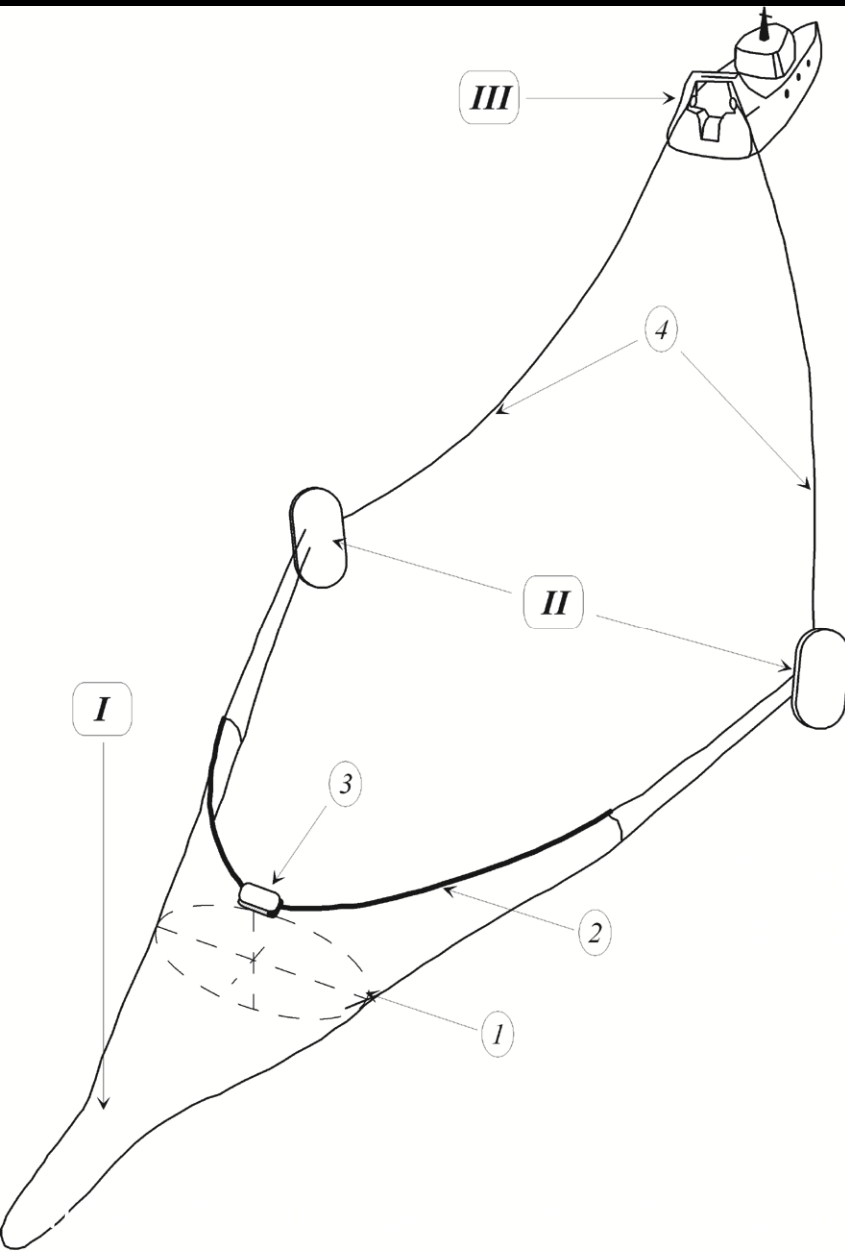
-----the Sea of Okhotsk – 542

Summer

-----the northwestern Pacific – 1329

Filter was tuned to select stations carried out
only during night time
in the upper pelagic layer (0-50)
over deep water regions of Russian EEZ





average biomass concentration or relative abundance

was estimated as kg/km^2

and transformed to normal distribution by power of $\frac{1}{4}$

species of midwater (mesopelagic) fishes were selected families

Chirocentridae, *Bathylagidae*, *Nemichthyidae*, *Chirocentridae* and *Lampridae*

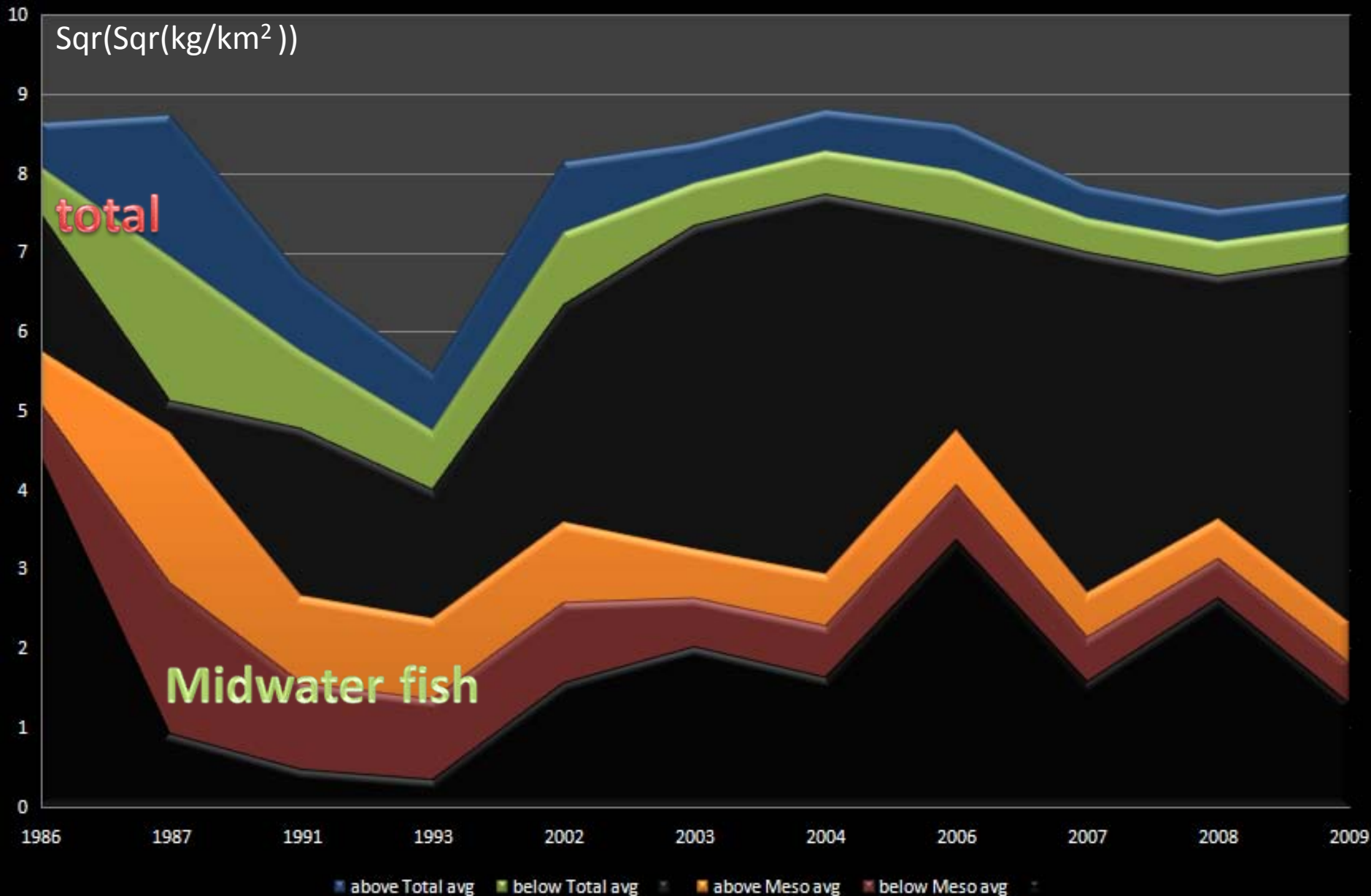
highest frequencies of occurrence

of BL

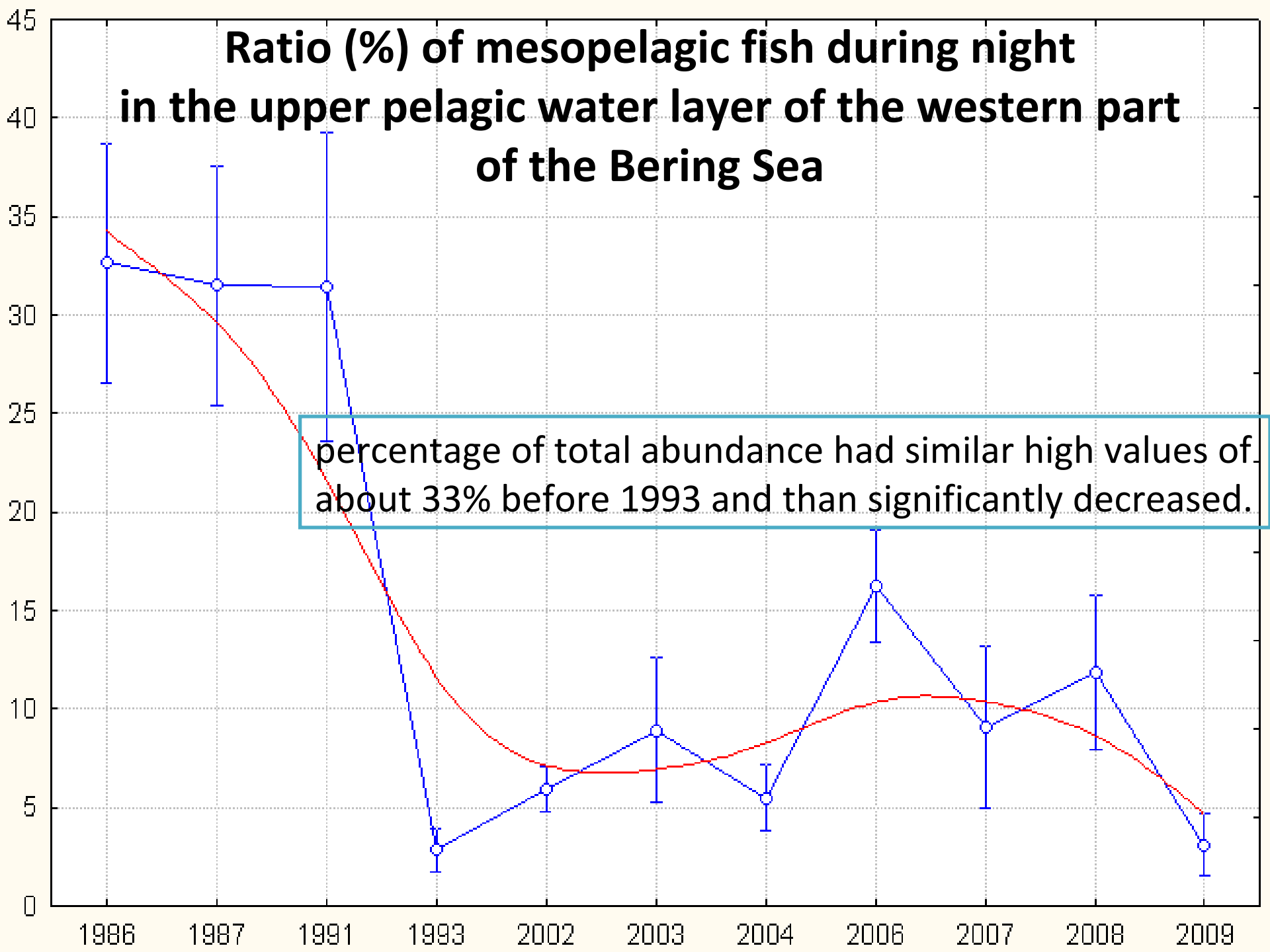
Upper of 95% confidence interval of frequency of occurrence were
(in descending order):

1. *Leuroglossus schmidti* (Northern smoothtongue) fam. *Bathylagidae*
2. *Stenobranchius leucopsarus* (Northern lampfish) fam. *Myctophidae*
3. *Lipolagus ochotensis* (Eared blacksmelt) fam. *Bathylagidae*
4. *Diaphus theta* (California headlightfish) fam. *Myctophidae*
5. *Stenobranchius nannochir* (Garnet lanternfish) fam. *Myctophidae*
6. *Scopelosaurus harryi* (Scaly paperbone) fam. *Notosudidae*

Confidence intervals (95%) of relative abundance in the western part of the Bering Sea (autumn)

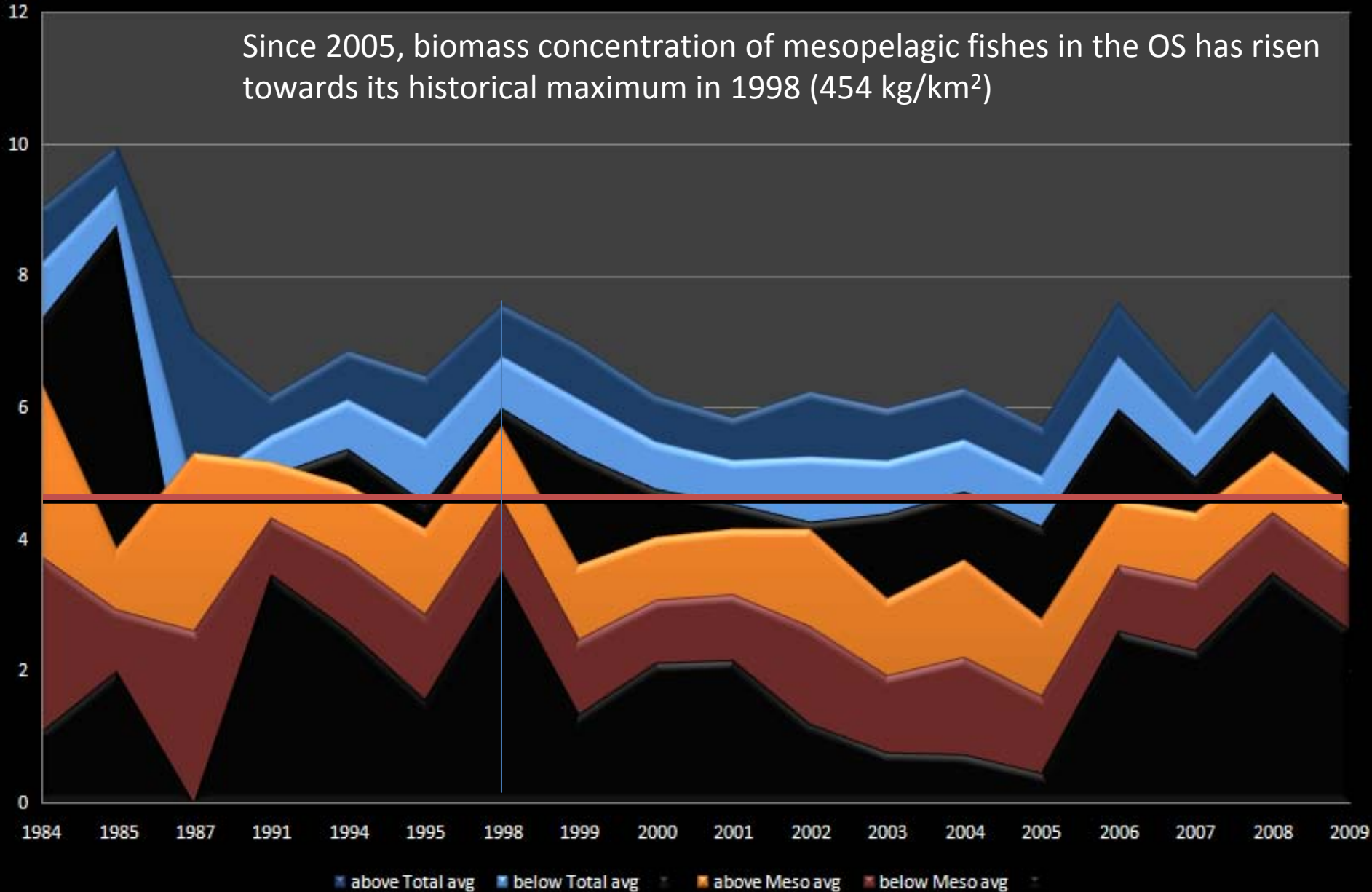


Ratio (%) of mesopelagic fish during night in the upper pelagic water layer of the western part of the Bering Sea



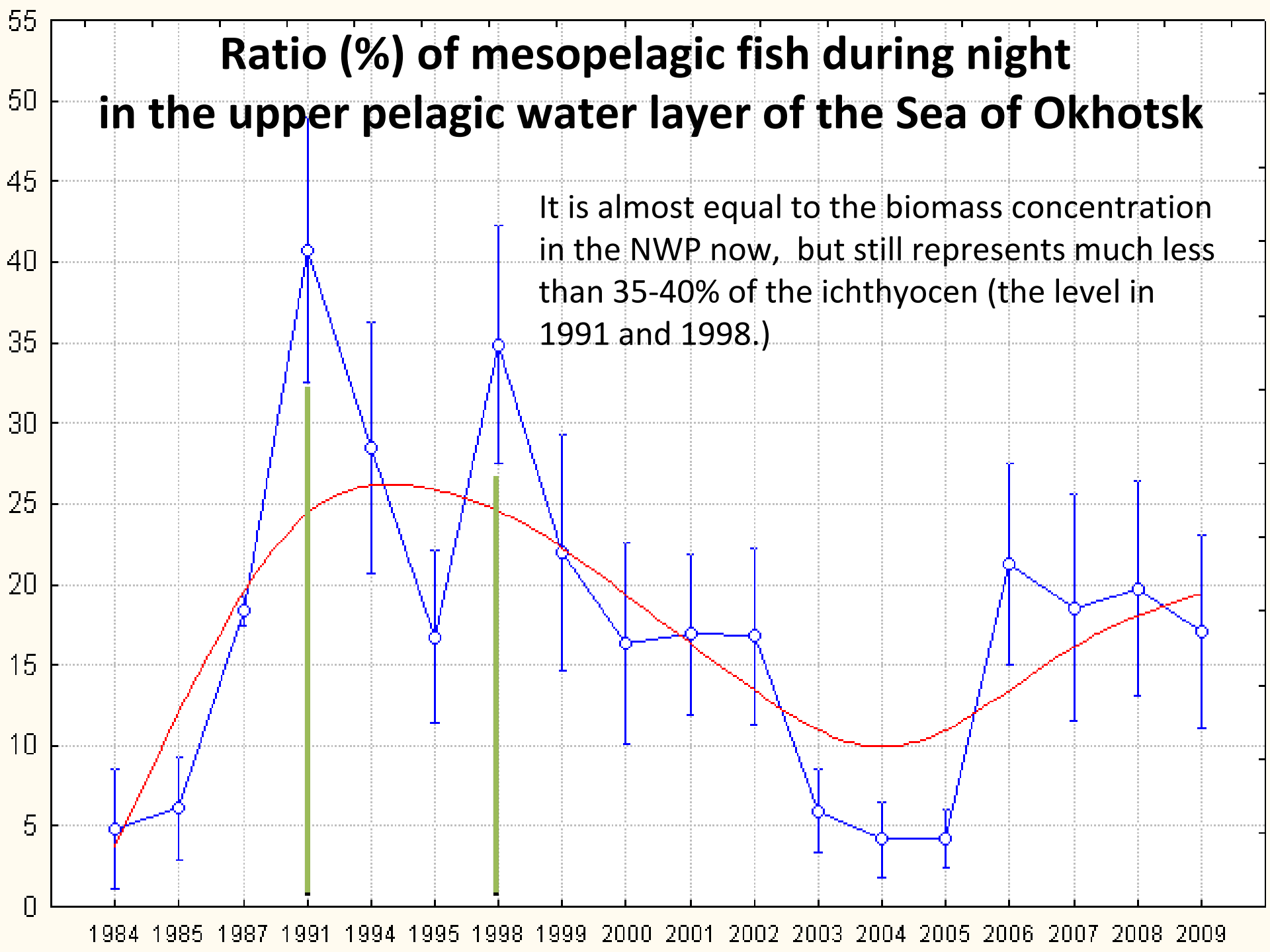
Confidence intervals (95%) of relative abundance in the Sea of Okhotsk (autumn)

Since 2005, biomass concentration of mesopelagic fishes in the OS has risen towards its historical maximum in 1998 (454 kg/km²)



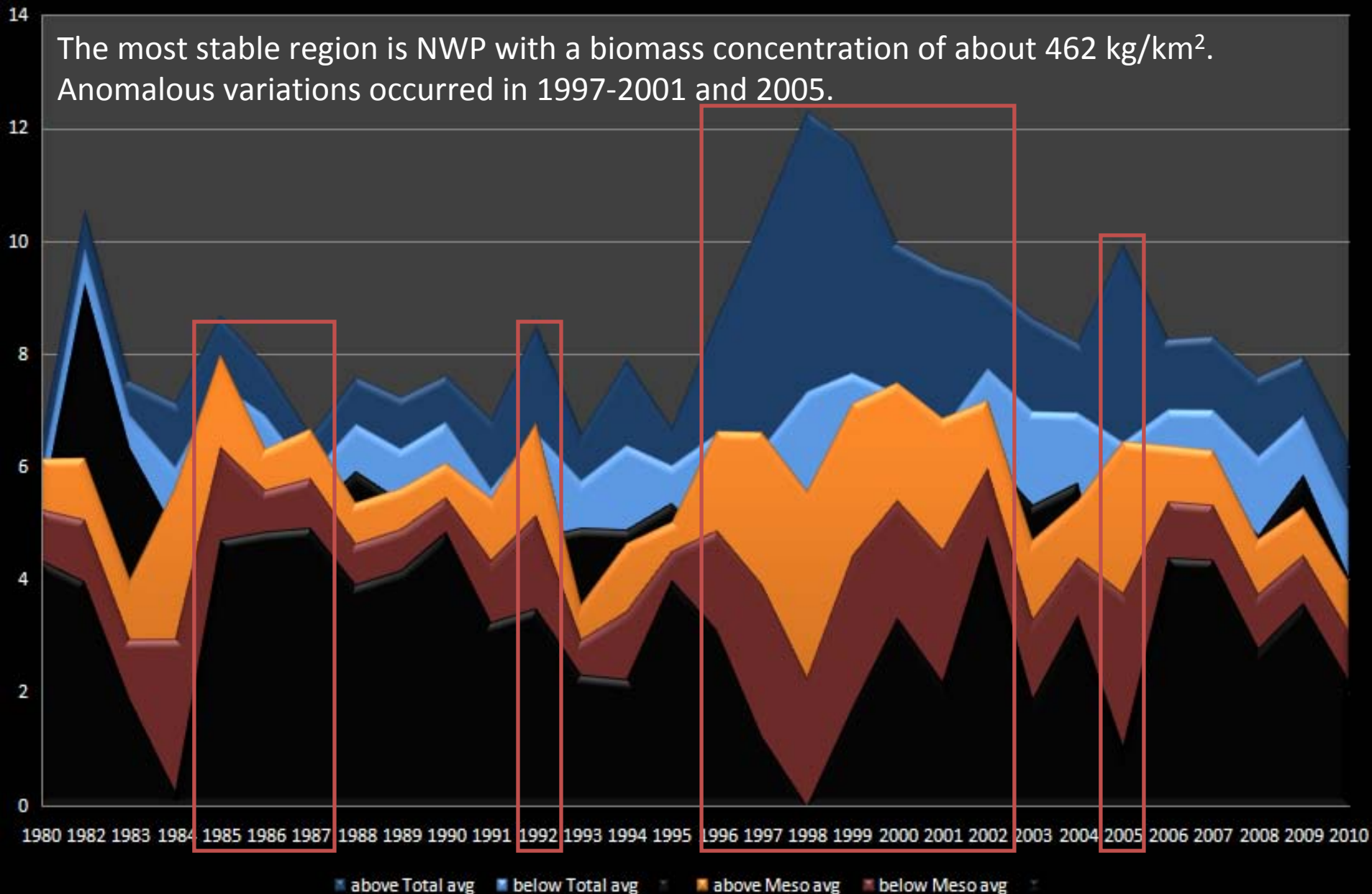
Ratio (%) of mesopelagic fish during night in the upper pelagic water layer of the Sea of Okhotsk

It is almost equal to the biomass concentration in the NWP now, but still represents much less than 35-40% of the ichthyocen (the level in 1991 and 1998.)

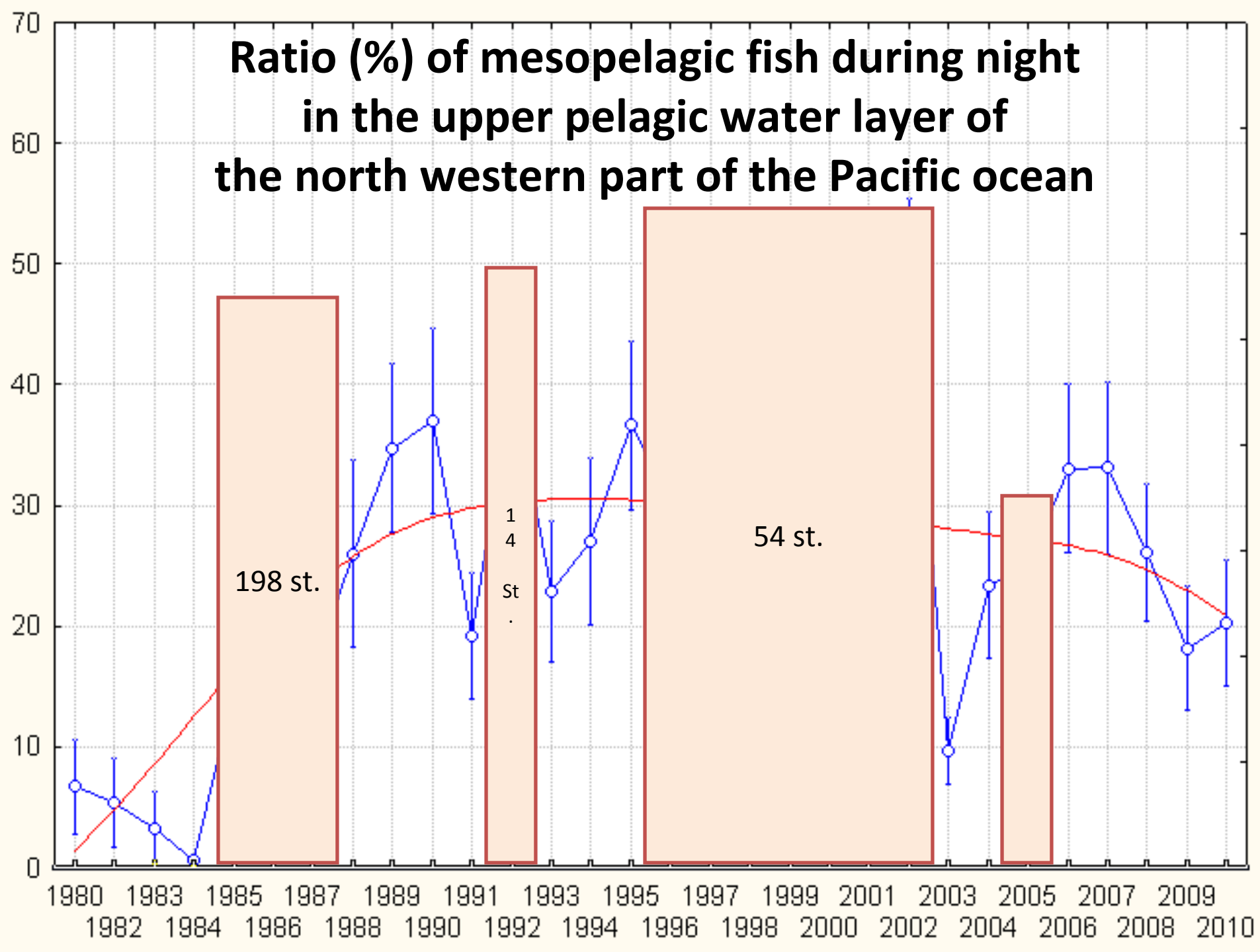


Confidence intervals (95%) of relative abundance in the north western part of the Pacific ocean

The most stable region is NWP with a biomass concentration of about 462 kg/km². Anomalous variations occurred in 1997-2001 and 2005.

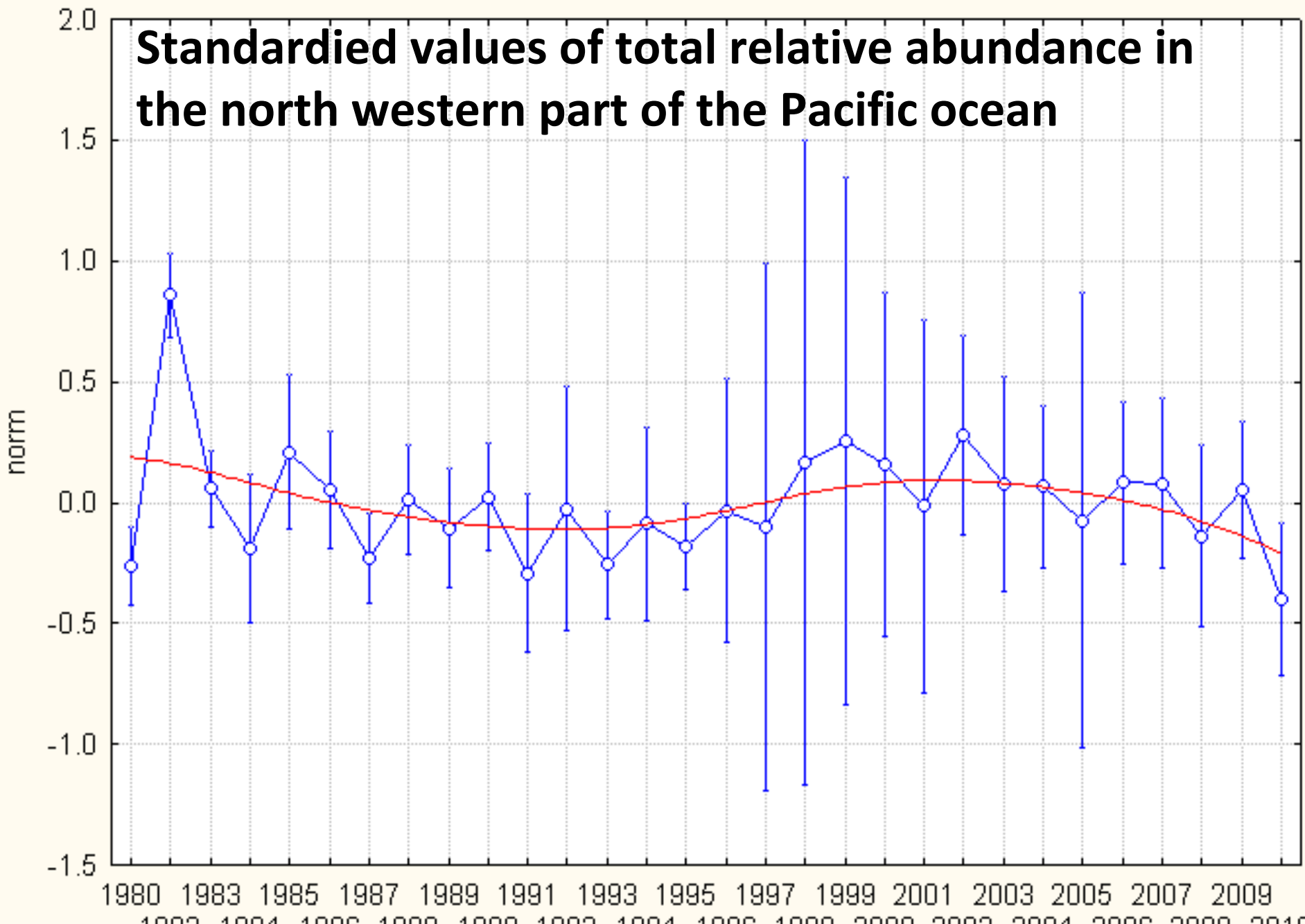


Ratio (%) of mesopelagic fish during night in the upper pelagic water layer of the north western part of the Pacific ocean

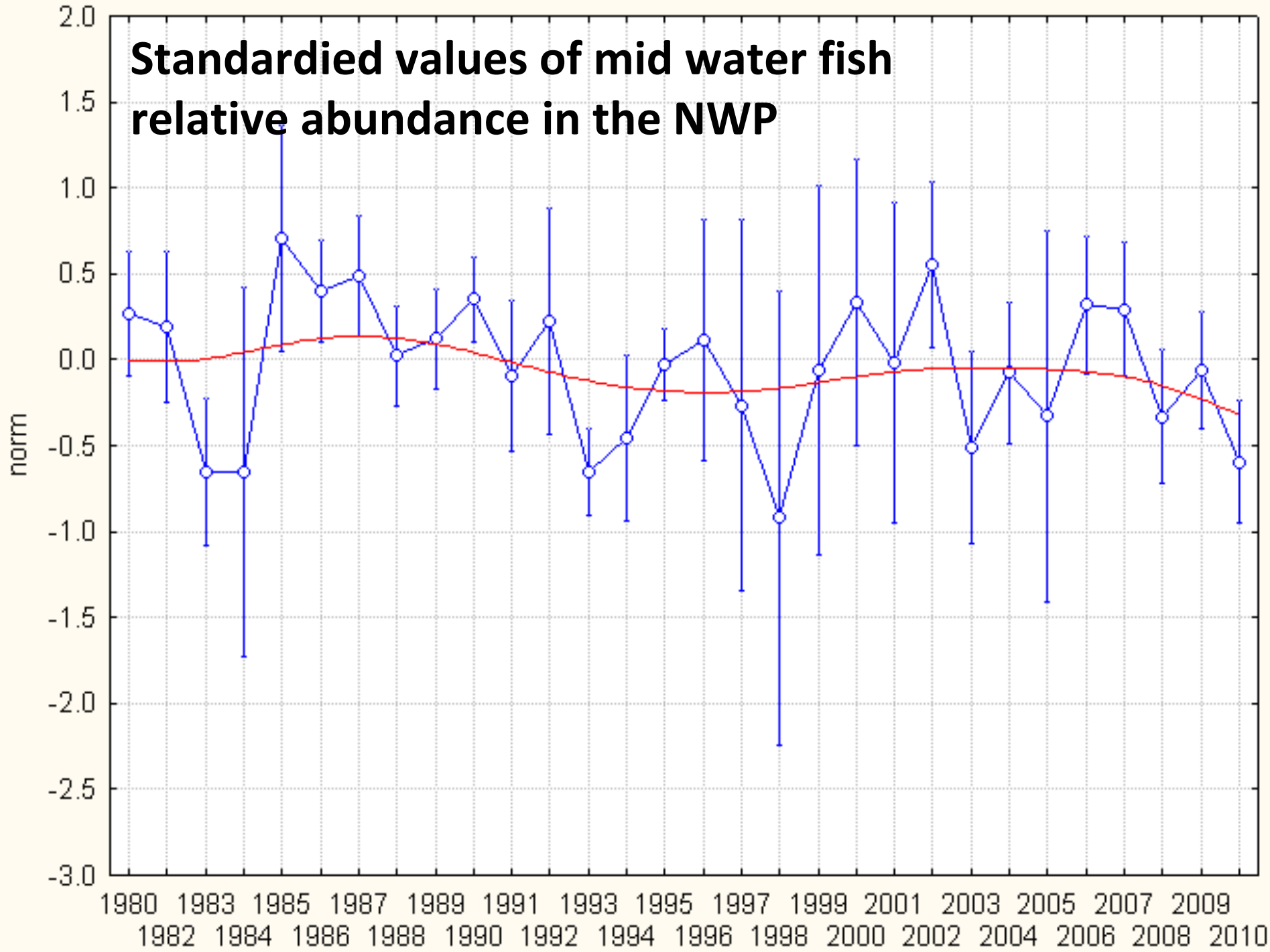


Red = Distance Weighted Least Squares

Standardied values of total relative abundance in the north western part of the Pacific ocean

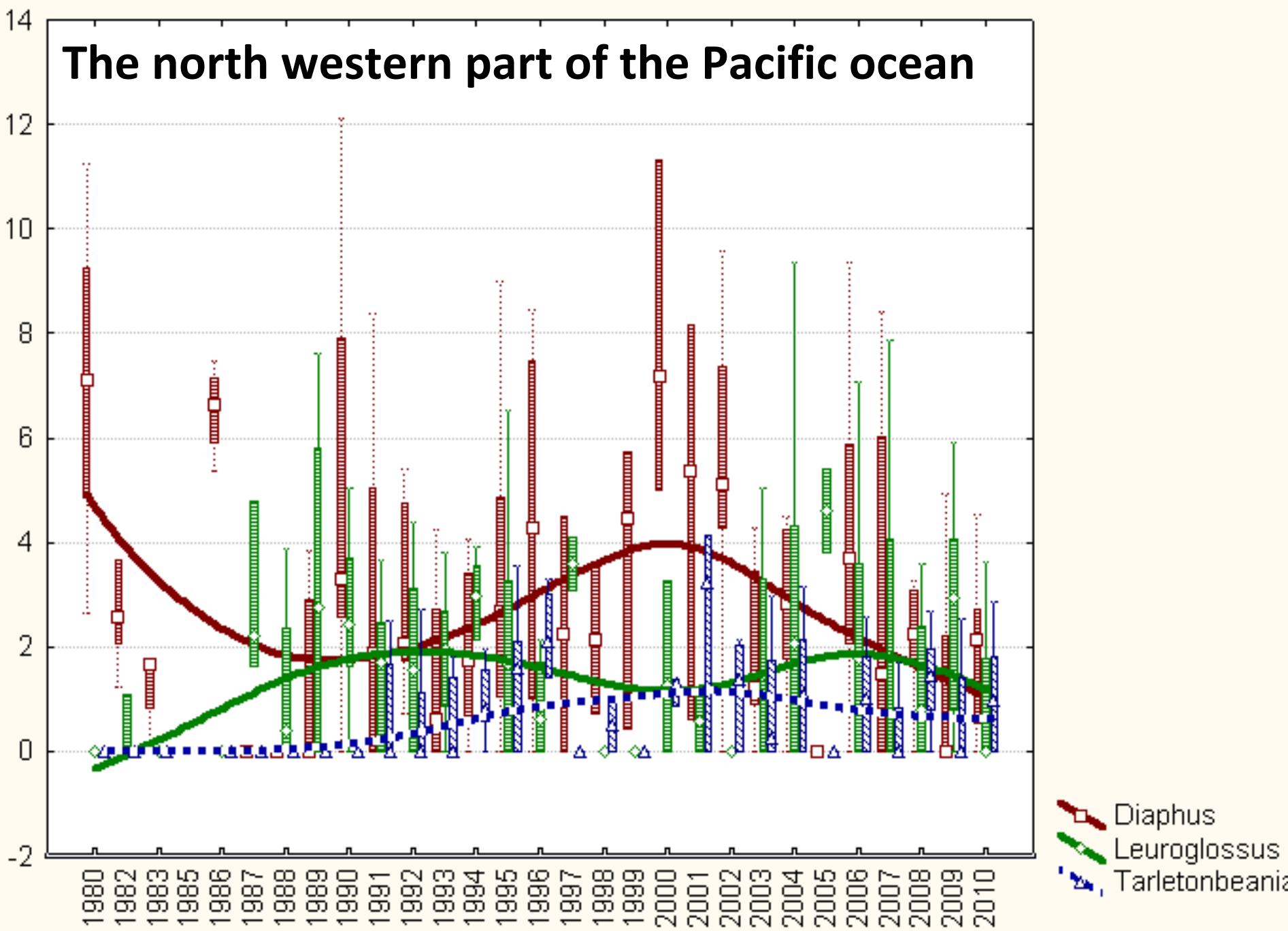


Standardied values of mid water fish relative abundance in the NWP



Median; Box: 25%, 75%; Whisker: Non-Outlier Min, Non-Outlier Max

The north western part of the Pacific ocean



- Noticed significant abrupt changes in a relative abundance of mid water fish in the Sea of Okhotsk and Bering Sea (in autumn).
- Mesopelagic fish began to play a greater role in the Sea of Okhotsk (~20%) than in the Bering Sea, where its ratio declined from ~33% to ~10% after 1993.
- Variation of relative abundance of mid water fish in NWP in summer is so great, that we can not significantly distinguish its concentration averages from total fish biomass concentration for many years, but this region seems to be stable enough with a weak negative tendency. The latest ratio of midwater fish is about 20% in NWP in summer.