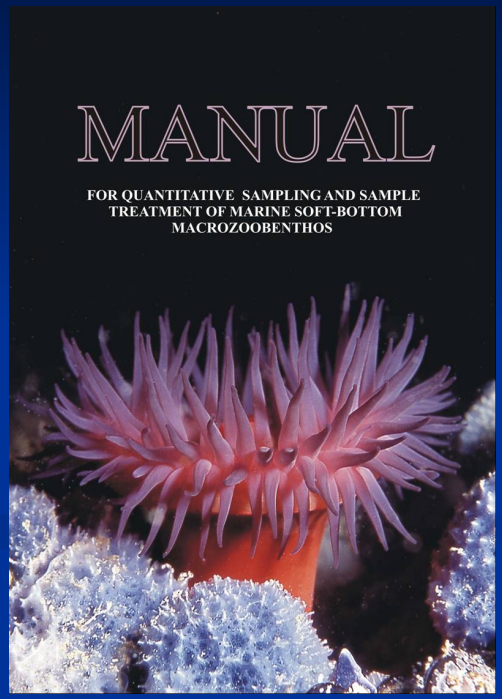
INCREASE IN UNDERSTANDING OF ENVIRONMENTAL STATUS AND FUNCTIONING OF THE BS ECOSYSTEM

15 Years of UNDP/GEF in the Black Sea Region,
Final Seminar,
14-15 February 2008, Istanbul

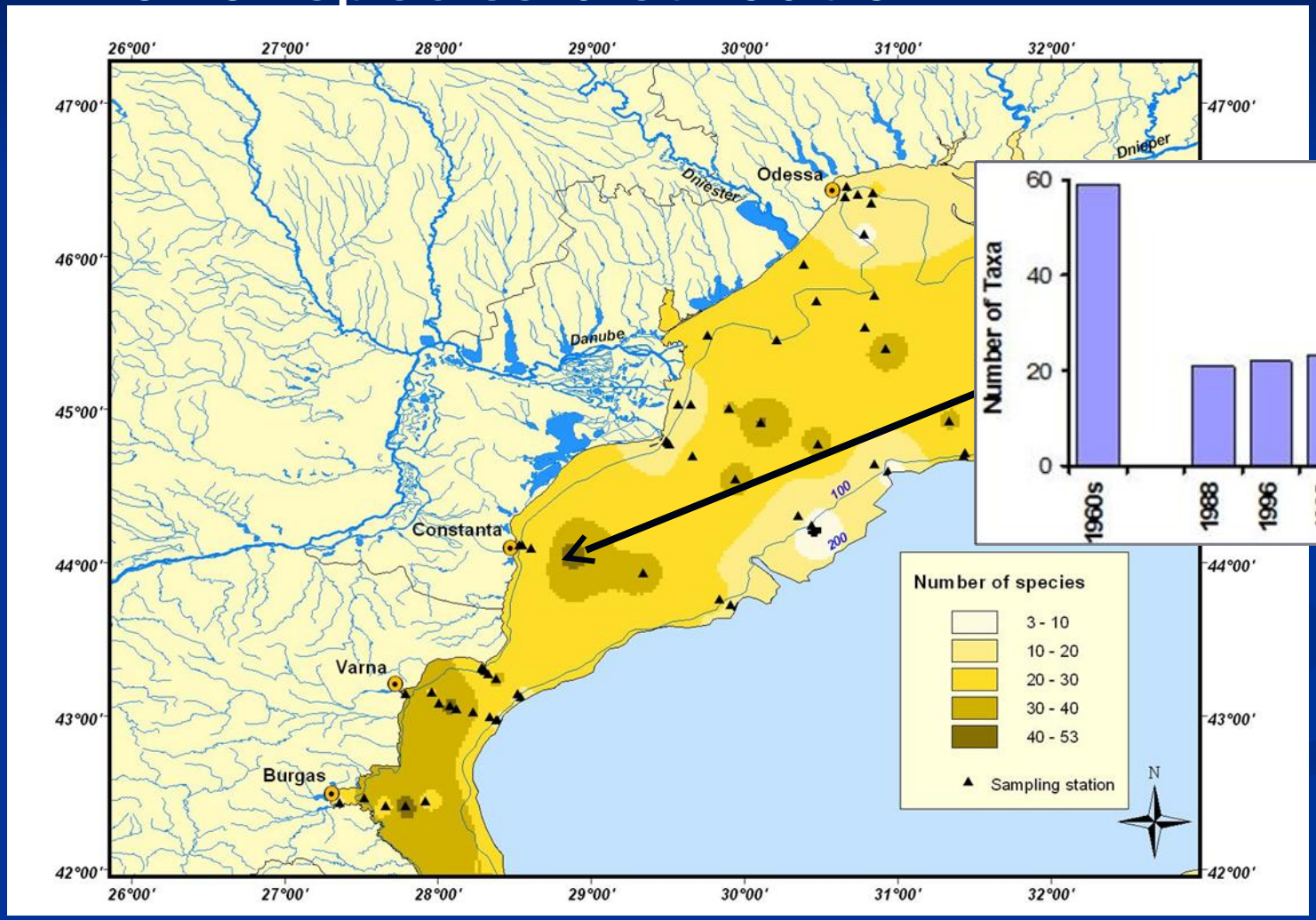
Zoobenthos (1)



- Macro- and meio-benthos
- Standardised macro-methods manual
- Excellent overview of data analysis options in research cruise reports and Todorova & Konsulova presentation (univariate and multivariate approaches)
- Ecological indices represent the best forward for result presentation

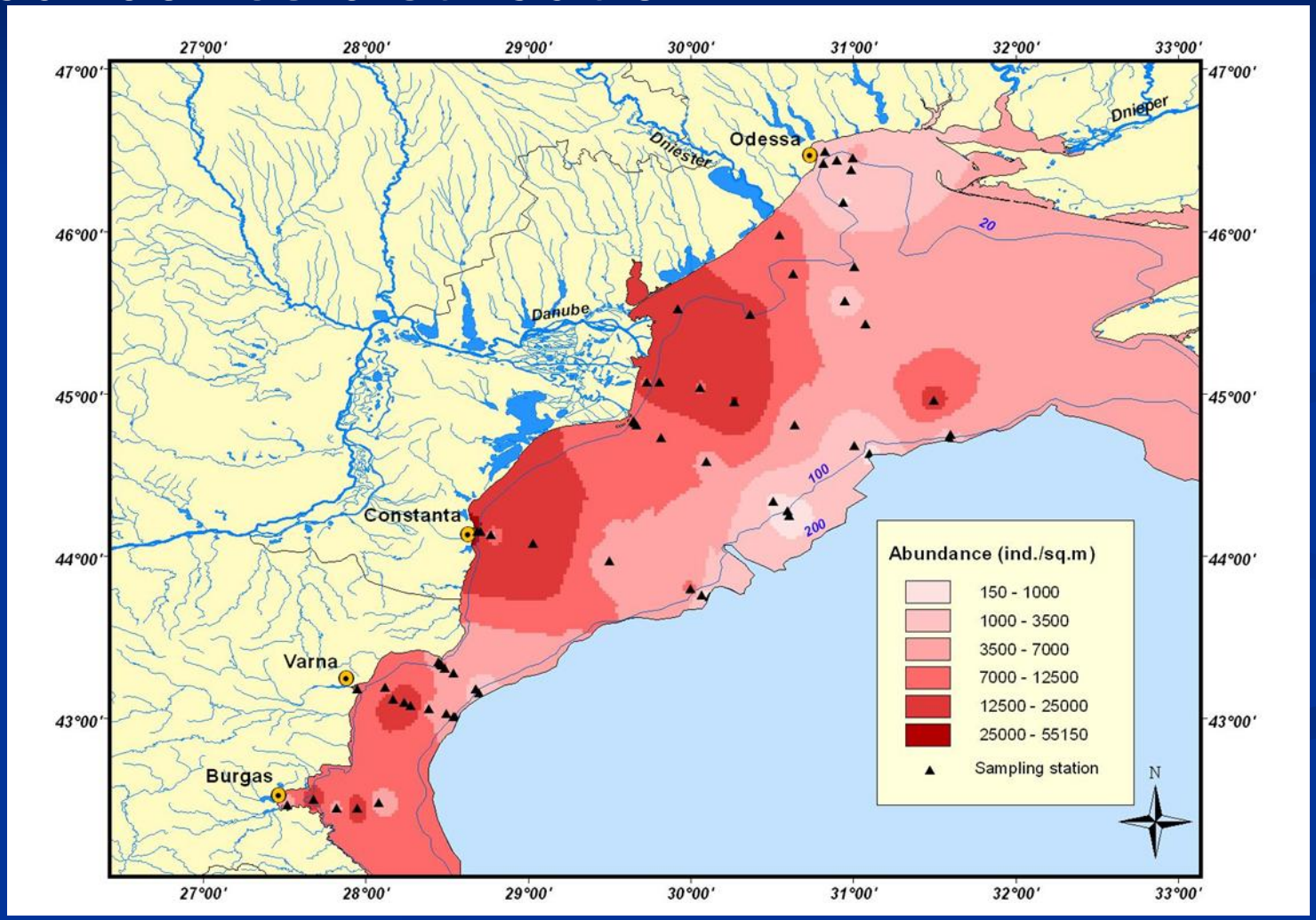
Zoobenthos (2)

- No. of species distribution:



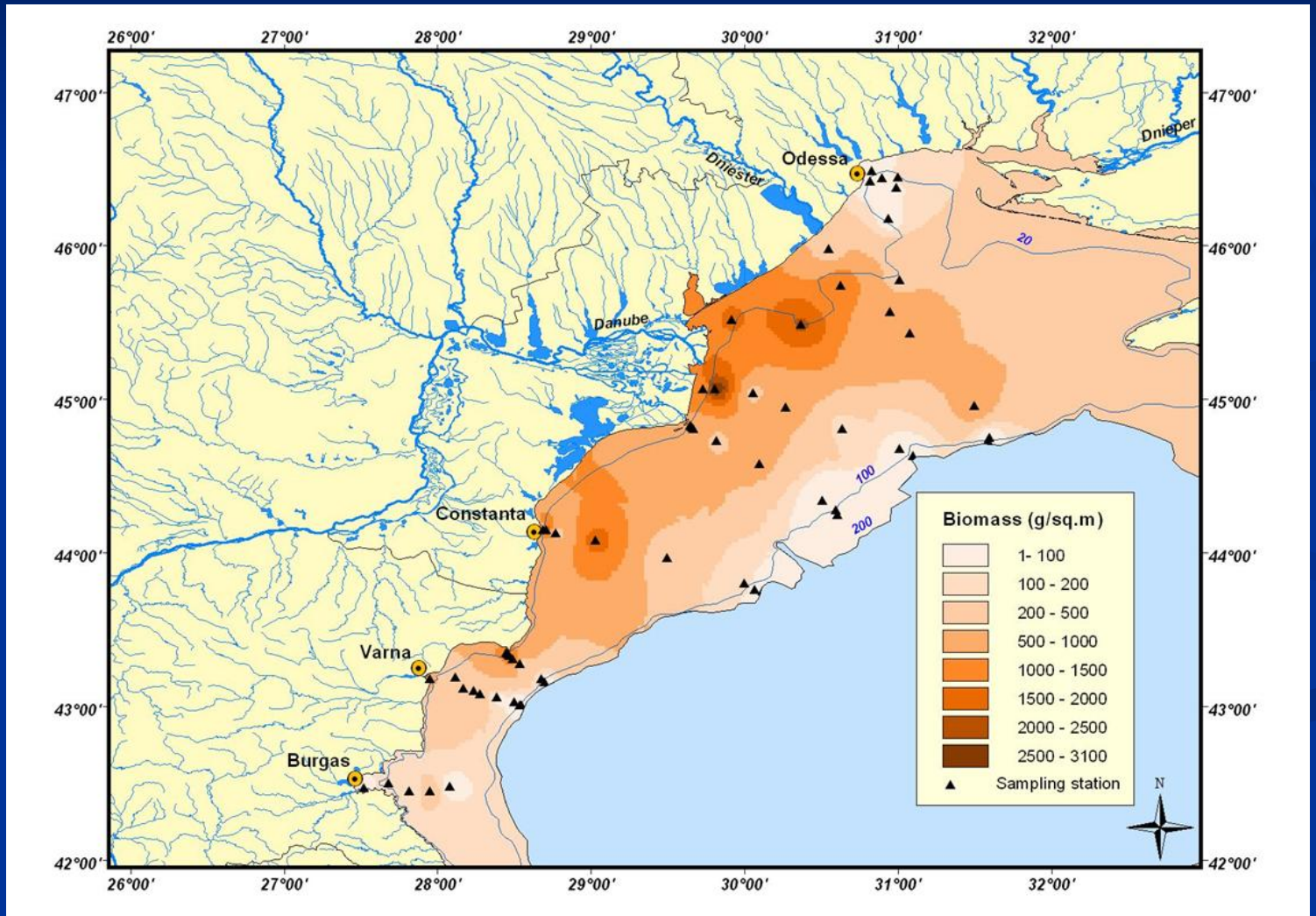
Zoobenthos (3)

- Abundance distribution:



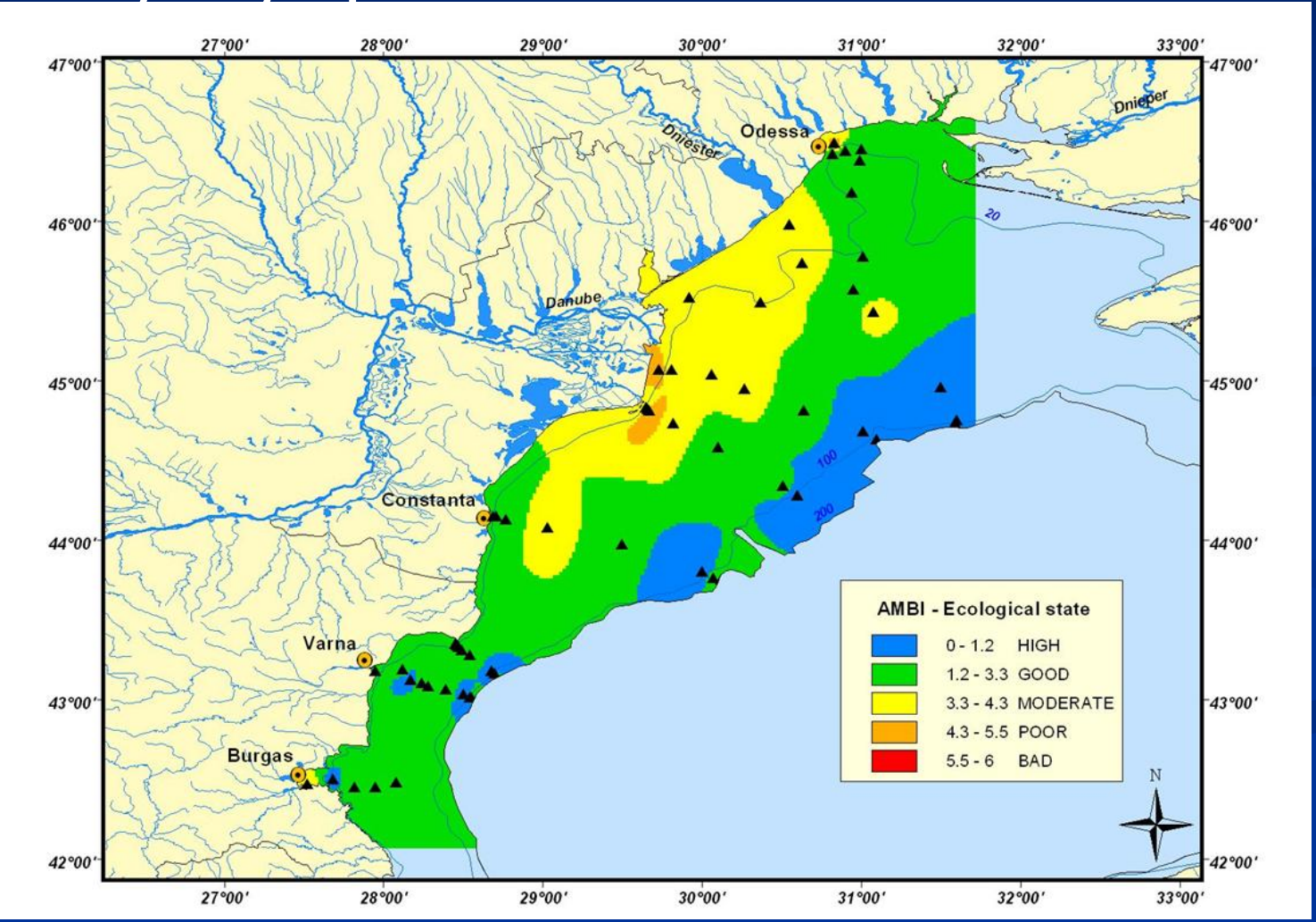
Zoobenthos (4)

- Biomass distribution:



Zoobenthos (5)

- AMBI geographic distribution



Zoobenthos (6)

WARNING

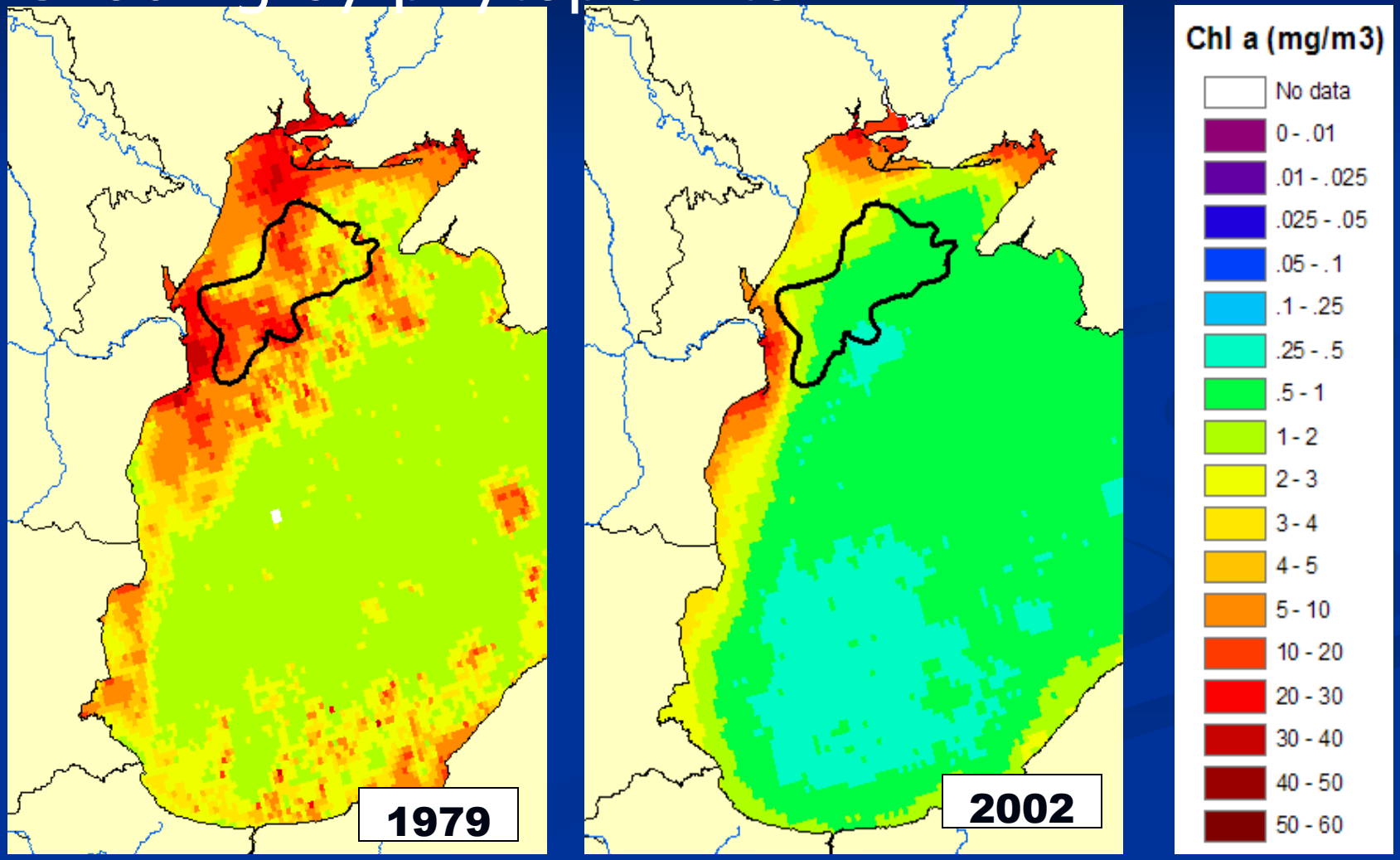
- Zoobenthos is not evenly distributed over short distances. Thus:
  - Both abundance and biomass of individual species vary substantially between replicates
  - The total number of species can vary greatly between replicates
  - 30 nautical miles offshore of Constanta, the number of macrozoobenthos species varied between 5 and 14 in individual replicates, with a total number of 25 species in 5 replicates

Phyllophora field (1)

- The *Phyllophora* field once provided a habitat for 118 species of invertebrates and 47 species of fish
- In 1964, 32 macro-algal species were recorded, but this had halved by 1986
- 3 years later only a quarter of the species recorded in the 1960s were present
- However, in 2004, a slight increase in macroalgal species numbers was recorded when compared to the 1989 situation

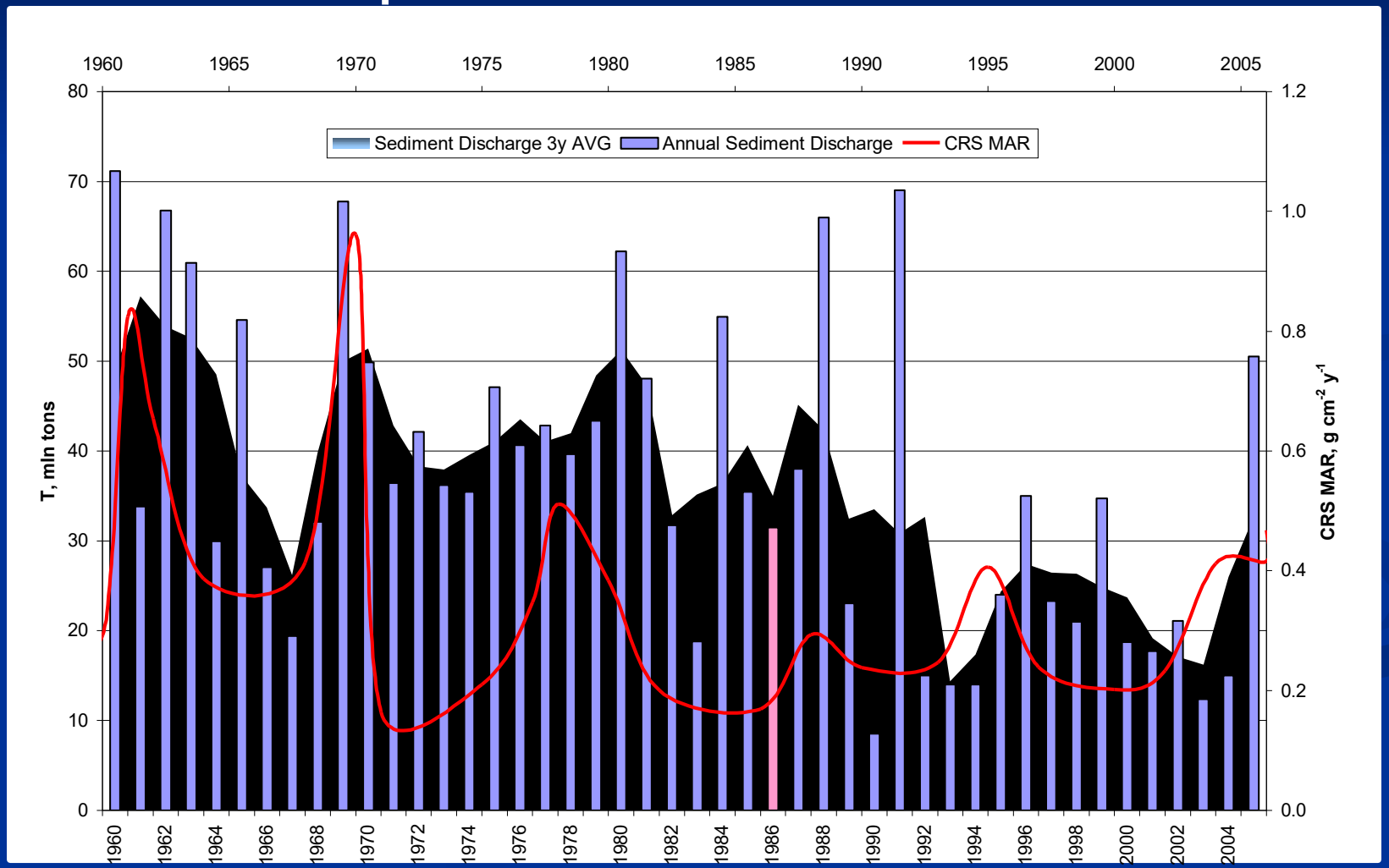
Phyllophora field (2)

- Shading by phytoplankton

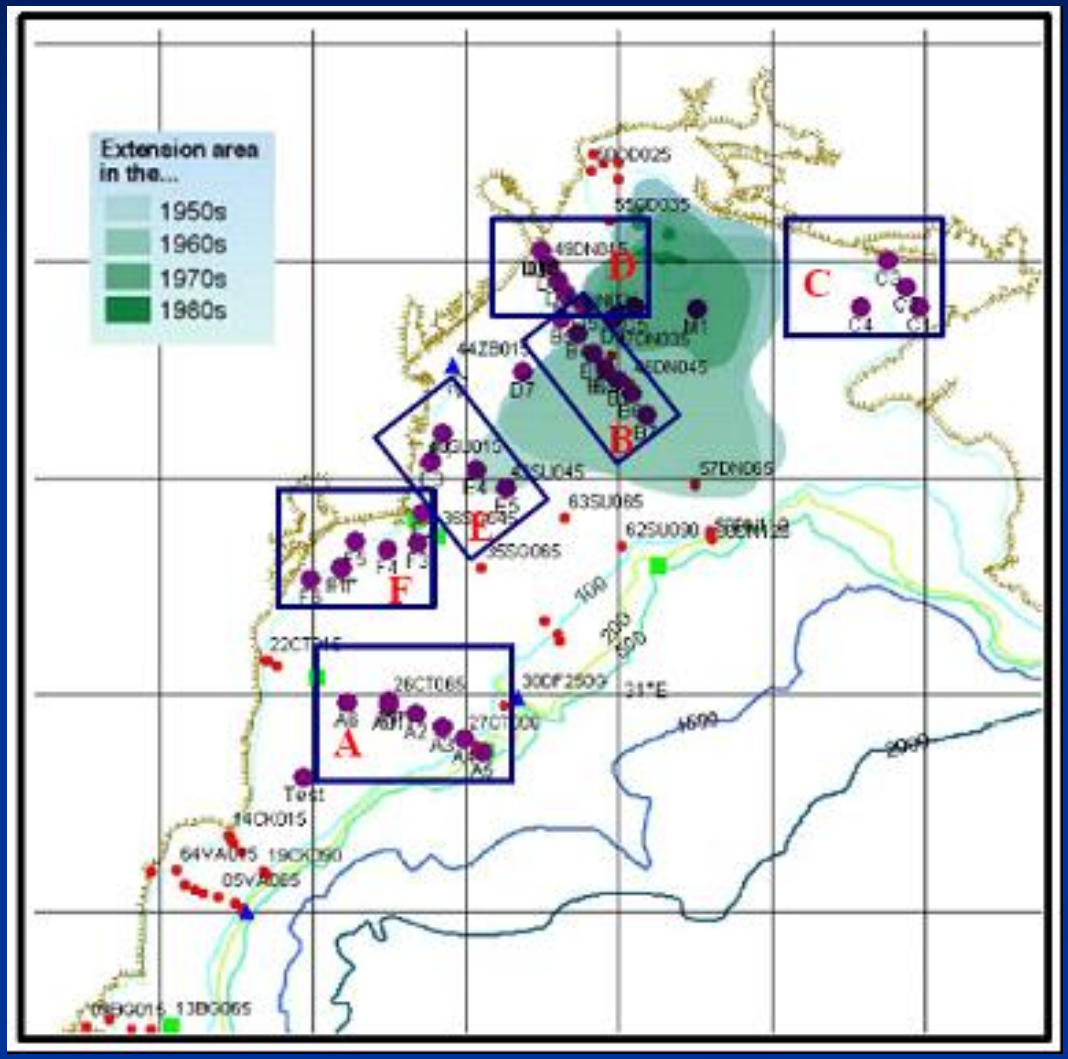


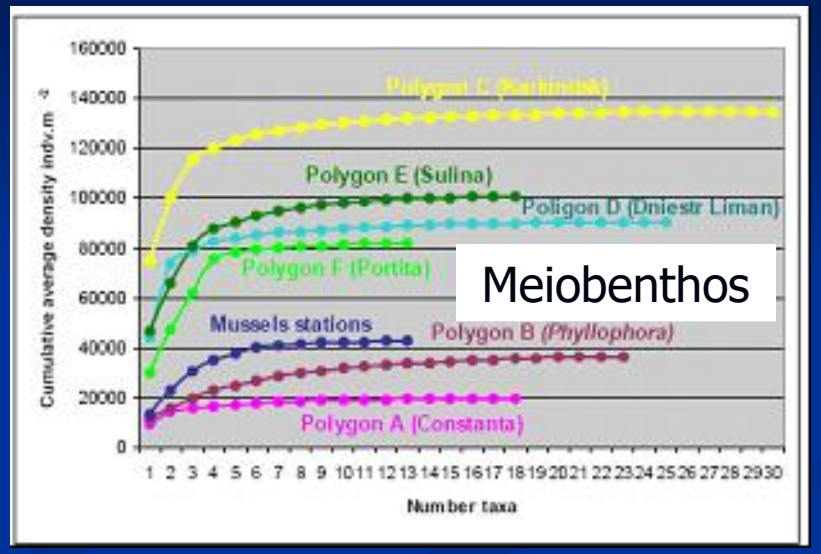
Phyllophora field (3)

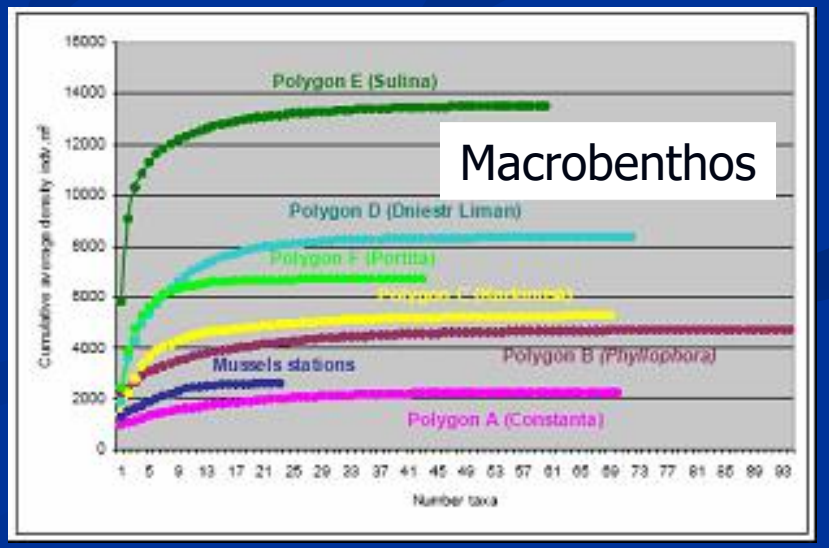
- Sediment deposition rates - Danube Prodelta



Phyllophora field (4)







Phyllophora field (5)

- Relatively low levels of zoobenthos occur in the *Phyllophora* field, but often with a high number of species, particularly of macrozoobenthos
- While one species dominates, this dominance is much less complete than in the other polygons and indicative of higher biodiversity
- Large numbers of ascidians actively process high organic flux from water column, preventing sediment enrichment

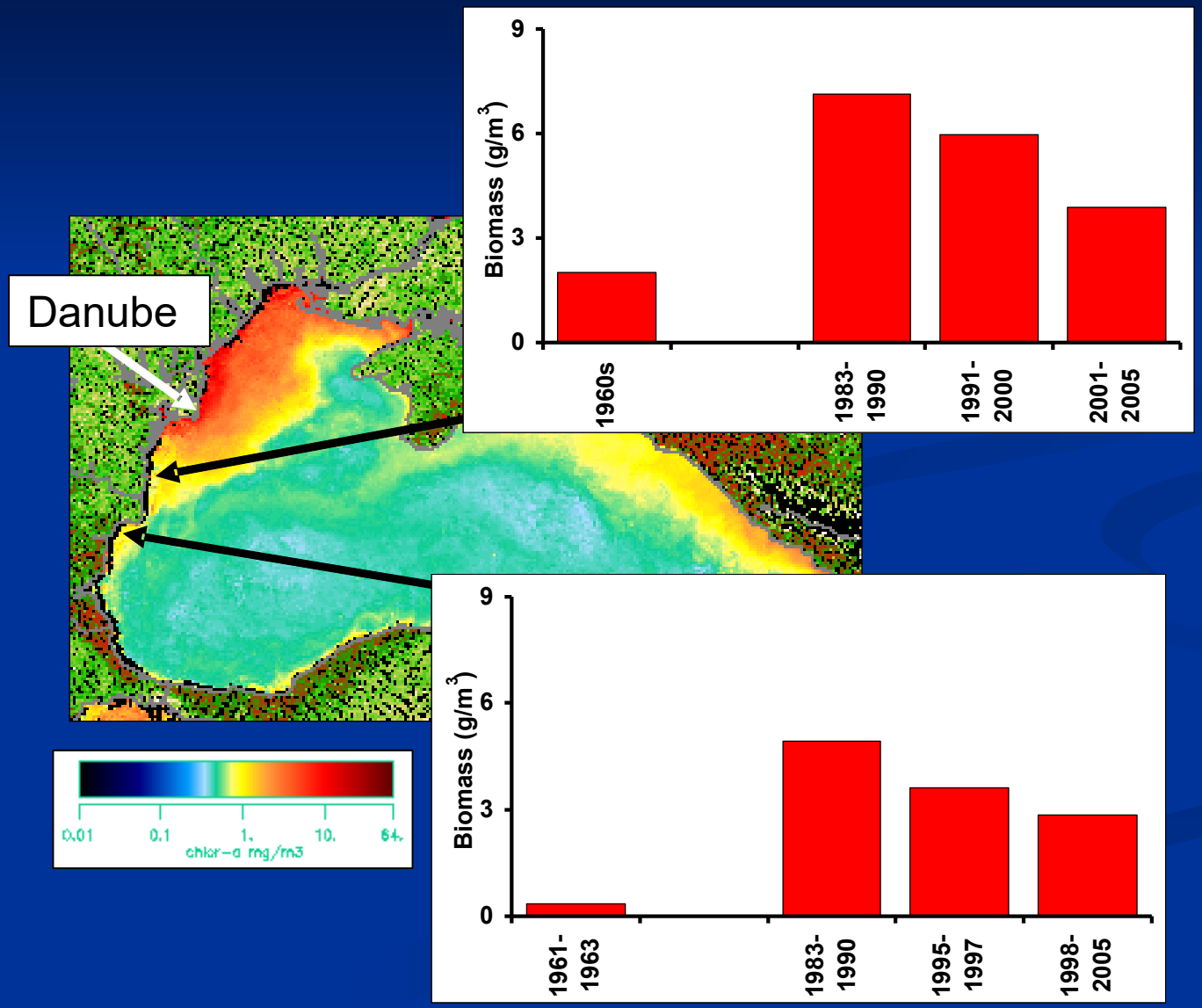
Phyllophora field (6)

- Originally *Phyllophora nervosa* dominated
- *Phyllophora brodiaei* in southern part of field, but rarely dominant. *Ph. pseudoceranoides* has not been recorded since 1989
- Now filamentous reds (*Polysiphonia*) and greens (*Ectocarpus, Desmarestia*) cover 70-80% bed
- *Phyllophora* (and other seaweeds) reduce internal loading of nutrients

Plankton

- Manuals written; equipment provided
- Plankton populations change quickly (on a seasonal basis)
- Participating scientists asked to present results in relation to long-term monitoring data
- Phytoplankton biomass and abundance have been on a decreasing trend since the early 1990s
- Species richness and other univariate indices are in favour of the “recovery phase” of the NW Black Sea ecosystem

Phytoplankton (1)

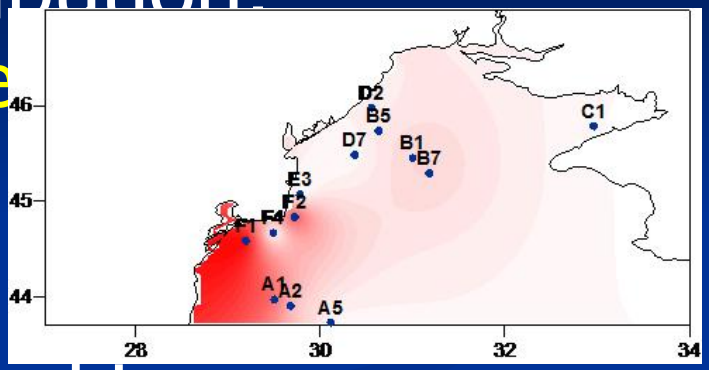


Phytoplankton (2)

- However, the dominance of mixotrophic/ heterotrophic dinoflagellates strongly resembles the "eutrophication phase"
- Concern over colonisation by invasive species (*Alexandrium* cysts – 2006)
- In the 1960s, the phytoplankton population was dominated by diatoms and dinoflagellates
- Now "others" constitute a much greater proportion – the ecology is changing

Zooplankton (1)

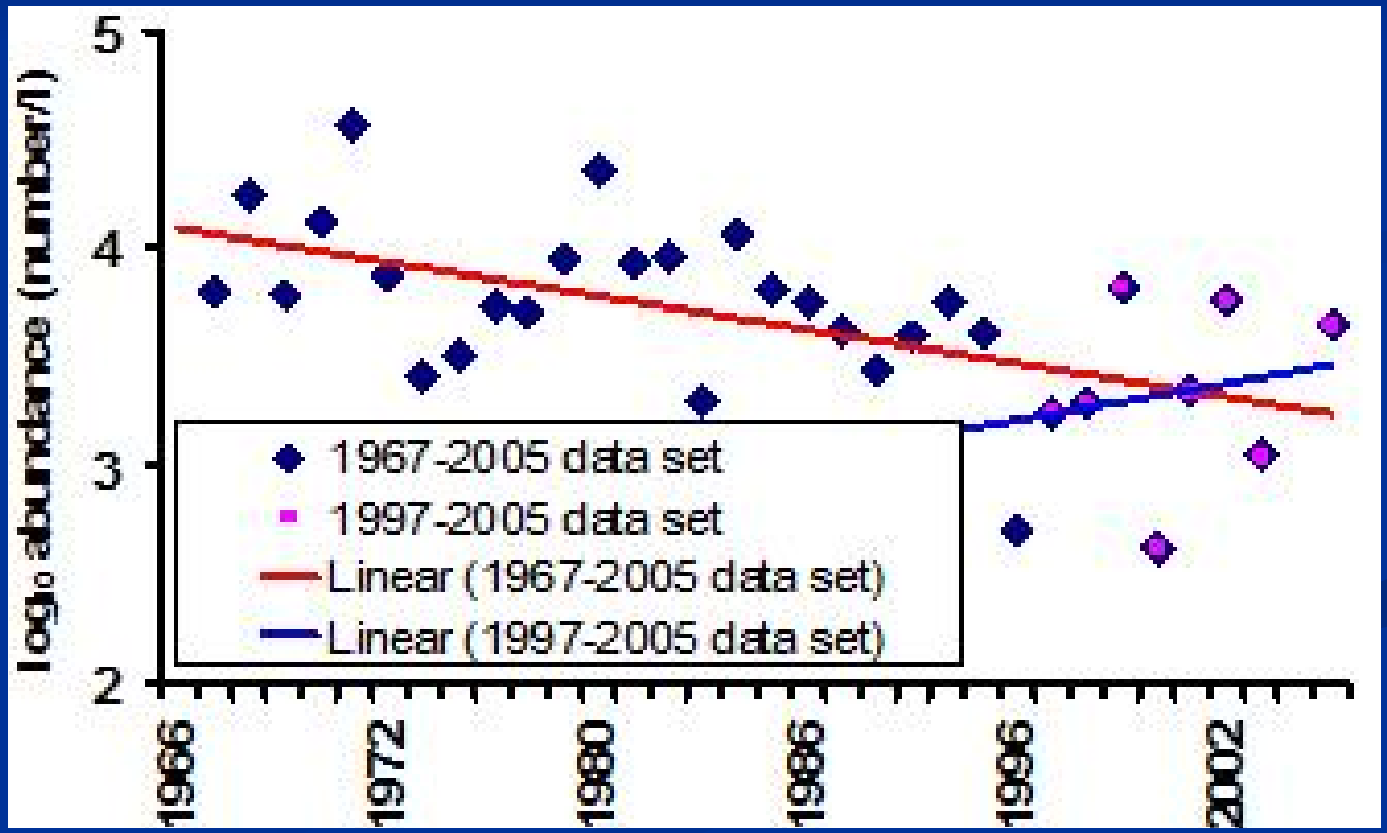
- Two patterns of vertical distribution:
  - Maximum close to the thermocline where *Noctiluca* dominates
  - Maximum in surface waters



- Copepods, Cladocera, Meroplankton, Appendicularia and Chaetognatha predominate in Northern Shelf waters
- Further south, *Noctiluca* dominates
- Improved diversity in northern (Ukrainian) waters
- *Mnemiopsis*/ *Beroe* battle continues

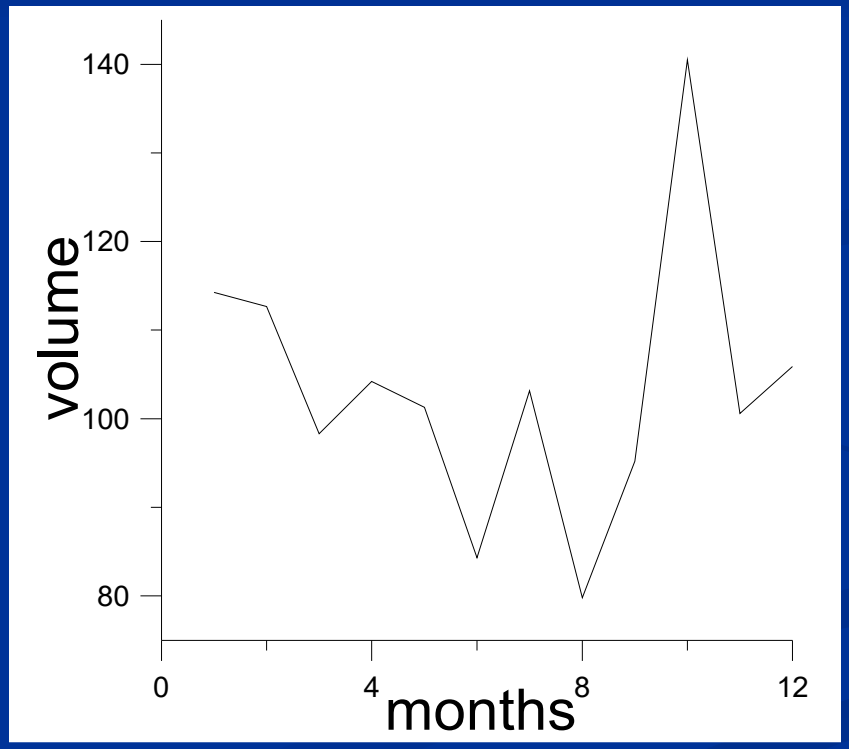
Zooplankton (2)

- Long-term summer abundance of Cladocera and Copepoda (Cape Galata):



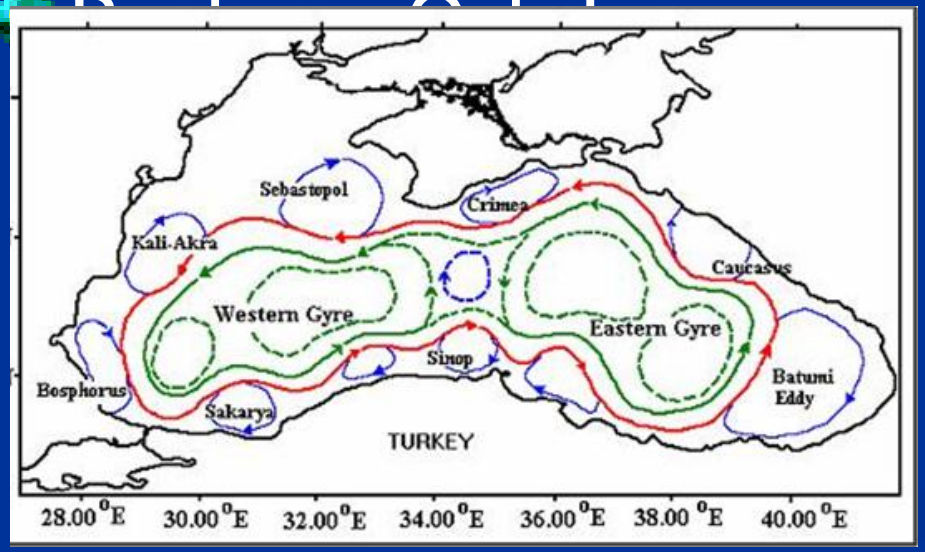
Nutrients and Fluxes (1)

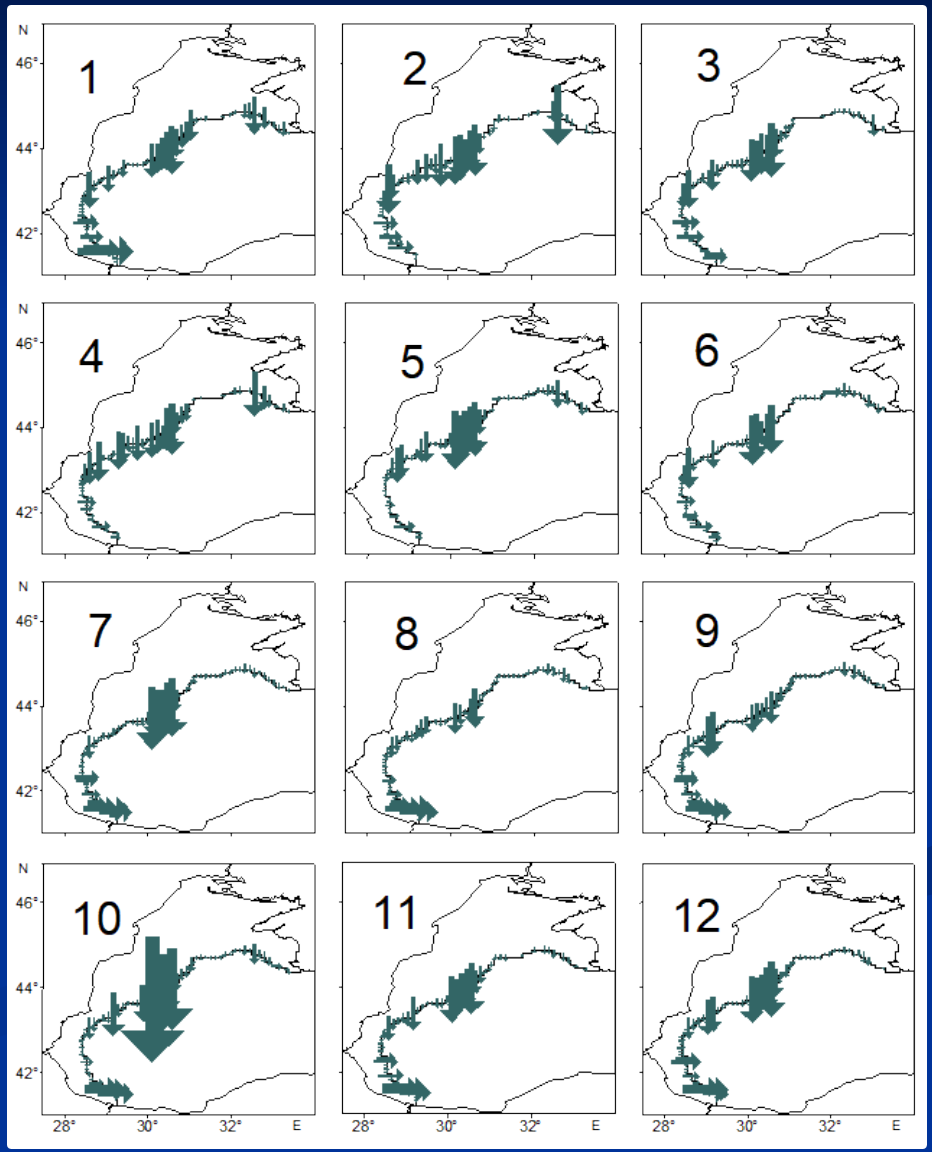
- Annual water transport across the shelf/open sea boundary:



Nutrients and Fluxes (2)

- Annual water transport across the shelf/open sea boundary:

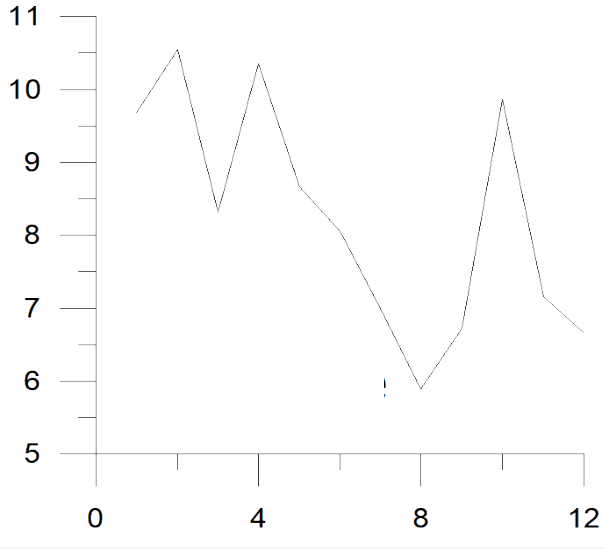




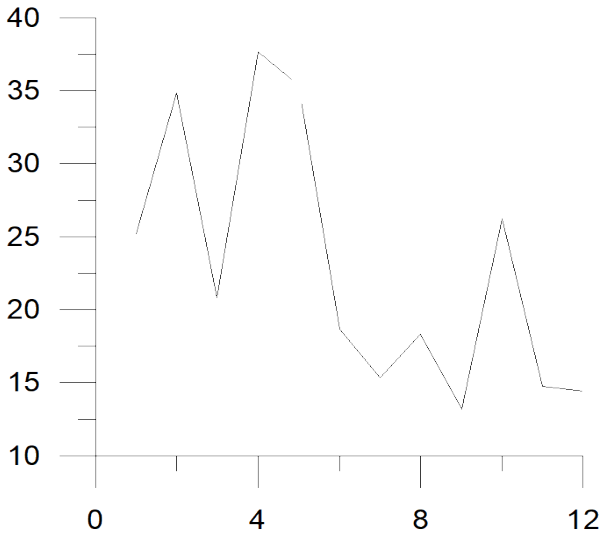
Nutrients and Fluxes (3)

- Annual DIN fluxes across the shelf/open sea boundary:

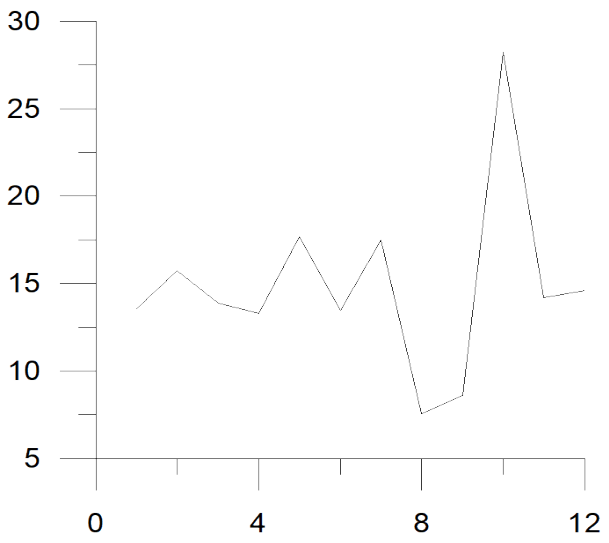
Ammonium



Nitrate

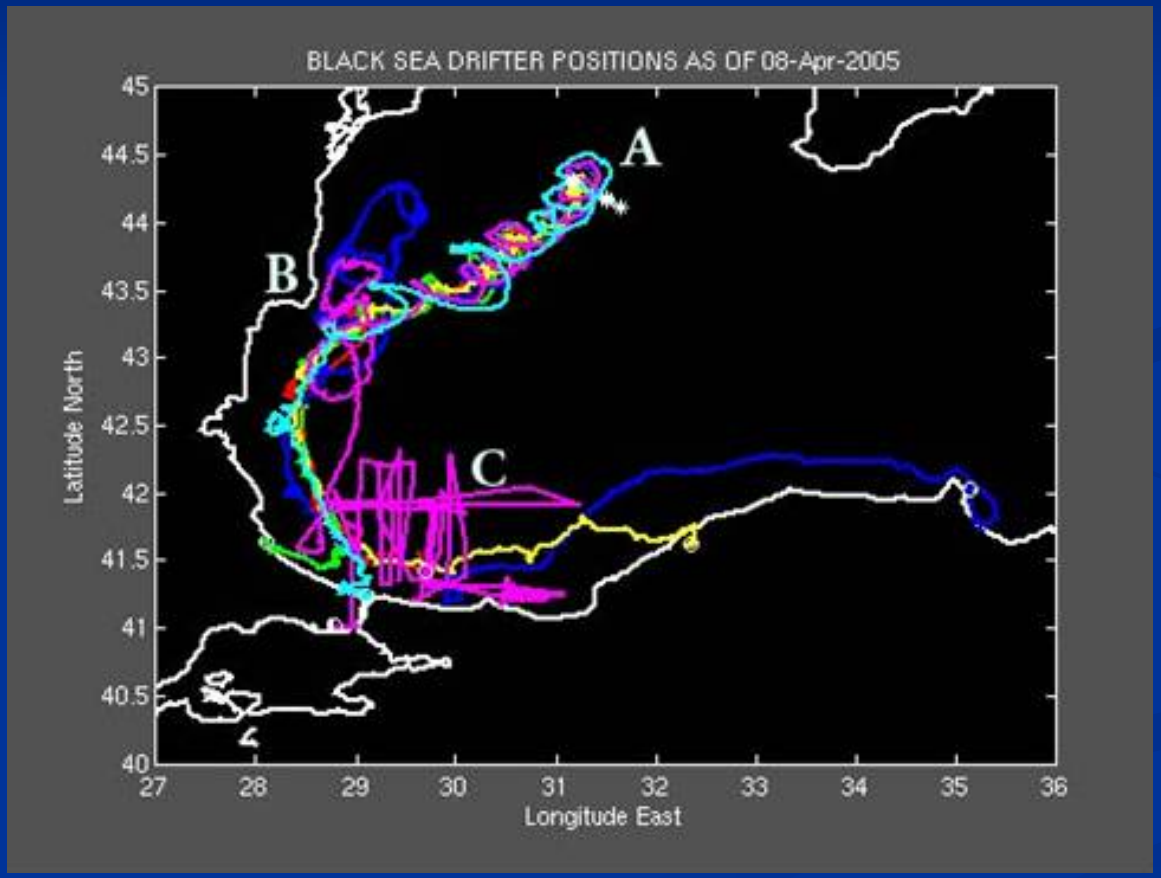


Nitrite



Nutrients and Fluxes (4)

- Surface trackers following anticyclonic eddy:



A= Release point
B = Cape Kaliakra
C = fishing vessel route

Nutrients and Fluxes (5)

- The nitrate maximum defines the oxycline boundary in deep regions of the Sea
- Phosphate conc's increase within the oxycline and the upper suboxic zone
- Surface conc's low, but may be locally elevated