MESOSCALE HETEROGENEITIES OF THE PHYTOPLANKTON DISTRIBUTION IN THE UPWELLING REGION OF N.W. AFRICA. Marta Estrada, Instituto de Investigaciones Pesqueras, Paseo Nacional, s/n, Barcelona-3, Spain

This communication reports some of the results of the taxonomic analysis of phytoplankton samples taken during the trajects between stations in the cruise Atlor II, of the RV Cornide de Saavedra.

Samples were taken every 30 minutes from surface water continuously pumped into the laboratories. Considering that the cruise speed of the ship was 8 knots, this represents an average distance between samples of about 7.2 Km. Water for phytoplankton analysis was stored into 150 ml glass bottles, after fixing with Lugol solution. Simultaneously, samples for photosynthetic pigments determination and particle counting with the Coulter Counter were also obtained. Information concerning these and other parameters studied during the cruise has already been published. Continuous recording of temperature, fluorescence, nitrate and nitrite was carried out along many of the transects. The phytoplankton samples were counted with an inverted microscope; 100 ml sedimentation chambers were used. Several series of samples had to be discarded because of the presence of silicate precipitates that introduced serious error in the estimation of algal abundances. In total, 213 samples were considered in the analysis of the results. The total number of species and other taxonomical entities recorded was about 350; from these, 20 species were chosen to carry out a principal component analysis. Rank correlation coefficients based on the abundances of all species recorded were calculated between successive samples.

As had already been shown by the study of the station samples and of the pigment and productivity data, the higher concentrations of phytoplankton were found close to the coast, where upwelling is more intense; offshore, another rich zone was located between 20° and 21° N and 20° and 21° W. Superposed to this general distribution is a rich patchiness that results in highly jagged profiles of phytoplankton abundance along the transects. Obviously, these records cannot be interpreted as an statical picture; they reflect the combination of several important sources of variation like, for instance, displacement of the vessel, water currents, and changes of the populations in time. Variations in the relation between phytoplankton abundance (as measured by cell counting or fluorescence data) and nutrient and temperature values are found depending on the sampling space considered. When all samples are pooled, phytoplankton density is positively correlated to nitrate concentration, but when the analysis is restricted to smaller regions, positive or negative relationships may be found, depending on the stage of development of each population.

The taxonomical composition of samples shows some global trends of variation that can be related to the different water types involved. The first factor of the principal component analysis shows a marked N-S gradient, corresponding to the main hydrographical features of the region; the second factor increases from east to west, and reflects the intensity of enrichment; the third factor is related to some typical species of the coastal upwelling zone north of 20° N. An important variation in the details is combined with these general patterns. The peaks in phytoplankton concentration are characterized by a high proportion of diatoms relative to the other groups; coccolithophorids tend to be concentrated in elevated numbers in particular regions. As could be expected, correlation coefficients are much higher between adjacent samples integrating a peak. In many cases, changes in abundance and taxonomical composition of successive samples were associated to variations in water temperature, suggesting that the origin of the patch could be related to hydrographical phenomena. Exponential processes involved in growth and diffusion would produce a

pattern characterized by a rich phase ("peaks", "patches") surrounded by zones of low abundance. The histogram of frequencies of phytoplankton densities is compatible with this hypothesis. The distribution is very asymmetric, showing an excess of samples with low phytoplankton concentrations (positive skewness). A logarithm transform of the data makes the distribution much closer to a normal, although with slight negative skewness; a similar treatment of the data for individual groups (diatoms, dinoflagellates, coccolithophorids) shows differences that can be discussed in relationship to their diverse ecological characteristics.