

High resolution biochronology for the last deglacial period in the Adriatic sea, based on planktonic foraminiferal associations and oxygen isotope stratigraphy

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Biostratigraphic events

Five major biostratigraphic events have been recognized in the Adriatic sea for the last 17000 years. High resolution oxygen isotope stratigraphy on four selected cores, IN68-5, 9, 10 and 21 together with ¹⁴C radiocarbon and AMS datings, allow us to date these events precisely as follows :

- Last occurrence of *Globorotalia scitula*, dated at about 13.5 kyrs BP;
- First strong reduction in dextral *Neogloboquadrina pachyderma* percentages, dated at about 10 kyrs BP;
- Last occurrence of *Globorotalia inflata* around 5 kyrs BP;
- Last occurrence of *Globorotalia truncatulinoides* at about 9.5 kyrs BP;
- Abrupt entry of the warm species association: *Globigerinoides ruber ruber*, *Globigerina calida*, *Globigerina digitata*, at about 9 kyrs BP.

Local Adriatic Biozonation

On the basis of these major events, of quantitative changes in the abundances of some species as well as of temporary disappearances or reappearances, the following eight biozones can be identified :

- Biozone 8, up to 13.5 kyrs BP : the top of this zone is defined by the last occurrence of *Globorotalia scitula* and a strong increase in dextral *Neogloboquadrina pachyderma* percentages from about 20% to 40%. The association is almost completely constituted by "cold species" whereas *Globigerinoides ruber* group and *Neogloboquadrina dutertrei* are present with very low percentages.

- Biozone 7, from 13.5 to 11.5 kyrs BP : this zone is characterized by an increase in the percentages of the *Globigerinoides ruber* group and *Globorotalia inflata* (near 10%) and by the occurrence of *Globorotalia truncatulinoides* at very low percentages.

- Biozone 6, from 11.5 kyrs to 10 kyrs BP : in this zone, the *Globigerinoides ruber* group is completely lacking, *Neogloboquadrina dutertrei* generally occurs with percentages around 5%. The top of this zone is marked by the abrupt reduction in *Neogloboquadrina pachyderma* percentages.

- Biozone 5, from about 10 kyrs to 9 kyrs BP : this zone is characterized by the reappearance of *Globorotalia inflata* and of the *Globigerinoides ruber* group and by a brief and last occurrence of *Globorotalia truncatulinoides*. In this biozone, we have also the first occurrence of the "warm" species *Globigerina calida* and *Globigerina praecalida*.

- Biozone 4, from 9 kyrs to 8 kyrs BP : this zone is easily recognized by the high frequencies of "warm" species such as *Globigerinoides ruber ruber*, *Orbulina universa*, *Globigerina calida*, and *Globigerina digitata* which can account for 70 to 80 % of the whole association. *Globigerina bulloides* and *Globigerina quinqueloba* are also present. In the same interval one can also note that radiolarians and diatoms can be present while benthic foraminifers are absent.

- Biozone 3, from about 8 kyrs to 6.5 kyrs BP: this zone is characterized by the last occurrences of *Globorotalia inflata* and dextral *Neogloboquadrina pachyderma* in the Adriatic Sea with total percentages around 20%.

- Biozone 2, from 6.5 to 5. kyrs BP : this interval is characterized by the relative high frequencies of *Globigerinoides ruber ruber*, *Globigerinoides trilobus* and *Globigerinoides sacculifer*. The benthic foraminiferal associations is also rich and well diversified.

- Biozone 1, from 5 kyrs BP to the present : this zone is characterized by the modern association of "warm" species such as *Globigerinoides ruber* group, *Globigerinoides trilobus*, *Globigerinoides sacculifer*, low frequency of *Globigerina praecalida*, *Globigerina bulloides* and *Globigerina quinqueloba* are also present.

This ecozonation is different from those observed in other West and East Mediterranean areas. The time distribution of many species does not appear to be linked to surface temperature changes alone : this is the case for *Globorotalia truncatulinoides* or dextral *Neogloboquadrina pachyderma*, which may occur either during the earlier cold phase of the deglaciation or during the Holocene. This underlines the fact that hydrographic changes as well as eustatic and tectonic sea level changes are important forcing parameters for the biological components.