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34. *DATA REPORT:* DIATOM ABUNDANCES IN SEDIMENTS FROM COASTAL WATERS OF SOUTHERN CHILE, SITES 859, 860, AND 861[1]

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INTRODUCTION

Ocean Drilling Program (ODP) Leg 141 drilled five sites in the region around the Chile Triple Junction, located close to the southern coast of Chile between latitudes 45° and 47°S. Diatom abundances and the main components of the assemblages are reported for Holes 859A, 860B, and 861C. With the exception of Site 861, low but recognizable diatom abundances are present only in the uppermost meters of sediment recovered at each site. These rare to trace occurrences and the virtually complete absence of diatoms in sediments from the vicinity of the Chile Triple Junction are assumed to be caused by the combination of low primary production, dilution by terrigenous detritus, and dissolution.

METHODS

Samples used in this study were treated and mounted for quantitative examination following the technique described by Bodén (1991). This technique includes freeze drying samples and subsequent chemical treatment with petroleum ether and a heated solution of hydrogen peroxide and hydrochloric acid. All slides were prepared using the random settling method.

Quantitative counts were routinely made at magnifications of ×400; ×1000 magnification was used when necessary for species identification. Counting was generally terminated after the examination of 500 fields of view with the exception of the uppermost samples in Holes 859A and 860B where counting was continued until 100 diatom valves was reached. In the uppermost sample in Hole 861C counts of 300 diatom valves were made.

For taxonomic descriptions and illustrations of species, refer to Barron (1985), Fenner et al. (1976), Schrader (1976), and references therein. In this study little effort has been made to assign the genera *Coscinodiscus* and *Thalassiosira* to different species. Specimens of different *Coscinodiscus* species are grouped together as *Coscinodiscus* spp. The wide variety of *Thalassiosira* specimens showing eccentric areolae patterns has been grouped as *T. eccentrica,* whereas all other *Thalassiosira* species are not differentiated, with the exception of easily recognized *T. oestrupii.* Specimens of the genera *Chaetoceros* and *Xanthiopyxis* are collectively described as resting spores.

RESULTS

Hole 859A

The uppermost sample investigated at Hole 859A (45°53.76′S, 75° 51.17′W) was taken at a sub-bottom depth of 1.20 m. The estimated diatom abundance at this depth was approximately 0.55 million valves and resting spores per gram dry sediment (Fig. 1). Samples investigated further downhole yielded trace abundances or showed a complete absence of diatoms.

On the basis of a count of 100 diatom valves, resting spores excluded, the observed assemblage is dominated by the *T. eccentrica* group (40%), *Paralia sulcata* (33%), *Thalassiosira* spp. (7%), *Coscinodiscus* spp. (7%), and *Pseudoeunotia doliolus* (4%). Other identified species and genera in the observed assemblage include *Hemidiscus cuneiformis, Nitzschia kerguelensis, Pleurosigma* spp., *Thalassionema nitzschioides,* and *Thalassiosira oestrupii.* The diatom valve/resting spore ratio is 4:2.

Hole 860B

In the top meter of Hole 860B (45°51.97′S, 75°45.10′W) the two samples examined, at 0.09 and 0.97 meters below seafloor (mbsf), show similar low diatom abundances as observed in Hole 859A with values of approximately 0.47 and 0.53 million valves and resting spores per gram dry sediment, respectively (Fig. 1). A few samples down to about 13 mbsf yielded diatom abundances of approximately 0.15 million valves and resting spores per gram dry sediment. From this sub-bottom level and further downhole samples show trace abundances or complete absence of diatoms (see Behrmann, Lewis, Musgrave, et al., 1992).

Assemblage analysis (100 valves counted, resting spores excluded) of the sample from 0.09 mbsf reveals the distinct dominance of *P. sulcata* (51%), *Thalassiosira* spp. (17%), the *T. eccentrica* group (14%), and *Actinocyclus curvatulus* (8%). Other identified species and genera include *Actinocyclus undulatus, Coscinodiscus* spp., *H. cuneiformis, Th. nitzschioides,* and *Trachyneis aspera.* The diatom valve/resting spore ratio is 4:6. A similar assemblage with a strong dominance of *P. sulcata* is observed in the sample from 0.97 mbsf.

The diatom assemblage observed in the samples from 1.40 mbsf (40 valves observed) is clearly dominated by *P. sulcata,* whereas the assemblages in the samples from 4.45, 10.95, and 12.45 mbsf (between 20 and 25 valves observed in each sample) seem to be dominated by species from the genus *Thalassiosira,* which accounts for about 40% of the valves observed in each sample. Genera and species observed in these samples include *A. curvatulus, A. undulatus, Astermophalus* spp., *Coscinodiscus* spp., *Eucampia antarctica, Hemidiscus karstenii, P. doliolus, P. sulcata, Stephanopyxis* spp., *Th. nitzschioides,* the *T. eccentrica* group, *T. oestrupii,* and *Thalassiosira* spp.

Hole 861C

The most diatom-abundant sample observed in this study originates from 0.38 mbsf in Hole 861C (45°51.03′S, 75°41.53′W). Although the abundance reaches a value of approximately 0.85 million valves and resting spores per gram dry sediment (Fig. 1) it is regarded as low. Below approximately 2 mbsf, diatoms are present in trace abundances or are completely absent, with the exception of an interval of rare abundances between approximately 55 and 70 mbsf. Within this interval abundances are generally about 0.15 million valves and resting spores per gram dry sediment with a maximum of approximately 0.65 million valves and resting spores per gram dry sediment in Sample 141-861C-7H-CC at 60 mbsf.

The uppermost sample in Hole 861C was counted to 300 valves (resting spores excluded). Dominant components of the assemblage

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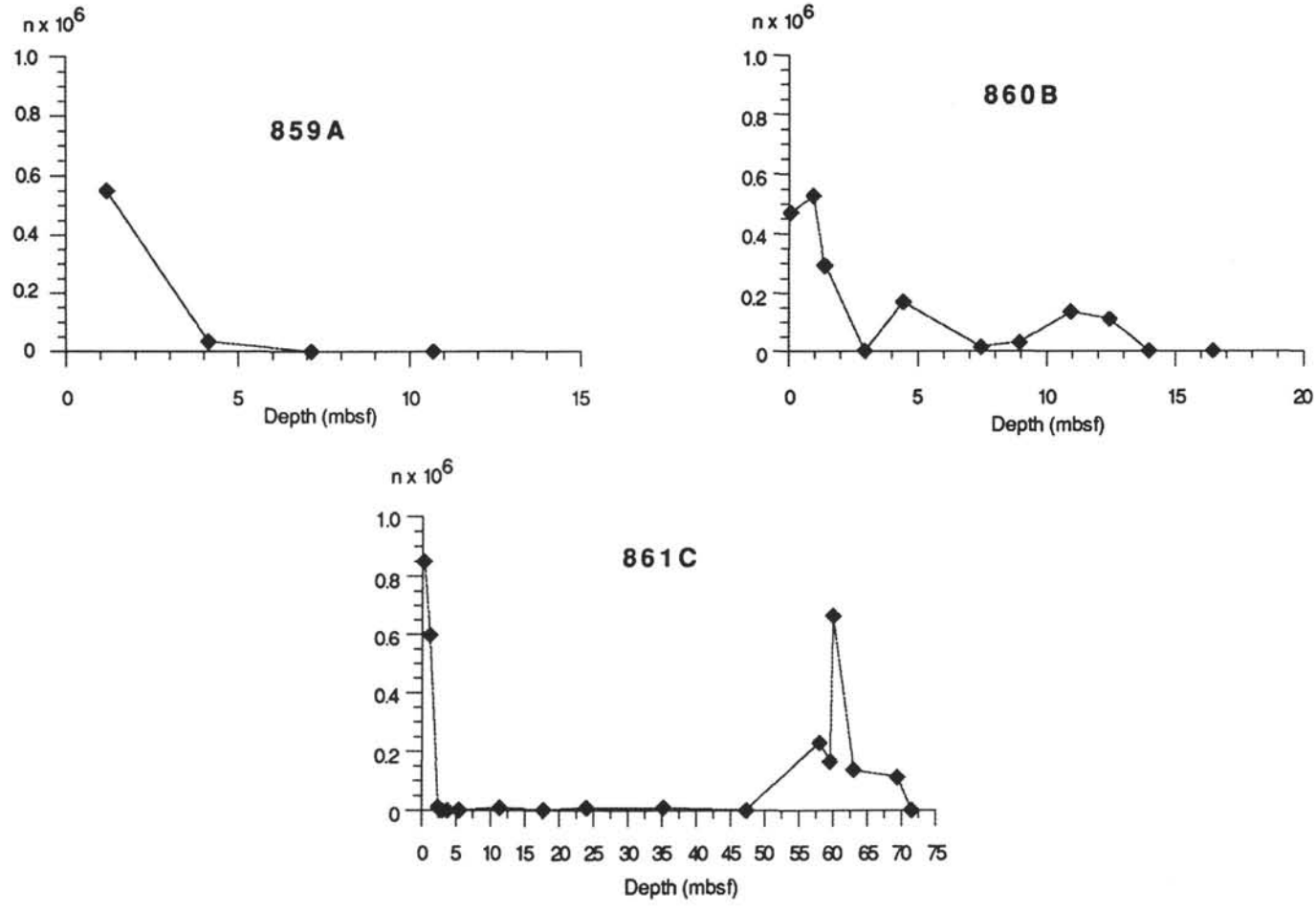

Figure 1. Diatom valve and resting spore abundances in millions (10^6) per gram dry sediment in Holes 859A, 860B, and 861C. Note differences in scale for depth axis.

are *P. sulcata* (41%), the *T. eccentrica* group (35%), *Coscinodiscus* spp. (9%), *Thalassiosira* spp. (6%), *A. curvatulus* (2%), *Actinopthycus* aff. *splendens* (1%), *H. cuneiformis* (1%), *N. kerguelensis* (1%), and *P. doliolus* (1%). Other identified species and genera include *Nitzschia separanda, Pleurosigma* spp., *Probosia alata, Th. nitzschioides*, and *T. oestrupii*. The diatom valve/resting spore ratio is 3:3. A similar assemblage, with a distinct dominance of *P. sulcata* and the *T. eccentrica* group, is observed at 1.18 mbsf.

The assemblages present in the interval between approximately 55 and 70 mbsf are strongly dominated by species from the genus *Thalassiosira.* Based on the observation of 50 valves the composition of the assemblage at 60 mbsf is *Thalassiosira* spp. (48%), *Coscinodiscus* spp. (14%), the *T. eccentrica* group (12%), *P. sulcata* (8%), and the less frequent *Actinopthycus* aff. *splendens, E. antarctica, P. alata, P. doliolus, Stephanopyxis* spp., and *Th. nitzschioides.* The diatom valve/resting spore ratio is 5.

SUMMARY

The occurrence of diatoms in sediments from the Chile Triple Junction region can generally be characterized as rare in surface layers (i.e., between approximately 0 and 2 mbsf) and absent or showing trace abundances in more deeply buried sequences (Fig. 1; see also Behrmann, Lewis, Musgrave, et al., 1992). None of the samples examined from the surface layers yielded abundances above 1 million diatoms per gram dry sediment. Consequently, these low diatom abundances in surface sediments indicate that productivity of siliceous plankton in the vicinity of the Chile Triple Junction was low.

Shipboard analysis of radiolarian assemblages indicates an upwelling regime for this part of the coastal region of Chile ("Biostratigraphy" section, "Site 859" chapter, Behrmann, Lewis, Musgrave, et al., 1992). In the upwelling region along the continental margin of Peru, for example, diatom frustules are typically a major constituent of deposited sediments (Suess, von Huene, et al., 1988). The remarkably low diatom abundances in surface layer sediments examined in this study, although diluted by terrestrial debris, are apparently not characteristic of coastal upwelling. Furthermore, the results of the assemblage analysis do not reveal any typical upwelling floras or species. For example, the three species used for identifying the strongest Peruvian coastal upwelling, *Delphineis karstenii, Skeletonema costatum,* and *Ditylum brightwellii* (Schrader and Sorknes, 1990) are not observed. Thus, diatom data do not support the hypothesis of an upwelling regime for this part of the Chilean coast.

The distinct abundance decrease of diatoms in the sediment from surface layers to deeper layers can be attributed to dissolution. Samples showing trace abundances are in most cases based on the observation of a single to few large (usually larger than 63 µm in diameter) and robust specimens of the genus *Coscinodiscus*. These rare findings of large, and robust diatom valves indicate selective dissolution against more delicate sculptured diatom species.

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* Abbreviations for names of organizations and publications in ODP reference lists follow the style given in *Chemical Abstracts Service Source Index* (published by American Chemical Society).

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