4.2 Sediment particle size

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This section provides a descriptive summary of the available sediment particle size data from samples collected for NSBP 2000 and compares it with earlier information, including a statistical evaluation of similarities between matching stations from the 1986 and 2000 North Sea benthos surveys. Examples of more detailed sources of sediment data derived from geological surveys of parts of the North Sea are given in Section 5.1.

4.2.1 Methods

All sediment datasets were collated into a uniform database containing percentages for mud content (grain size <63 μm), sand (grain size between 63 μm and 2000 μm), gravel (grain size >2000 μm), median grain size, and sediment sorting coefficient, except the data for the Dutch continental shelf, for which only median grain size and mud content were available.

The datasets for which fractional data were available were reprocessed to yield uniformly calculated means, sorting coefficients, and descriptive assessments (see Figure 4.2.1).

The program GRADISTAT, Version 4.0 (Blott and Pye, 2001) was used for analyses.

4.2.2 Results and discussion

All the sediments sampled in the 2000 survey were relatively coarse grained, with 90% containing <10% silt/clay (Figure 4.2.2), and with most samples being predominantly sandy in nature. The proportion of silt/clay generally increased to the north. Gravelly sands and sandy gravels predominated in the south and east, and these are reflected in larger median grain sizes (Figure 4.2.3) and more poorly sorted sediments (Figure 4.2.4) in these areas.
Figure 4.2.2. Percentage of mud content for NSBP 2000 stations. (Colour intensity increases with increasing % mud).

Figure 4.2.3. Median grain size for NSBP 2000 stations. (Colour intensity increases with increasing median size).
These patterns are consistent with earlier descriptions of the distribution of sediment types in the region (Figure 4.2.5) and correspond approximately to variations in bathymetry and tidal current velocities. The sources of sediment are varied, and the present distribution is the result of a complex interaction of modern processes (tides, waves, and surges) with the effects of glaciations, changes in relative sea level, active sediment erosion, particularly of older Quaternary deposits, and relict features (Goldberg, 1973; Nio et al., 1981; Pantin, 1991; Basford et al., 1993; Irion and Zöllmer, 1999).

Comparing 1986 and 2000

A reduced dataset consisting of 1986 and 2000 samples was constructed according to the paired-station algorithm (see Section 3), which identified those that lay relatively close together. In all, 146 station pairs were thus retained.

The median grain size (µm) was the only parameter that could be reliably compared (Table 4.2.1). A two-tailed $t$-test conclusively demonstrated no statistically significant difference between the two datasets ($P = 0.75 > 0.05$). The degree of correlation between the station pairs is illustrated in Figure 4.2.6.

| Table 4.2.1. Mean and variance of median grain sizes in 1986 and 2000. |
|---------------------------------|-----------------|-----------------|
| Mean µm 1986                  | Mean µm 2000    |
| Mean                         | 189.19           | 192.28          |
| Variance                     | 13179.3          | 17245.9         |
| Observations                 | 146              | 146             |
Figure 4.2.5. North Sea sediment types (after Eisma, 1981).

Figure 4.2.6. Top panel (a): relation between median grain sizes for 146 station pairs (1986 and 2000 data). Pearson correlation = 0.567, P < 0.001. Bottom panel (b): plot of residuals against median μm in 2000.
References


