NORTH-WESTERN BLACK SEA SHELF BOTTOM LANDSCAPES

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Keywords: seafloor relief, paleo-valley, biocenosis

Introduction

Seafloor landscapes of the northwestern Black Sea shelf have been formed on submerged Pre-Holocene North Pontic alluvial plain paleo-relief due to sedimentation and development of benthic biocenoses. This paper describes various aspects of shelf morphology.

Material and Methods

The shelf surface has been subdivided using morphological and statistical analyses of seafloor relief, lithological characteristics and statistical parameters of Holocene sediments, and benthic bio-cenoses locations. Statistical treatment of (1) water depth, (2) thickness of Holocene sediments and (3) percentage of silt, and clay within the sediments from 1596 locations was performed. Each landscape area has a similar distribution of statistical parameters.

Results

In general, the shelf surface is a gently southward-tilted plain, but according to statistical analysis there are several depth intervals where the surface is flat or relatively steep (Larchenkov and Kadurin, 2005). The inner shelf plain is separated from the coast by offshore erosional coastal slope, which extends down to 10-15 m with angles up to 5°. Seafloor relief irregu larity to 40 m depth is clearly marked by linear incised depressions and troughs. Depression bottoms are almost flat with less than 1° gradient, their slopes h ave 3- 4°, but in some places it approaches 7°. Orienta tions of most depressions are submeridional, but some sections are aligned latitudinally. The largest depression is the Dnieper trough, which extends like an elbow from the Dnieper-Bug liman to 40 m depth. Odessa sand-bank with a depth of 10 m sits on the northern part of the depression.

A rather large West-Tendra rise separates Dnieper trough from Karkinit depression where the depth is up 30-35 meters. Southwestward of the depression, other elements of the inner shelf bottom relief include: Dniester rise, Dniester trough, and Budak rise, which is joined to the paleo-valley and avandelta of the Danube River. All rises and terraces at the 40-45 m depth interval are divided by gentle (1-2°) slope extending as an arc from Zmeiny Island to Tarkhankut Cape form a flat plain 20-80 km in width. The seafloor surface gradient increases to 2-4° at depths greate r than 60 m, and bottom relief irregularity is marked by the depth amplitude of 5-10 meters. This area of the shelf has a width from 6 to 36 km, and it stretches to the shelf edge along 100 m depth. However, the edge is deeper than 130 m near the Crimean Peninsula southwest of Kalamit Bay, and south of Zmeiny Island. The offshore and central part of the shelf have been subdivided by Fesjunov (1996) into six major seafloor landscape types: avandeltas, nearest offshore slope, terraces of the inner shelf, and river paleo-valleys separated into more than 25 local landscapes.

The following landscape areas have been divided based on analysis of the aforementioned parameters (Fig. 1).

1 Erosional coastal offshore slope is located in two areas. It is a very narrow zone with up to 10 m depth covered by shelly detritus or muddy shelly detritus with highly productive Mytilus biocenoses.

2. Danube avandelta and paleo-valley is characterized by a dominance of clayey mud with low car-bonate content, is up to 30 m thickness, and polychaete biocenoses.

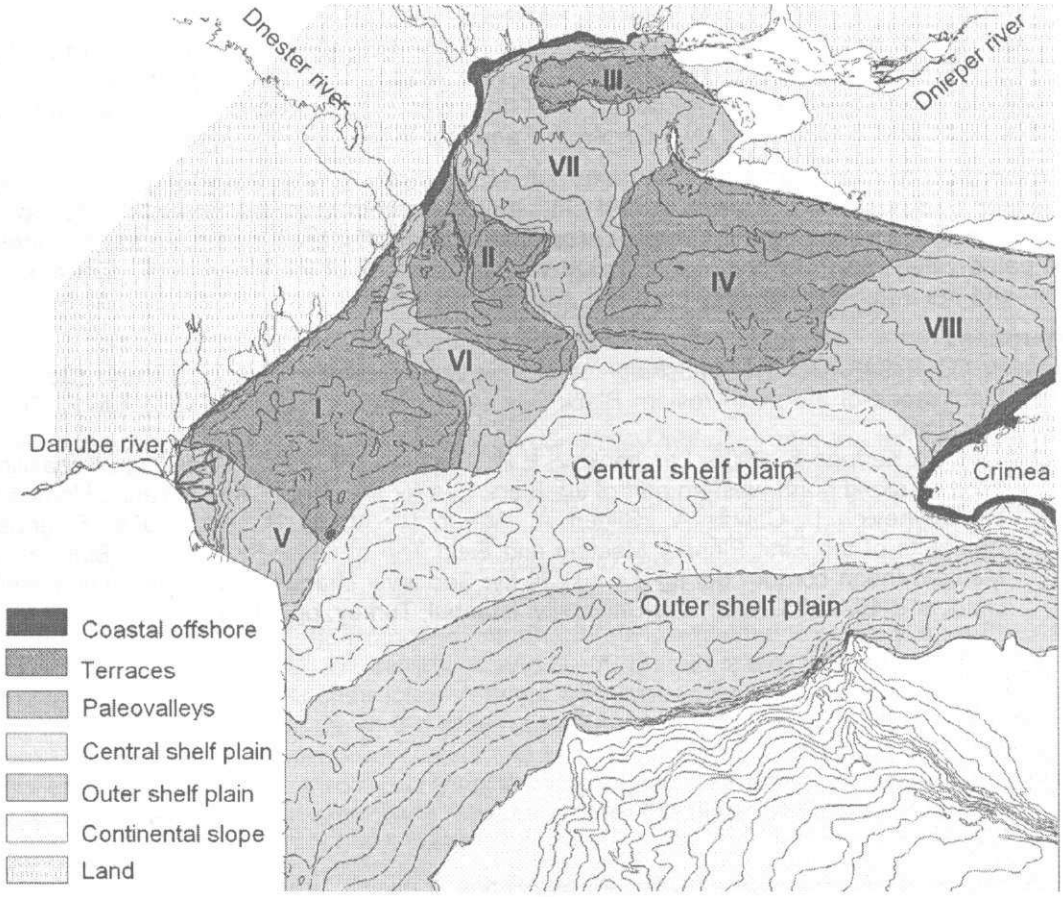

Figure 1. Landscape regions of the northwestern Black Sea shelf. Rises: I – Budak, II – Dniester, III – Odessa sand-bank, IV – Western Tendra; V - Danube avandelta and paleo-valley. Depressions: VI – Dniester, VII – Dnieper, VIII – Karkinit.

3. Depressions of river paleo-valleys occupy Dnieper and Paleo-Dniester troughs, and Karkinit de-pression, where water depth increases from 23-30 m in paleo-valley heads to 40- 42 m in a sea-ward direction. Pelitic material within the sediments increases with sea depth, and muddy shells-rich sediments on the slopes of depression valleys change downward into shelly muds and than into muds. Also organic matter content in the sediments increases from 0.5-0.9% to 1.8-2.4%. Here *Mytilus* is the dominant species, and polychaetes are subdominant.
4. Terraces of the inner shelf. Western Tendra, Dniester and Budak rises are located in areas where average depths are between 17-23 m, but less than 30 m, except over Odessa sand-bank, which is a shallow region. Here common sediments are shelly debris and detrital shelly sands. Rather active biogenic sedimentation can be observed on the crests of terraces. These are areas of biocenoses dominated by of *Mytilus.*
5. Central shelf plain is located at depths between 45-60 m. There are mainly muddy shells- rich sediments with 1.6-2.3% organic carbon here. Both *Mytilus* and *Phaseolinus* are the dominant species in the biocenosis.
6. Outer shelf plain is located southward, in depths greater than 60 m and down to the shelf edge. Here the biocenosis visibly changes and *Phaseolinus* is the dominant species, polychaetes are subdominant, and *Mytilus* is absent.

Conclusions

1. Inner, central and outer shelf areas have been delineated along the northwestern part of the Black Sea. Inner shelf is characterized by very rough relief, and it is bordered by the terrace along approximately 45 m depth. Very flat central shelf area is situated at up to 60 meters depth and is separated by a discernible seafloor ledge from the outer shelf.

2. According to the distribution of statistical parameters of the water depth, Holocene sediment thickness, and percentage of silt and clay within the sediments, the following landscape areas have been delineated: erosional coastal offshore slope, Danube avandelta and paleo-valley, depressions of river paleo-valleys, terraces of the inner shelf, central shelf plain, and the outer shelf plain.

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