SPATIAL LITHOFACIAL ANALYSIS OF LAKE SARBSKO DEPOSITS AND ITS PALEOGEOGRAPHICAL SIGNIFICANCE

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F i n a l r e p o r t

Particular interest in coastal lagoons, their deposits and evolution arises from transitional marine-terrestrial character of that environment and specific conditions of sedimentation.
Due to interplay of high organic productivity and intensive input of material from the surrounding area, lagoons are regarded as sediment traps and show high sedimentation rate.
Depositional processes in lagoons are also influenced by sea level fluctuations which affect the position and continuity of the barrier cutting off lagoon from the sea, and then, the geometry of the basin as well as salinity and oxygenation of waters.
Contemporary lagoons differ from each other with respect to morphometrical and hydrological features and their sediments reveal distinct facial diversity.
Despite many studies concerning sedimentary processes in lagoons and properties of sediments, the problem of their internal variability is still open. On the other hand, from paleogeographical point of view, identification of lagoonal facies, their spatial extent, stratigraphical succession and genesis is essential for reconstructions of phenomena that took place in the basin and its catchment.
This theoretical framework allowed the author to carry out spatial chemofacial analysis of lagoonal deposits based on detailed geological survey of lake Sarbsko – coastal lake (closed lagoon) situated on the middle Polish Baltic coast.
Most of above mentioned investigations have been accomplished owing to financial support of International Association of Sedimentologists (1000 €), that I received in June 2004.
The lake has been covered by network of 45 bore holes located along five cross-section lines.
Within the project the following problems have been taken up:

1) Lithological and facial diversity of deposits based on geochemical data from 859 samples comprising SiO_{2terig}, SiO_{2biog}, $CaCO_3$ and organic matter contents and for selected profiles – Ca, Mg, K, Na, Fe and Mn concentrations. Results of those investigations have been included in my PhD thesis [1] and partly published in [2] and [3].
2) Genesis of carbonate sediments in lake Sarbsko. In the lake two horizons of carbonate sediments occur – lower lying beige gyttja and upper black gyttja with admixture of FeS. Apart from stratigraphical position, these deposits differ from each other with respect to spatial extent and thickness. The former has

been encountered in the north-western part of the lake as a continuous layer while black gyttja occur in the form of lenses in five isolated areas.
Those observations led the author to the conclusion that conditions of precipitation of carbonate minerals in both cases must have been different.
To verify the hypothesis, salinity and oxygenation of the environment of deposition have been determined. The proxies of those parameters were, respectively, Mg/Ca and Fe/Mn ratios. Additionally, morphology of carbonate crystals has been examined under scanning electron microscope.
Collected data revealed that dominant carbonate mineral in both gyttjas was calcite and that it was a product of decalcification of fresh and well oxygenated waters. On the other hand, the shape and dimensions of crystals suggest that precipitation of $CaCO_3$ in beige gyttja was rather rapid process, while bigger and better developed calcite in black gyttja indicates much slower crystallization.
An article concerning carbonate problems is being prepared.

3) Characteristics of polygenetic marine-lagoonal-lacustrine littoral zone found in the southern part of lake Sarbsko. Littoral deposits overlay sedge peat and are dominated by sands with small amount of gravel. Underlying peat has been dated to make sure that the age of the littoral is consistent with results obtained by Tobolski [4] and Miotk & Bogaczewicz-Adamczak [5] who established time frames for corresponding marine deposits in the northern part of the basin.
Vertical variability of grain size in littoral sediments indicates interplay of water level drop and lowering of lagoon shore dynamics as a consequence of isolation from the sea.
Preliminary results of sedimentological investigations from the littoral zone of lake Sarbsko have been presented during the conference Sediment 05 in Thun, Switzerland, in July 2005.

Grant awarded by IAS has been spent as follows:

Specification of expenses	**Allocation**	**Problem***	**Gross price**	
			PLN	**Euros****
GRAPHIT POWDER -325 mesh, 99.999%	AAS analysis of K, Na, Fe, Mn concentrations	1	941.84	232.94
Bung's microburette	Complexometric titration of Ca and Mg	1	183.00	41.23
SEM-DES analysis	Carbonate minerals investigations	2	600.00	148.70
C^{14} dating	The age of peat underlying littoral deposits	3	2400.00	611.73
		TOTAL	**4124.84**	**1034.6*****

* outlined in the text
** convered according to data of Polish National Bank
*** I am aware that overdraft will not be refunded

Literature:

[1] Woszczyk M. 2005a Przestrzenna analiza litofacjalna osadów jeziora Sarbsko i jej paleogeograficzna wymowa, unpublished PhD thesis, Adam Mickieiwicz University, Poznań, 122pp.

[2] Woszczyk M. 2005b Cechy geochemiczne osadów jeziora Sarbsko jako odbicie jego genezy, in: Borówka R.K. (ed.) Plejstoceńskie i holoceńskie przemiany środowiska przyrodniczego Polski Wybrane aspekty, 68 – 71

[3] Woszczyk M. 2005c Dynamics of sedimentary processes in coastal lagoons and spatial variability of their deposits – lake Sarbsko case study, in: Haas H., Ramseyer K., Schlunegger F. (eds) Sediment 05 The Sediment Factory, Abstracts, 153 – 154

[4] Tobolski K. 1967 Analiza palynologiczna osadów jeziora Sarbsko, Badania Fizjogr. nad Polską Zachodnią t. XX, 173 – 177

[5] Miotk G., Bogaczewicz-Adamczak B. 1986 Marine transgressions on the basis of investigations of subfossil biogenic sediments in the Sarbska Bar, Southern Baltic, Quaternary Studies in Poland 7, 65 – 72