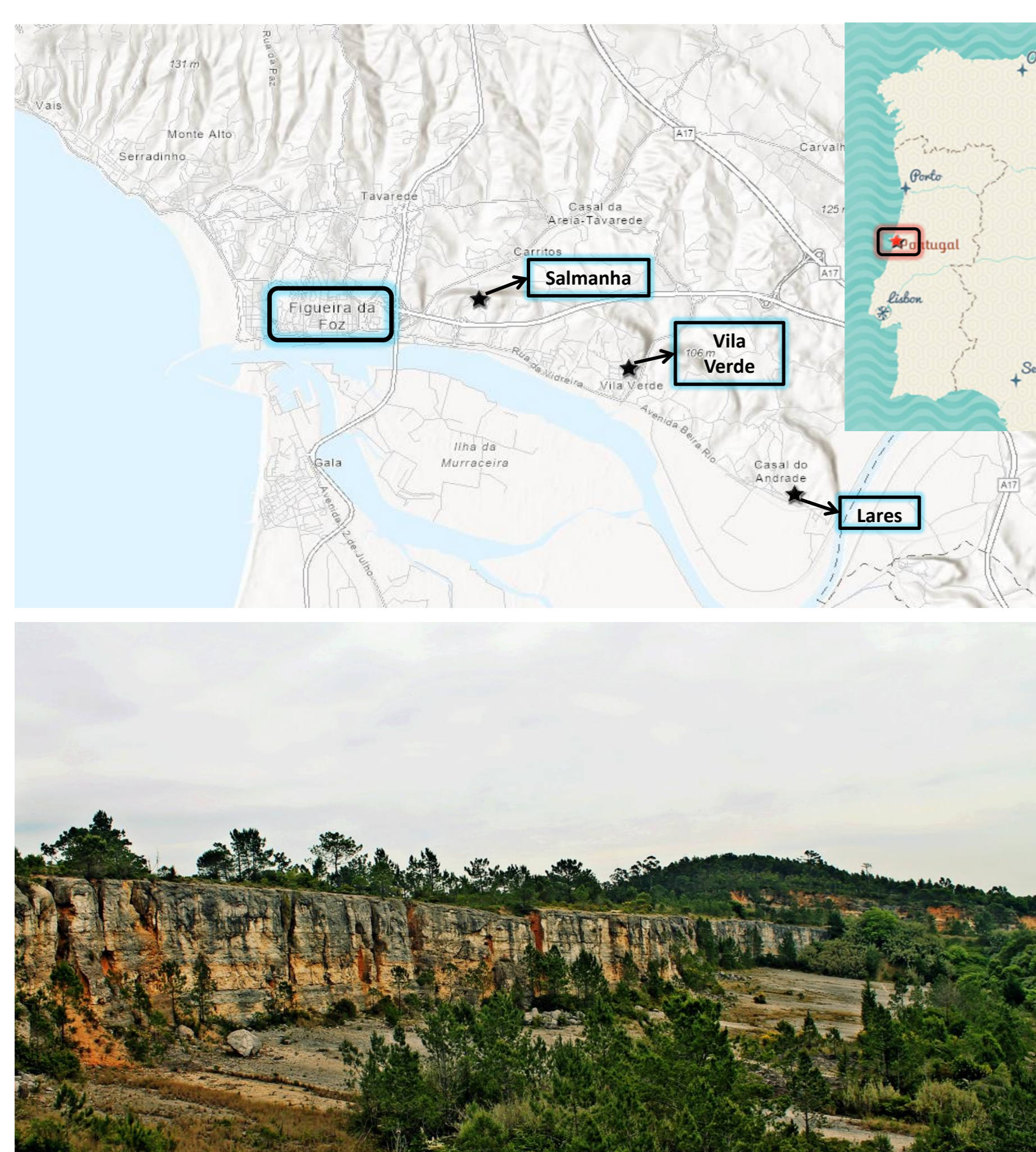


Summary

The Baixo Mondego region in West Portugal is known to expose a large record of middle to upper Cenomanian and lower Turonian platform carbonates with rich fossil assemblages. There are a huge variety of microfacies suggests a rather complex palaeo-environmental setting. Several workers initiated their study since the 60s, but the available information now require being complemented with new biostratigraphic data with palaeoecological relevance. Within this scope, the upper Cenomanian carbonate levels "C" to "J" of the Costa d'Arnes Formation were sampled from stratigraphic sections located between the localities of Salmanha, Vila Verde and Lares. A representative collection of 85 thin sections was then prepared for a micropaleontological study completed in the Earth Sciences Department of the New University of Lisbon, University of Coimbra and the University of Vigo.

Geological setting

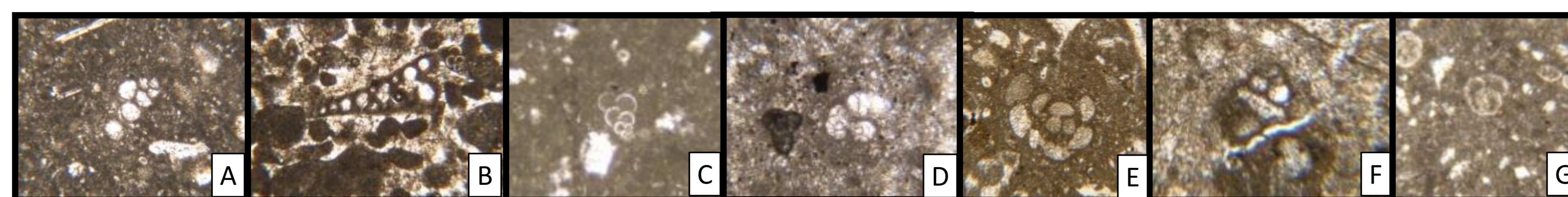


Biostratigraphy

Salmanha quarry				Crinoidea	Chlorophyta & Rodophyta	Planktic Foraminifera	Polychaeta									
Stage	Ammonite zone	Planktic Foraminifera zone	Depth (m)	Level	Lithology	Porifera	Cnidaria	Bryozoa	Brachiopoda	Gastropoda	Echinoidea	Crinoidea	Chlorophyta & Rodophyta	Planktic Foraminifera	Polychaeta	
Lower Turonian	Ammonites nososiles nososiles	Hedbergella delrioensis	O													
			N													
			M													
			L													
			K													
	Upper Cenomanian	Thomasinella rollandi	Hedbergella delrioensis	J3												
				J2												
				J1												
				I												
				H3												
Neocambricoccus jullii		Hedbergella delrioensis	Hedbergella delrioensis	H2												
				H1												
				G												
				F												
				E												
Mehlocooceras geslinianum	Hedbergella delrioensis	Hedbergella delrioensis	D													
			C3													
			C2													
			C1													
			C													

Microfacies identification and results

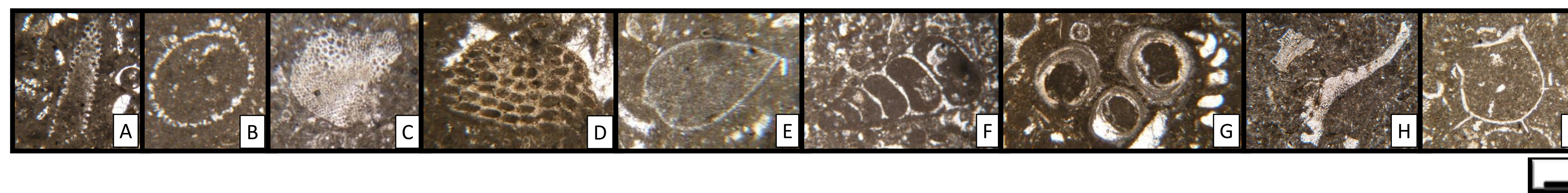
- Consequently the following planktonic foraminiferal taxa were identified in a wackstone-packstone carbonate microfacies rich in bioclasts/bioclastic: *Hedbergella delrioensis* (A), *Heterohelix* sp. (B), *Guembeltria cretacea* (C), *Helvetoglobotruncana prae-helvetica* (D), *Rotalipora cushmani* (E), *Whiteinella* spp. (F), *Dicarinella* sp. (G), and *Praeglobotruncana delrioensis*.



- They occur together with the benthonic foraminifers: *Thomasinella punica* (A), *Placopsilina cenomana* (B), *Hemicyclammina sigali* (C), *Gavelinella* sp. (D), *Marssonella oxycona* (E), *Dorothia* sp. (F), and *Ammobaculites* spp. (G), and forms attributed to the genus *Lenticulina*, *Quinqueloculina* and *Nautiloculina*.



- The bioclasts include abundant dasycladacean algae (A, B) and small fragments of invertebrates, including sponges (C), bryozoans (D), bivalves (E), gastropods (F), serpulid worms (G), echinoids (H), crinoids (I) and calcispheres. These Tethysian-influenced assemblages indicate the presence of a rather distal, mid- to outer-shelf environment with open marine conditions.



Conclusions

Upper Cenomanian is characterized by an increase in the water column, in the diversity of the fauna and in the amount of carbonates present in the sediments. There are some small intervals that reveal a decrease in carbonate sedimentation, towards a more marly pole. At the boundary of the Cenomanian-Turonian exists a return to carbonate sedimentation that increases into the last levels towards a more micaceous terrigenous.

During the correlative interval of the OAE2 the disappearance of a large number of benthic organisms is recorded, which is possible to observe due to the smaller number of specimens found in our levels and for to the more dominance of algae remains. At the beginning of the lower Turonian there is a basal lagoon that could be due to the decrease in carbonate sedimentation and/or that could also be influenced by a Lazarus effect.

In a nutshell, there are different changes of the environment in some levels, but in general it is a shallow sea, within the photic zone, with normal salinity, temperature that varies but belongs to a temperate/tropical climate with warm surface waters which are characteristic of the carbonate platforms of the Tethys and that at certain times had a greater richness of nutrients on the surface due to overproduction and disoxic conditions in the benthic environment during the correlative interval of the OAE2.