

LIMITING FACTORS ON SHELL GROWTH AND SEGREGATION OF AMMONITE POPULATIONS: EVIDENCE FROM ADULT SIZE VARIATIONS WITH TIME AND SPACE.

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The shape and the ornamentation of ammonite shells are often closely related to their habitat but little information is available on ammonite population structure. The purpose of this contribution is to study spatio-temporal variations in adult size of ammonites in order to elucidate the limiting factors acting on shell growth. This work is based on a extensive palaeontological field study of the Valanginian to Lower Hauterivian ammonite fauna from south-east of France. Between the *Campylotoxus* and *Radiatus* zones, more than 23600 ammonites have been found along 9 reference sections of the Vocontian Basin and 2 sections of the Provence Margin with an accurate stratigraphic control. - The evolution of the ammonite fauna was integrated into a sequence stratigraphy framework. The major faunal renewals were correlated to the relative sea-level changes. In the Vocontian Basin, first appearance phases and faunal crisis are contemporary to the third order lowstand (limestone dominant alternation) and transgressive systems tracts (marly dominant alternation) respectively. The diversity and abundance maxima are often closely related to the lower system tract (Reboulet, 1995).

a) The study of the ammonite succession shows also episodic time-size variation. The decrease in adult size is closely correlated with rising sea level. For example, during the transgressive system tract of the *Campylotoxus* zone, the evolution of *Neocomitidae* and *Olcostephanidae* families shows a decrease in size of the mature conch. The increasing in adult size is often correlated with falling sea level (lowstand system tract). - The evolution in adult size variation is not totally controlled by internal factors because such tendencies are obvious in various contemporaneous families. The parallelism between evolution of adult size ammonite and eustatic sea level fluctuations shows that this character is indirectly controlled by bathymetry. In *Nautilus*, as in fossils chambered-shelled Cephalopods, an essential part of the growth process is the emptying of cameral liquid; increasing average habitat depth may cause slower net growth (Ward, 1987). Another limiting factor for shell growth is temperature, which is also closely related to depth.

b) Moreover, the adult size variation of populations is not randomly distributed between basin and platform. At specific or generic levels, larger ammonites are found in shallow platform environments (Provençal Margin) whereas smaller ones occur in much deeper habitats (Vocontian Basin). If the supposed absence of significant geographical barriers is confirmed, this could be related to a behavioural segregation.

This contribution raises some new questions about the structure of ammonite populations, on speciation and on heterochronic processes.

References : Reboulet S., 1995: L'évolution des ammonites du Valanginien-Hauterivien inférieur du bassin vocontien et de la plate-forme provençale (S-E de la France) : relations avec la stratigraphie séquentielle et implications biostratigraphiques. *Doc. Lab. Geol. Lyon*, 137, 371 pp., 44 fig., 38 pl..

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