CONCH – a new software for quantitative morphological analyses of ammonoid shells

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Species description in palaeontology is based on the morphology of preserved hard parts. Specifically, for the spirally coiled shells of ammonoids an extensive intraspecific variation of conch shape, ornamentation, size and the suture line has been documented. Recognition of ammonoid species, however, is usually based on the grounds of subtle morphological differences of the adult stage. This procedure does not account for intraspecific variation or ontogenetic changes. The few available quantitative studies of ammonites have improved our understanding and the way of species description, documenting a wide intraspecific variability in conch parameters. Studies of intraspecific variation are likely not more widespread for three reasons: 1) not enough material from a single bed, 2) poor preservation of the fossil material and 3) it is a time-consuming process. Here we present a new software which significantly reduces the amount of time by 50% or more necessary to measure standard distances for spirally coiled monomorph or heteromorph shells, i.e. diameter, whorl height, whorl interspace, umbilical width, and ornamentation. Our software allows the collection of morphological data in 10, 30 or 45 degree steps. It is possible to collect more data from a single shell to precisely document ontogenetic changes compared to data collected from sectioned specimens. The set of marker placed along the shell outline can be saved as a project file, displaced markers can be corrected, and the project files can be shared with other researchers. Based on basic shell parameters indices and expansion ratios can be calculated. A dataset summarizing the morphology of a collection of heteromorph ammonite shells from the Hauterivian (Lower Cretaceous) heteromorph ammonite genus Aegocrioceras from Northwestern Germany will be presented.