Nomenclature Problems of Ammonite Biohorizons (Faunal Horizons) in Jurassic and Cretaceous Stratigraphy

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Most detailed correlatable units using in the Jurassic and Cretaceous biostratigraphy are ammonite biohorizons (or faunal horizons). Most important features of biohorizons are the following: (1) potential indivisibility to those taxonomic criteria on which they are established, (2) determinacy as lower and upper boundary of biohorizons in a geological section, (3) identification from recognition of the single (unique) index-taxon (usually species or subspecies) (Callomon, 1984, 1985; Page, 1995; Gulyaev, 2001, 2002; Rogov et al., 2009, among the others). Paleobiological nature of biohorizons could be connected primarily with phylogenetic or immigration events (Zakharov et al., 2007); their geological nature controlled by different sedimentary and post-sedimentary processes.

For optimization of the decision of major aims of stratigraphy, which are subdivision and correlation, within the single area several parallel scales of biohorizons based on the different lineages of the key-taxa could be present. Also at a composite scale "intercalated" biohorizons based on the invasions of the immigrant species could be present (Fig. 1).

Taking into account a geological structure and an investigation level of a concrete regional section presence of gaps between successive biohorizons is allowed as well as noncoincidence of their boundaries with zonal and subzonal boundaries.

For the first time in the Jurassic such detailed geochronological ammonite-based units ("hemerae") were used at the end of the XIX century (Buckman, 1893), but active application of biohorizons in the Jurassic and Cretaceous biostratigraphy began since 80th of the XX century.

Rapid development of the infrazonal approach during the last three decades has lead to the certain anarchy in establishing of new biohorizons and other infrazonal units. Proposed index-taxa of newly established units in many cases were given in open nomenclature, and many chronospecies were marked by non-linnean characters (greek letters, digits etc). All such examples are responsible for ambiguity in the understanding of the established units and should be considered only as provisional and require for revision. In other cases biohorizons are erected without any References to bed(s) in the studied sections and even within the heterogeneously condensed deposits. It is expedient to consider all such units as unavailable. If ones unable to present in publication detailed data about the position of new units within sections, better to use terms "faunal assemblage" or "fauna" instead the term "biohorizon". Biohorizons are also sometimes recognized by acme-level of the index-species or by concurrent ranges of some taxa. In our opinion using of relative abundance of index-taxa for recognition of biohorizons as well as several index-taxa is undesirable, because nature of such units not always unambiguous and their correlative potential is small. Such units could not be considered as true biohorizons, and should be used as acme-horizons/zones and as concurrent range horizons/zones.

The current nomenclature uncertainty creates the necessity to develop a set of basic rules for establishing, recognizing and describing of biohorizons, because further use of biohorizons without such rules could lead to discredit of the whole infrazonal approach. Below brief review of the proposed rules are given (Gulyaev, 2002).

Most important nomenclatural characteristics are availability and validity.

Availability of biohorizon determined by (1) presence of name, which is consist from-word "biohorizon" or its synonym, available name of the index-species, name of author and year of publication of biohorizon; (2) presence of the stratotype; (3) accordance to publishing criteria accepted by ICZN and ICBN.

Validity of the biohorizon determined by principle of triple priority, including subordinate principles: (1) **minuteness**: the biohorizon having a smaller stratigraphical range has priority over a biohorizon having the larger stratigraphical range; (2) **continuity**: the biohorizon based on a species of the same lineage as contiguous biohorizons has a priority over a biohorizon based on a species of other lineage if it does not contradict with minuteness (3) **seniority**: the oldest of the available names of biohorizon has priority to the later, if it does not contradict the principles of minuteness and continuity.

Nomenclature of biohorizons in some extent depends on the nomenclature of the index taxa: (1) if the name of the index-species change on the basis of objective synonymy or homonymy (nomenclature type remains), the name of biohorizon also automatically changed, but the author remains the same, and his name is placed in brackets; (2) if the name of the index-species is recognized invalid due to the subjective synonymy, also becomes invalid and the name of the

biohorizon. In the latter case, the author of the new name of the biohorizon will be the first who revised it.

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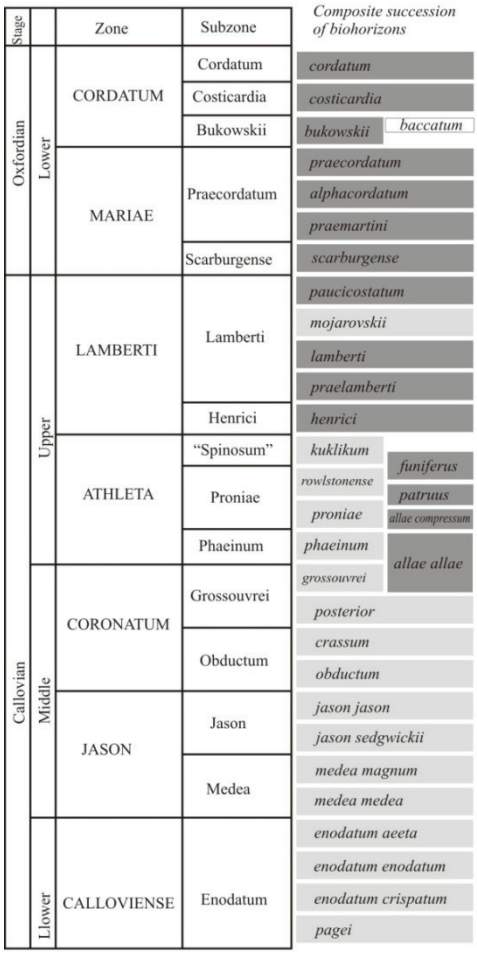
Key words: Infrazonal biostratigraphy; Ammonites; Biohorizons; Faunal horizons; Nomenclature



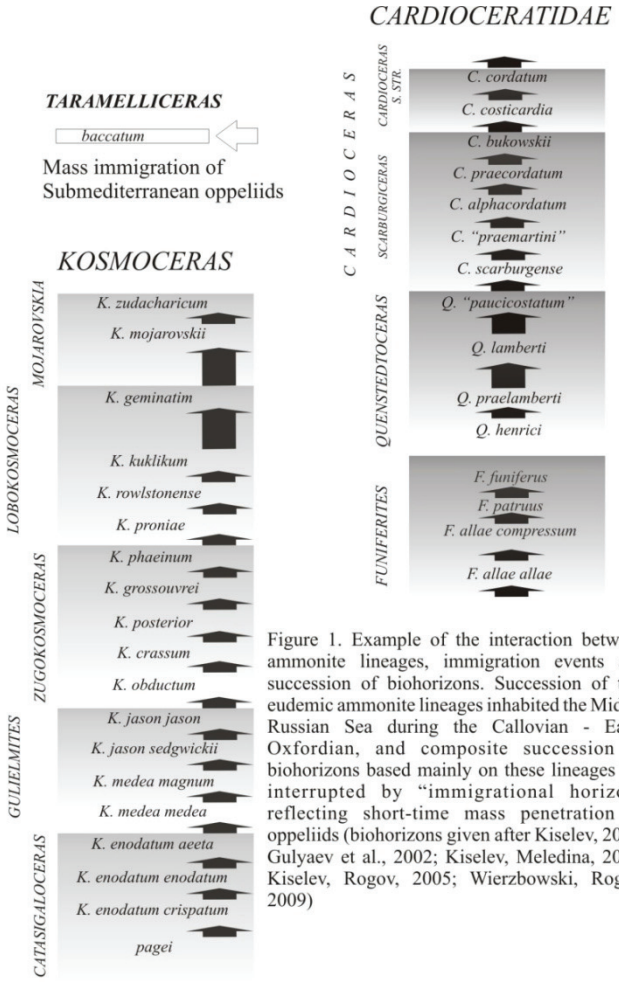


Figure 1. Example of the interaction between ammonite lineages, immigration events and succession of biohorizons. Succession of two eudemic ammonite lineages inhabited the Middle Russian Sea during the Callovian - Early Oxfordian, and composite succession of biohorizons based mainly on these lineages but interrupted by "immigrational horizon" reflecting short-time mass penetration of oppeliids (biohorizons given after Kiselev, 2001; Gulyaev et al., 2002; Kiselev, Meledina, 2004; Kiselev, Rogov, 2005; Wierzbowski, Rogov, 2009)

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