Vendian Animals in the Phylum Proarticulata

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Nearly a dozen taxa of Vendian metazoans known from Eastern Europe and South Australia make up the Phylum Proarticulata Fedonkin 1985. The body plan of proarticulates is unusual for solitary (non-colonial) metazoans. These bilateral organisms have a segmented metameric body, but, left and right segments (isomers) are organized in an alternating pattern relatively to the axis of the body – they are not direct mirror images. This phenomenon is described as the symmetry of gliding reflection. Some proarticulates demonstrate obvious asymmetry of left and right parts of the body. For instance, *Yorgia*'s initial right isomer is the only one which spreads far towards the left side of the body. *Archaeaspis* has an unpaired anterior lobe confined by the furrow to the left side only.

The phylum Proarticulata includes the European genera *Andiva*, *Archaeaspis*, *Cyanorus*, *Dickinsonia*, *Kharakhtia*, *Paravendia*, *Podolimirus*, *Vendia*, and *Yorgia*. The Ediacaran assemblage of South Australia contains, in addition to *Dickinsonia*, such forms as *Spriggina, Marywadea*, and probably, *Praecambridium*. Small size of the latter does not allow certainty about its taxonomic position.

Most body imprints of proarticulates have in the past been primarily preserved on the sole of sandstone beds in negative relief. However, in the fossil localities of Zimnii Bereg (the Winter Coast) of the White Sea one can observe unique types of preservation on soles of the sandstone beds. Some fossils appear as chains of positive imprints (a good example being *Yorgia*) with the negative imprint of this animal at the end of the trail. Positive imprints are confined to the "elephant skin" surface texture that is interpreted as the remains of a microbial film. This surface and the body imprint sometimes show coherent deformation due to the taphonomic causes. Some body imprints may be laterally compressed or even rolled up independently from the bacterial film. These deformed impressions may reflect unsuccessful attempts to escape from the sand avalanches that buried the living animal. Positive body imprints are interpreted as the feeding tracks produced by an animal working on the surface of a bacterial film. Grazing of that bacterial film could have been accomplished by the work of numerous hair-like organs located on the ventral side of the body. Presumable traces of this work are preserved in the positive imprints as a >>>>-like microrelief.

Taphonomic details revealed in *Yorgia* due to its large size allow interpretation of the chains of positive imprints of other proarticulates as grazing traces. In addition to *Yorgia*, two fossil taxa, *Epibaion* and *Phyllozoon*, seem to have produced similar grazing traces. Small groups of positive body imprints are documented for *Dickinsonia costata* as well.

Some body imprints demonstrate features of internal anatomy, such as the dense network of branching channels in the anterior lobe of *Yorgia*. Other imprints highlight thick axial channels and numerous lateral branches, which may bifurcate in some species. This geometry of internal organs may be related to digestive, distributive and/or secretory functions.

The external morphology of proarticulates shows three distinct patterns: Dipleurozoa, Vendiamorpha, and Cephalozoa (a preliminary name). The dipleurozoan body is divided by isomers entirely (*Dickinsonia, Epibaion,* and *Phyllozoon*). The vendiamorphan body is segmented completely, but all isomers are curved towards the posterior, and the first isomer is normally much larger than the rest (*Vendia, Paravendia, Podolimirus*, and *Karakhtia*). Cephalozoans demonstrate incomplete segmentation, their anterior zone free of isomers (this group includes *Yorgia, Andiva, Archaeaspis, Cyanorus,* and probably, *Spriggina*, *Marywadea*, and *Praecambridium*).

Large body size of many proarticulates (up to 1 meter and even greater), their very unique body plan and their complex morphology, special mode of feeding, andother other features are characteristics that seem to set the Proarticulata aside as a separate metazoan phylum which existed and became extinct, presumably, before the beginning of the Cambrian Period.

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