

3D models related to the publication: Convergent allometric trajectories in Devonian-Carboniferous unornamented *Polygnathus* conodonts

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Abstract

The present 3D Dataset contains sixteen 3D models of unornamented *Polygnathus* illustrating allometric variation and bilateral asymmetry within four “Operational Taxonomic Units” analyzed in the publication: Convergent allometric trajectories in Devonian-Carboniferous unornamented *Polygnathus* conodonts.

Keywords: Allometry, Bilateral asymmetry, Geometric morphometrics, Occlusion

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INTRODUCTION

This contribution presents 3D models of sixteen P₁ conodont elements belonging to unornamented *Polygnathus* of the Puech de la Suque section (PS, Montagne Noire, France) (Girard, 1994) dating from the Late Devonian and early Carboniferous. P₁ elements were present by pair in the pharyngeal area of the feeding apparatus and are considered to have functioned in occlusion in order to process the food (Donoghue and Purnell, 1999a, 1999b). Among the 441 P₁ elements that were sampled in ten stratigraphic levels from the Upper Devonian to lower Carboniferous of the Puech de la Suque section, sixteen were selected (Table 1) to illustrate allometric trajectories and bilateral asymmetry in four “Operational Taxonomic Units” (OTUs) relaying along the record (Nesme et al., 2025). The 3D surfaces of these elements were used in a geometric morphometric analysis aiming to assess the patterns of morphological variation through time. Results showed that the morphospace occupancy changed through time, letting to the delineation of OTUs regrouping elements of stratigraphic levels sharing the same patterns of morphological variation. Allometric trajectories varied among OTUs (Fig. 1), due to differences in the morphology of small-sized specimens, possibly related to variations in life-style and feeding habits. However, all trajectories converged towards similar large-sized elements, suggesting increasing functional constraints with increasing size. Compared to this variability in allometric patterns, patterns of bilateral asymmetry remained relatively stable across OTUs. The convergent allometric trajectories across OTUs suggest that large-sized unornamented *Polygnathus* shared similar functional constraints in all OTUs, possibly due to convergence of the feeding behavior.

METHODS

Polygnathus P₁ elements were glued onto a toothpick and scanned at a cubic voxel resolution of 1.4 μm using the Phoenix Nanotom

S microtomograph (ICT) on the AniRA-ImmOs platform of the SFR Biosciences, Ecole Normale Supérieure, Lyon, France. The scanning parameters were as follow: 100 kV, 70 IA, 3000 projections at 360° with no filter. Surfaces were segmented semi-automatically with the Avizo software (v. 9.1; Visualization Science Group, FEI Company) with the segmentation threshold selection tool. The 3D surfaces are provided in ply format, and can therefore be opened with a wide range of freeware.

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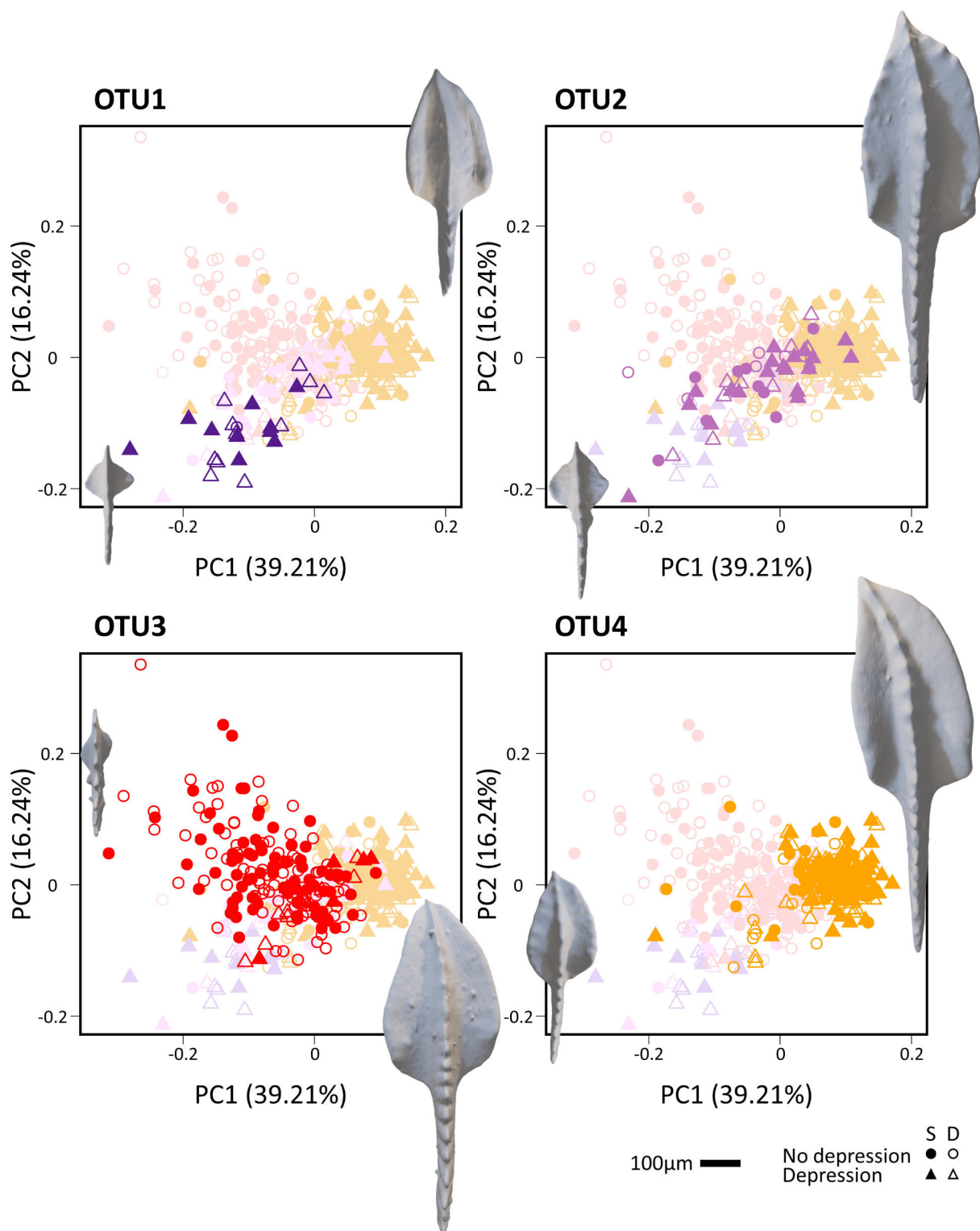


Figure 1. Morphospace of P_1 unornamented *Polygnathus* elements from the Upper Devonian and lower Carboniferous in the Puech de La Suque section. The four panels represent the range of each OTU (dark symbols) superimposed to the total morphospace occupancy (light symbols). From top left to bottom right, the successive OTUs, from the Late Devonian OTU1 to the more recent Carboniferous OTU4. The oral figuration of the smallest and largest specimens of each OTU are displayed next to the graphs to illustrate the morphological changes occurring along allometry. The specimens figured for each OTU from small to large are the following: OTU1: UM-PSQ-011 and UM-PSQ-010, OTU2: UM-PSQ-016 and UM-PSQ-015, OTU3: UM-PSQ-018 and UM-PSQ-019, OTU4: UM-PSQ-022 and UM-PSQ-023. S: sinistral, D: dextral.

Coll nr.	Side	Period	OTU
UM-PSQ-010	Dextral	Devonian	OTU1
UM-PSQ-011	Sinistral	Devonian	OTU1
UM-PSQ-012	Sinistral	Devonian	OTU1
UM-PSQ-013	Dextral	Devonian	OTU1
UM-PSQ-014	Sinistral	Carboniferous	OTU2
UM-PSQ-015	Sinistral	Carboniferous	OTU2
UM-PSQ-016	Dextral	Carboniferous	OTU2
UM-PSQ-017	Dextral	Carboniferous	OTU2
UM-PSQ-018	Sinistral	Carboniferous	OTU3
UM-PSQ-019	Sinistral	Carboniferous	OTU3
UM-PSQ-020	Dextral	Carboniferous	OTU3
UM-PSQ-021	Dextral	Carboniferous	OTU3
UM-PSQ-022	Sinistral	Carboniferous	OTU4
UM-PSQ-023	Sinistral	Carboniferous	OTU4
UM-PSQ-024	Dextral	Carboniferous	OTU4
UM-PSQ-025	Dextral	Carboniferous	OTU4

Table 1. List of the unornamented *Polygnathus* P₁ elements from the Puech de la Suque section used in the related publication: Convergent allometric trajectories in Devonian-Carboniferous unornamented *Polygnathus* conodonts. Coll nr.: collection number.