BROOCHES IN MOTION

Tracing shape evolution in La Tène brooches from Central Europe

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1 Introduction

Brooches are among the most suitable archaeological artefacts for the study of the La Tène period (460-30 BC) in Central Europe.

They have provided one of the most precious sources of archaeological information, expressing wealth, social status, and regional or personal identity.

Brooches and other artefacts found together in archaeological assemblages have proved vital in reconstructing the chronology of the La Tène period, subdividing it into several discrete phases (LT A – LT D2).

Although the chrono-morpho-typology of La Tène brooches is now well known, further morphometric analyses may still bring to light some new insights.

The first goal of this study is to check the current general chrono-morpho-typology.

The second goal is to provide visual representation of continual progressive changes in La Tène brooches over time.

The third goal is to illustrate these general shape changes in brooches found in funerary assemblages, and to test the pertinence of several human- and computer-based seriations.

The fourth goal is to test shape differences between two contemporaneous types of brooches from two different geographic regions.
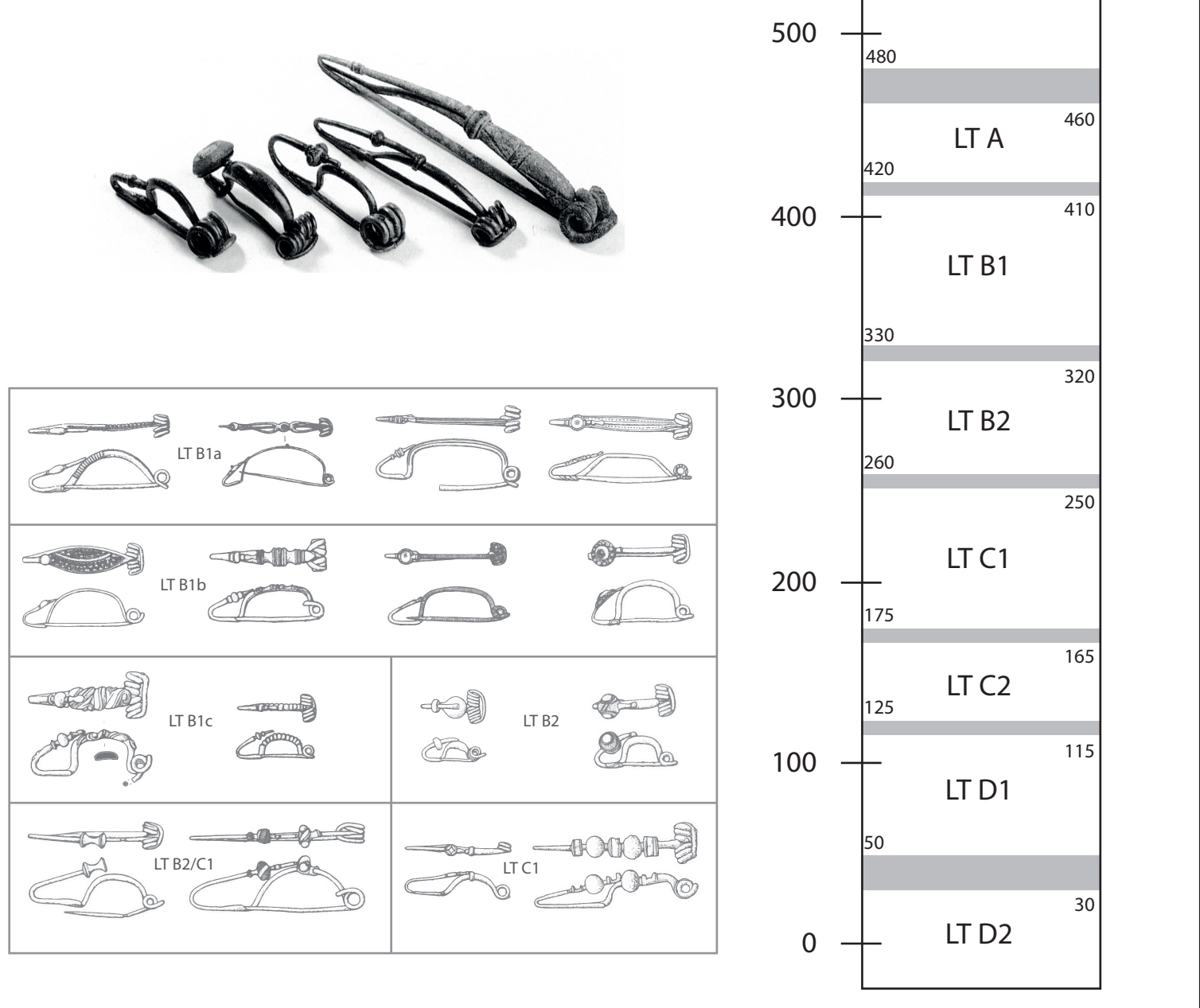

2 Materials and methods

The dataset consists of 381 complete, well-illustrated, and previously classified brooches of frequently occurring types found in 53 cemeteries and settlements in Bohemia, Moravia, and Bavaria.

All brooches were assigned to broad morpho-chrono-typological classes: LT B1a, LT B1b-c, LT B2, LT C1, and LT C2. Time-classes for brooches found in funerary assemblages were also defined by the position of the grave containing the brooch in the current handmade and computer-based seriations.
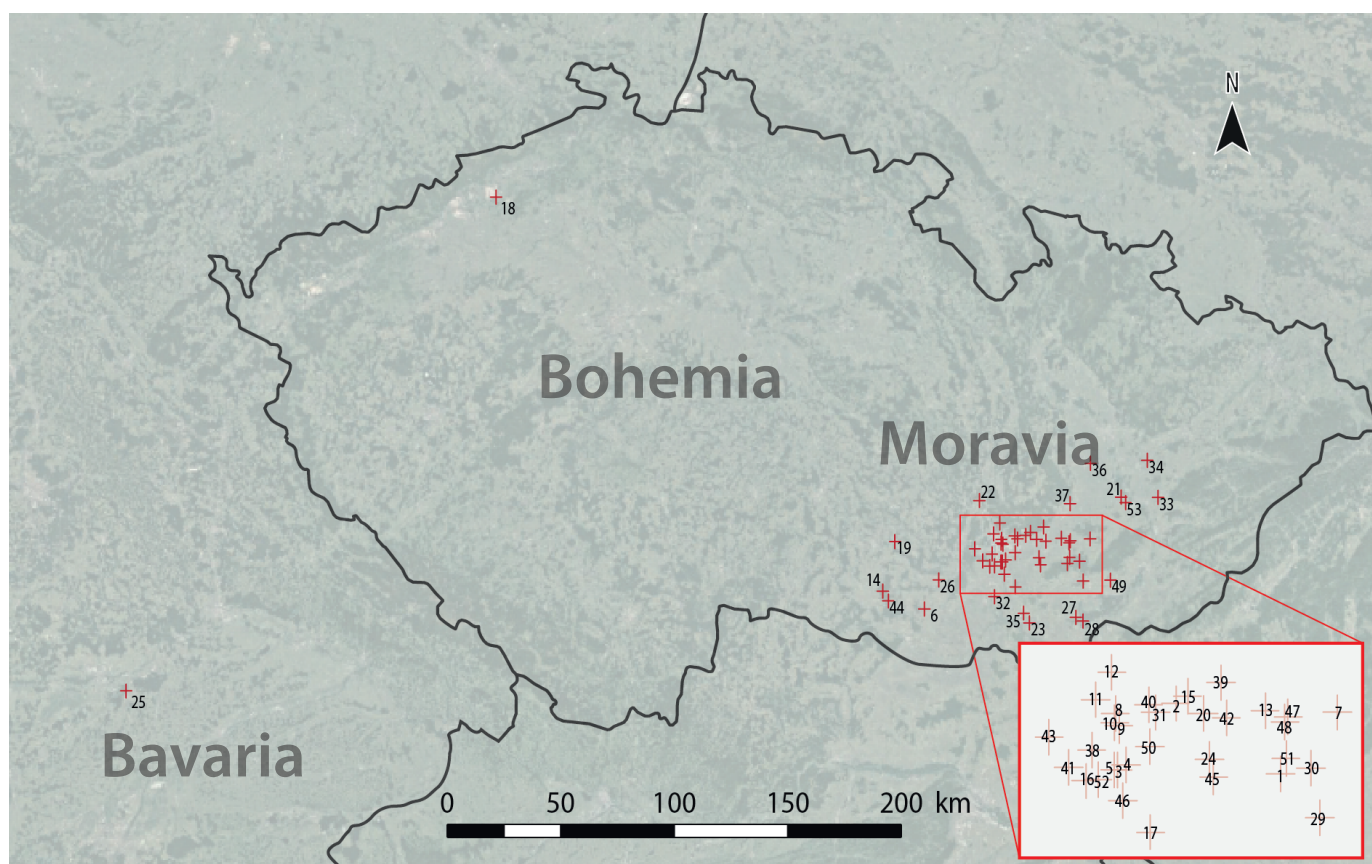

Brooches were treated with Generalised Procrustes Analysis of 15 landmarks. Differences between typological classes were inspected by PCA, LDA, MANOVA, and Two-way non-parametric permutational MANOVA.

The continual changes in brooches over time were modelled by regressing shapes along the cubic spline, passing by points representing the centroids of the five typological classes in the PCA space. The relationship between shape and time in seriations was then examined by Multivariate Regression and by Procrustes ANOVA.
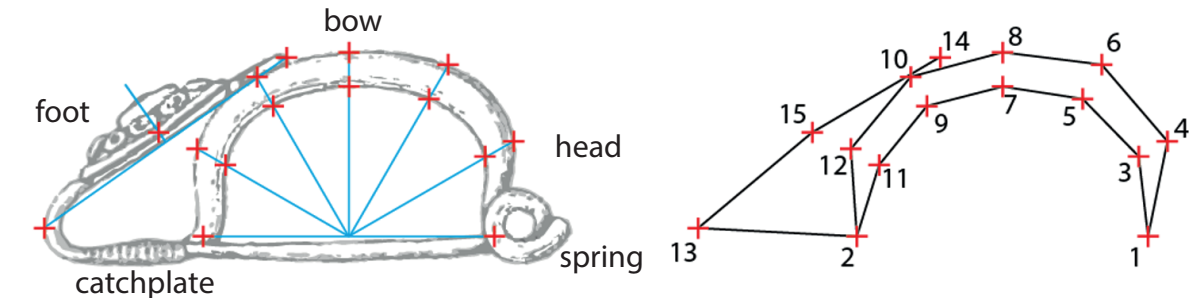
Landmark positioning on the lateral view illustration of the brooch. L1 marks the point where the bow meets the head (spring). L2 is placed where the bow meets the foot (catchplate). Between L1 and L2, ten other landmarks (L3 to L12) were placed on the bow, at 30° angles. The remaining three landmarks were placed on the foot, at each extremity (L13, L14) and in the centre (L15).

	Regions				Nomenclature (types and variants)		
Chronology	Bohemia	Moravia	Bavaria	Total	Waldhauser (1978)	Čižmář (1975)	Gebhard (1991)
LT B1a	2	18	0	20	F 1100	Roof/Parabolic-bow T.	-
LT B1b	31	24	0	101	F 1200, F 1300	Duchcov T.	-
	6	40	0		F 1400	Münsingen T.	-
LT B2	22	28	0	50	F 2100	Brooch with "ball" on foot T.	-
LT C1	21	17	5	43	F 3000	MLT T.	13b, 13c
LT C2	0	6	28	34	-	Mötschwill T.	1a, 1b, 16, 17a, 17b, 18a, 18b, 20

Roof-bow T. Duchcov T. Münsingen T. Brooch with "ball" on foot T.

Brooch with "ball" on foot T. MLT T. MLT T. Mötschwill T.
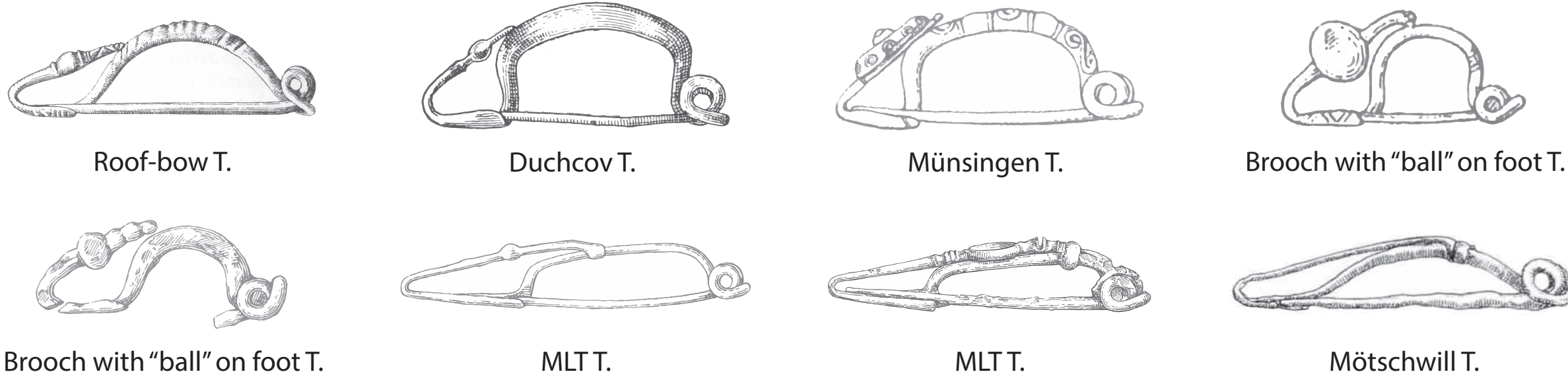
3 Results

1. Checking the chrono-morpho-typology

All brooches within the PCA-based morphospace seem to be well separated by chrono-typology, except LT C1 brooches, expressing the greatest shape disparity.

This observation was confirmed by both MANOVA (p<0.0001) and LDA - 85-90% of brooches were well classified. However, assuming that overlapping brooches represent transitional stages between consecutive archaeological phases, only 2% of brooches were misclassed.
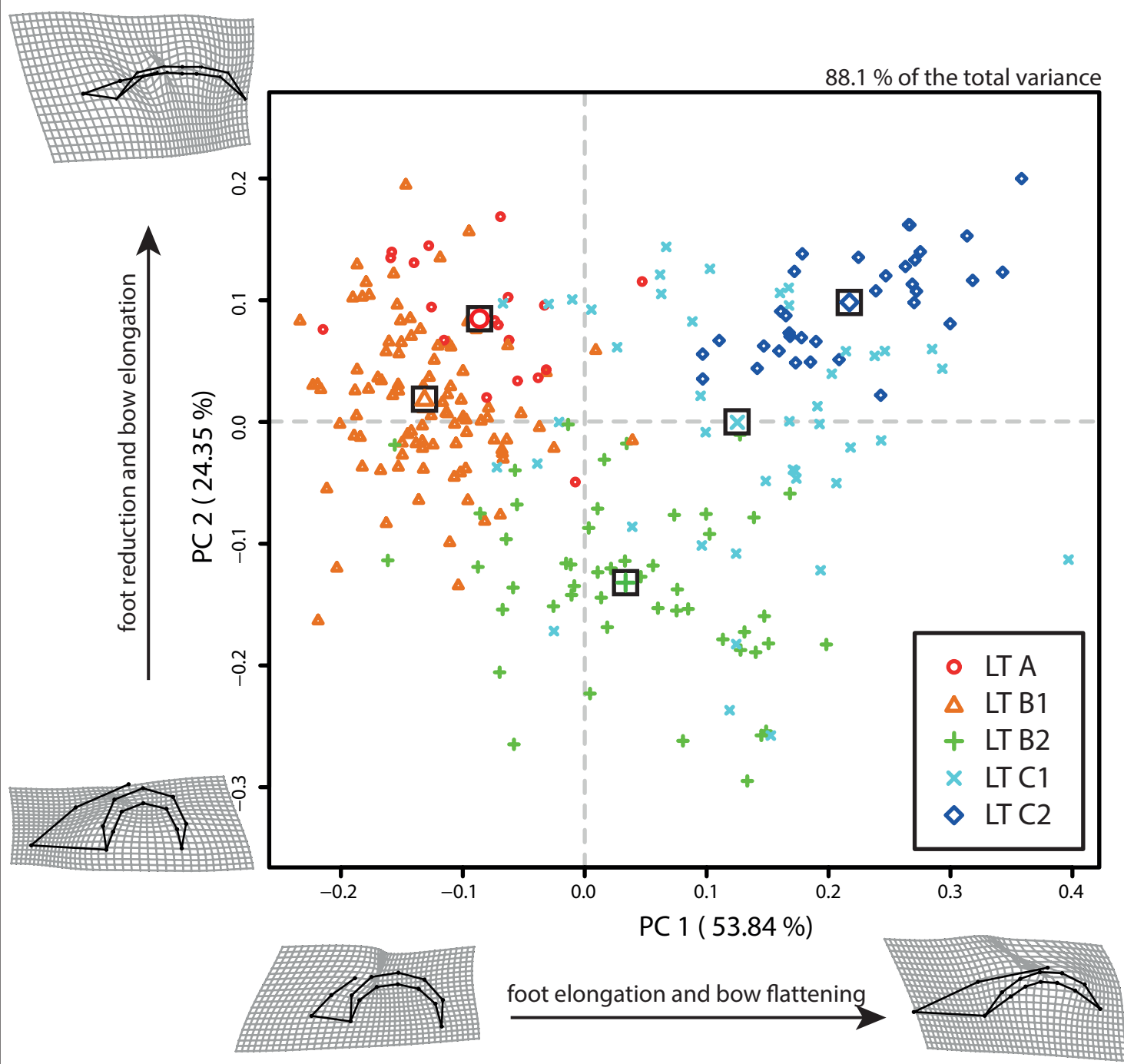
2. Shape evolution in La Tène brooches

Shapes reconstructed along the cubic spline visually reveal brooch parts that were objects of interest for modification made by ancient brooch manufacturers.
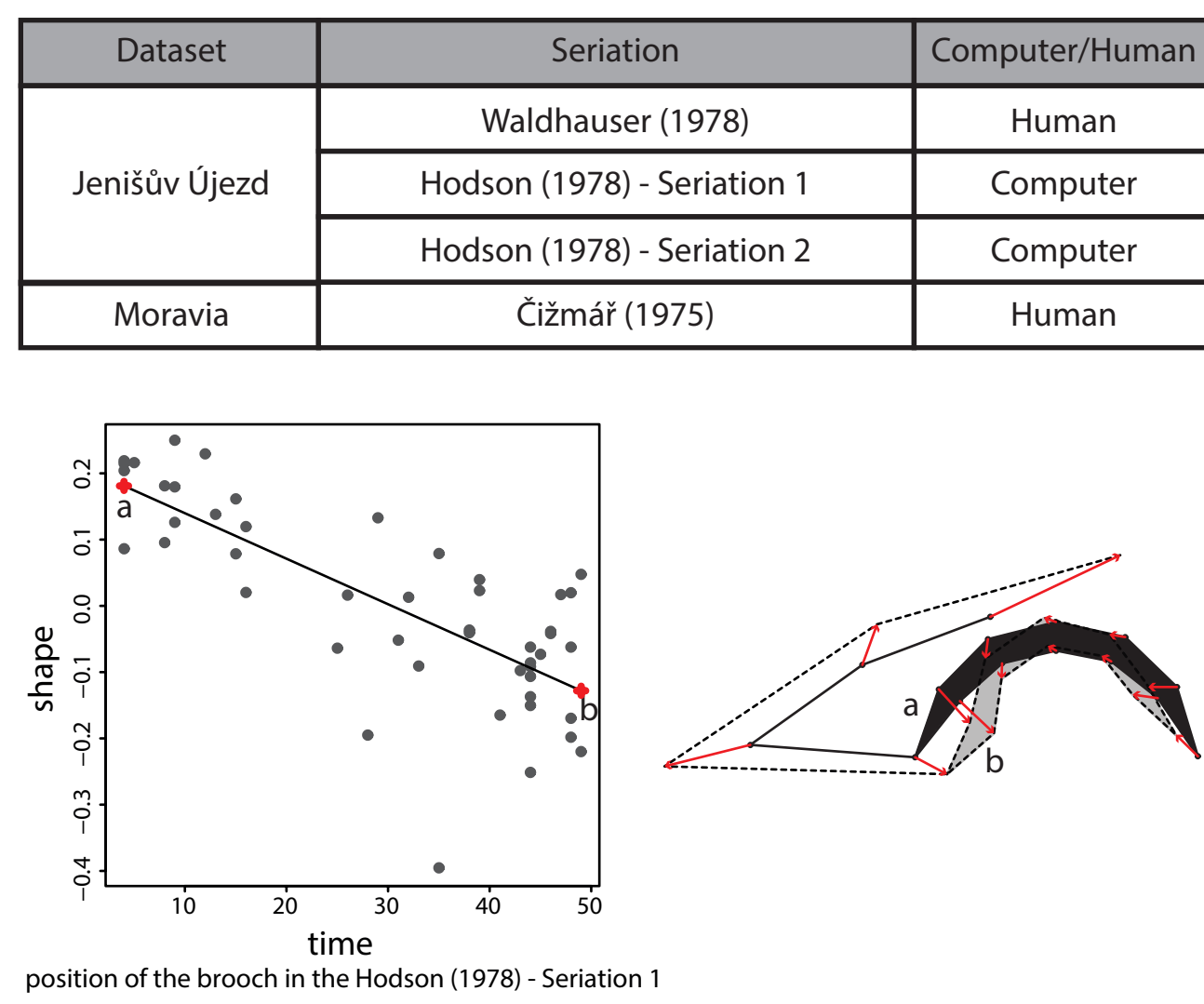
For example, the arched brooches produced in LT B2 were no longer in favour in LT C1, and the design of the bow returned to shapes privileged in LT A. The final transformation of LT C2 forms highlights tilting and moving the centre of interest towards the head of the brooch, often decorated in LT D1.
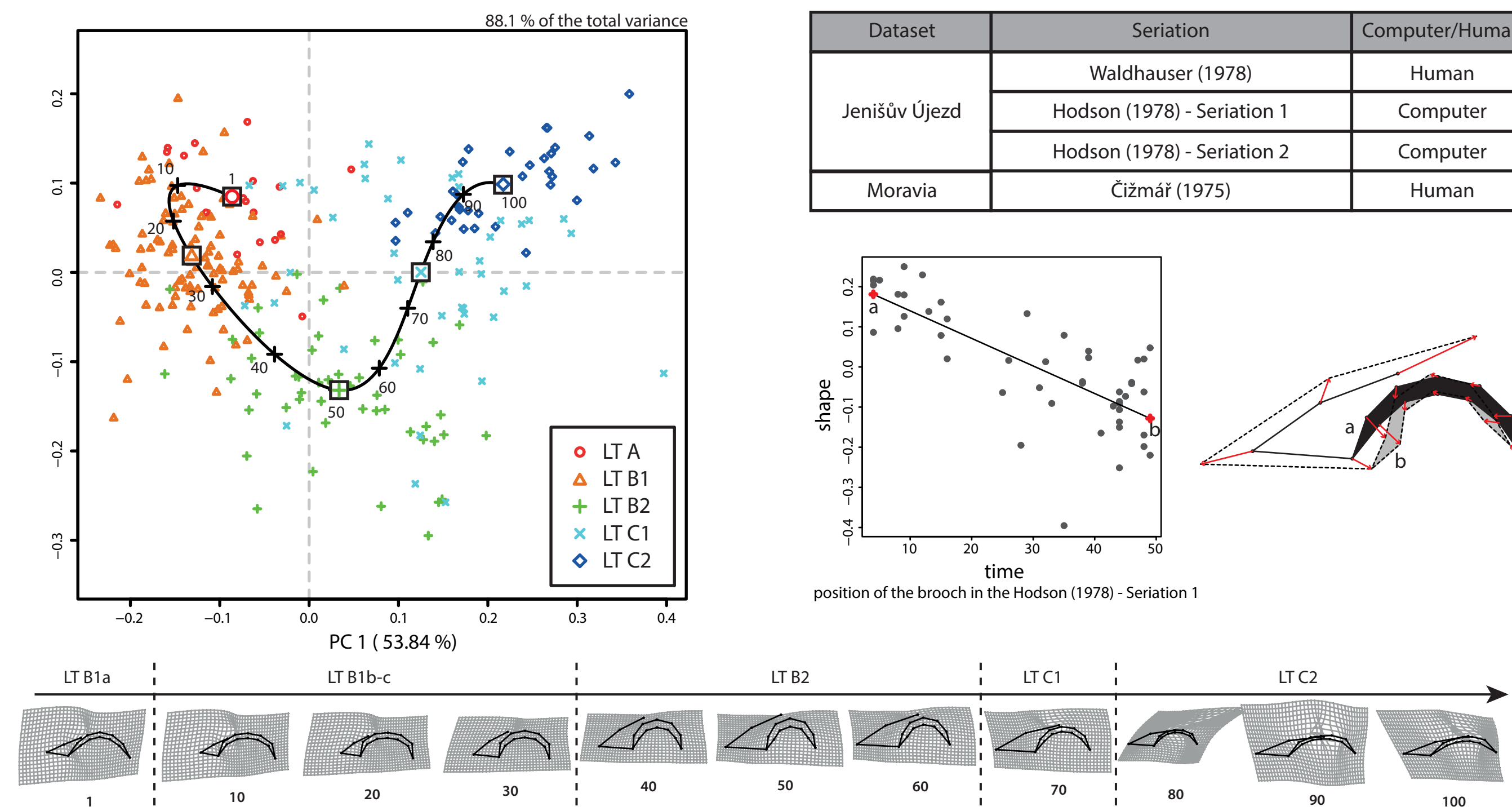
3. Shape evolution in cemeteries brooches

The relationship between shape and time in four inspected seriations is significant in all cases (p<0.002), and accounts for 44 to 58% of the total shape variation.

This relationship is represented by foot lengthening and bow rounding, until the foot finally became attached to the bow.

Dataset	Seriation	Computer/Human
Jenišův Újezd	Waldhauser (1978)	Human
	Hodson (1978) - Seriation 1	Computer
	Hodson (1978) - Seriation 2	Computer
Moravia	Čižmář (1975)	Human

4. Typological and regional differences

The typological and regional comparison was performed on two contemporaneous types of brooches (Duchcov and Münsingen) from two geographic regions (Moravia and Bohemia).

Results reveals no differences between the shape of Duchcov and Münsingen types (i.e. brooches without the characteristic knob for Duchcov, or the disc for Münsingen), but attest the regional differentiation of the Duchcov brooches.
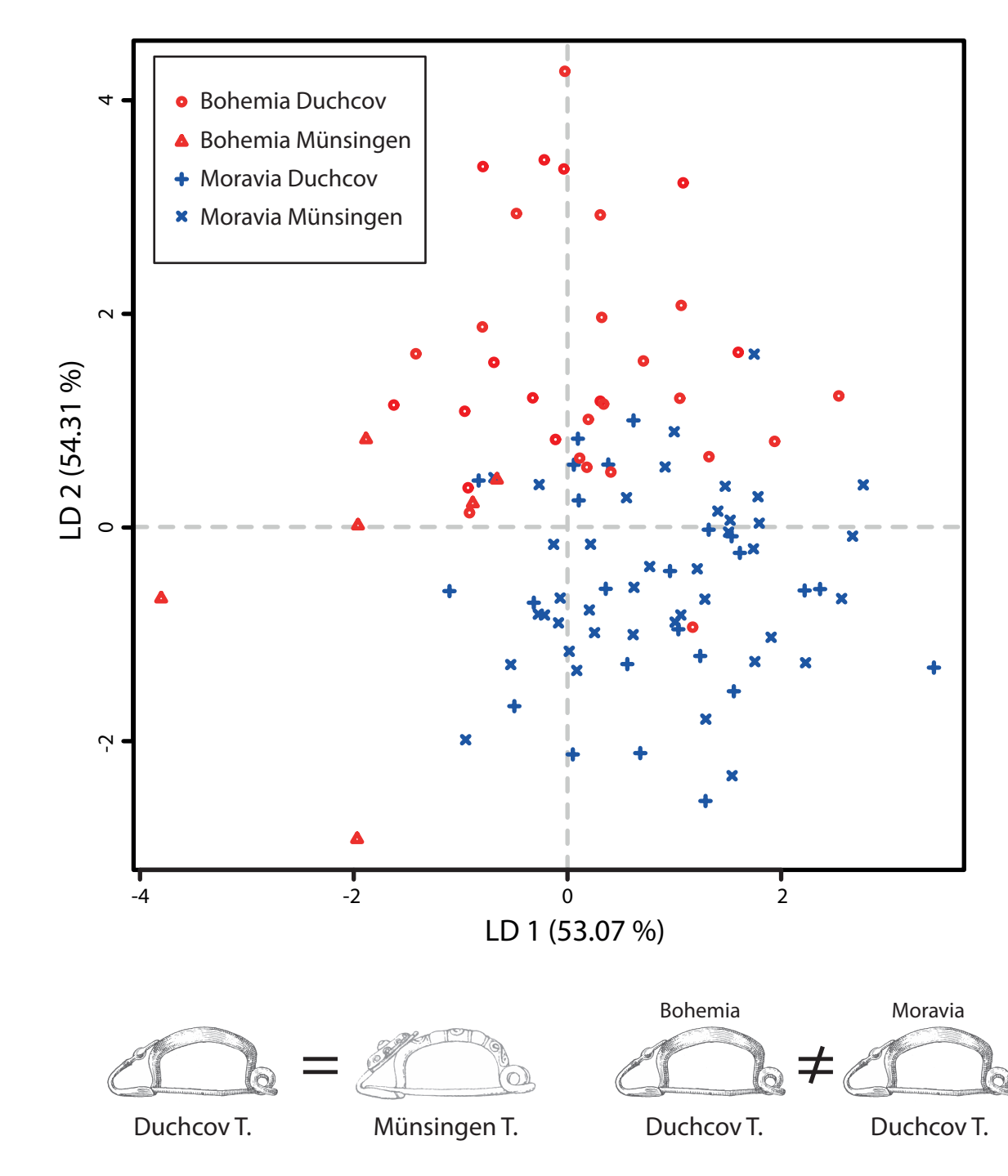
4 Conclusion

Traditional methodological approaches are reliable for brooch morphology classification. However, as specialist intuition is not easy to acquire or reproduce, the application of morphometrics should be privileged as the most easily reproducible investigation technique.

The visual representation of continual evolution in La Tène brooches highlighted the main trends in innovation. Observing shape evolution over longer time sequences may give deeper insight in shape and stylistic evolution, responding to the demands of ancient societies.

Seriations, whether produced by specialists or by computer, are coherent and clearly demonstrate shape changes over time. Residual shape variation can be attributed to other factors, such as the role of brooches in social stratification, regional costume differences, or differences in fabrication techniques.

The producers of Duchcov type brooches in each region followed their own pattern of brooch production, possibly driven by factors related to regional dress and collective identity. The difficulty of type differentiation is coherent with the difficulty of classifying incomplete brooches observed in the literature.

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