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NEW DEVELOPMENTS IN THE MIB. THE ANALYTICS PACKAGE: WEIGHT, DIAMETER AND AXIS

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New Developments in the MIB. The Analytics Package: Weight, Diameter and Axis

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Abstract: The website monedaiberica.org publishes a comprehensive catalogue of over 50,000 ancient coins from the Iberian Peninsula, including mean weight and diameter data for each type. We have enhanced the catalogue with two key features: (1) individual type records now display graphics with statistical calculations, and (2) a new dynamic analysis section enables users to perform custom catalogue queries with interactive statistical visualisations. This analytical tool facilitates comparative studies across different coin types and offers user controls for customising graphic parameters, significantly expanding the research capabilities of the platform.

Keywords: Iberian coinage, Catalogue, Statistics, Violin plot, Box plot, Kernel density plot.



Recent ECFN meetings witnessed the progressive development of the Numisdata database and the creation of the digital catalogue of the Iberian coinage. This database is now publicly accessible at monedaiberica.org (MIB), which aims to organize the monetary production of the ancient cities of the Iberian Peninsula and Southern Gaul from a broad and multidisciplinary historical perspective. The term moneda ibérica reflects a geographical scope, encompassing coinages struck in the Iberian Peninsula by Greeks, Punics/Carthaginians, Iberians, Celtiberians, Vascons, Lusitanians, and Latins, between the sixth and first centuries BC. Additionally, the term carries linguistic implications, as it includes Gaulish coinages that used the Iberian script.

MIB provides a comprehensive typological catalogue accompanied by documentation on individual coins, hoards, and finds, all supported by an exhaustive bibliography. It describes more than 4,200 types issued by more than 220 cities/mints and displays more than 50,000 coins. The catalogue is also accessible through the ARCH portal. MIB is designed as a native digital collection, not a printed book in digital format.

This paper presents recent developments in the catalogue's statistical analysis features. A

comprehensive reference catalogue should provide statistical summaries of the most documented values: weight, diameter, and die axis position. To meet this requirement, we developed a dynamic analysis tool that calculates and displays statistical parameters for these three data categories (Fig. 1). The system performs calculations using JavaScript, with graphical representations implemented through the D3.js library.

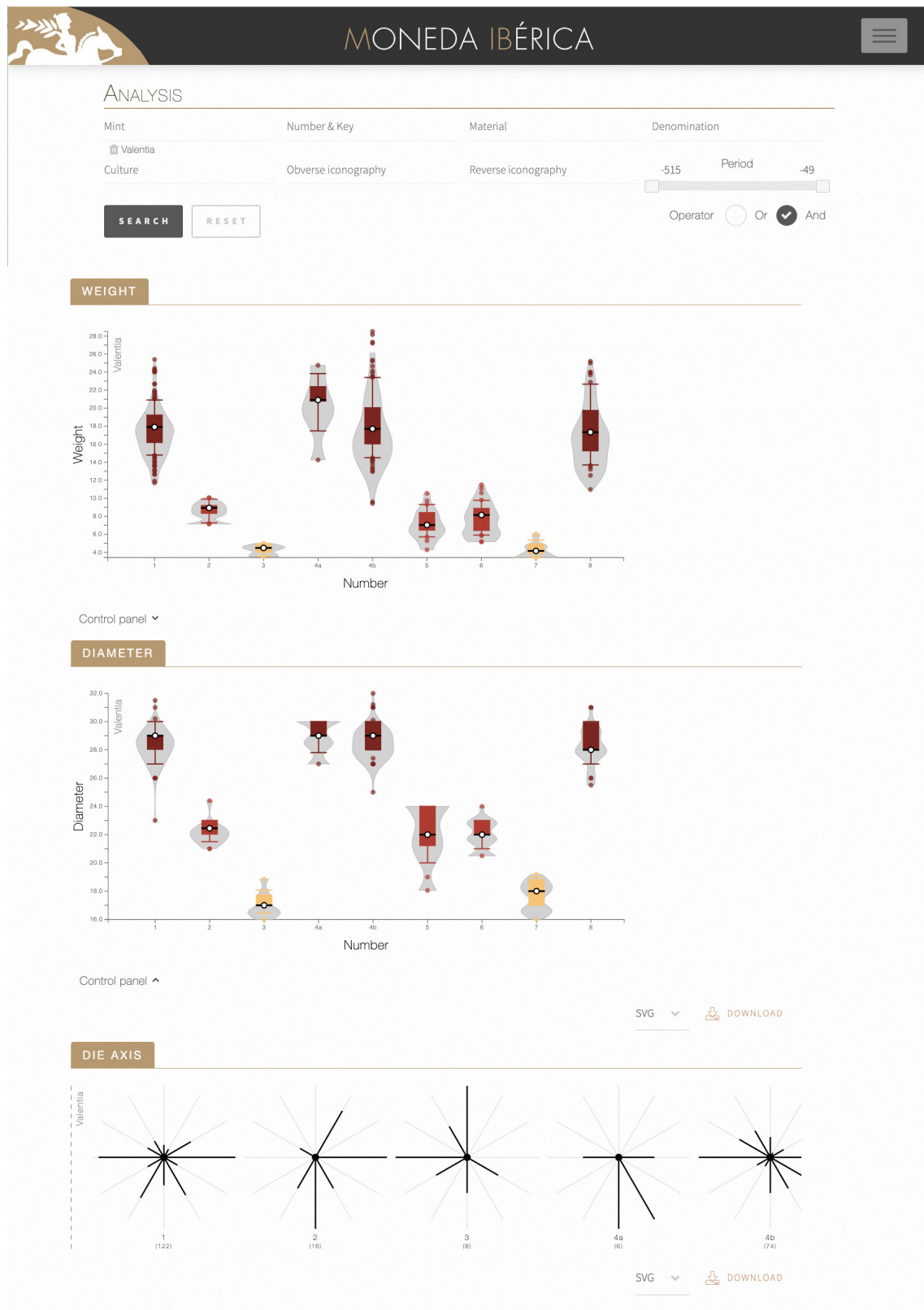


Fig. 1. Dynamic analysis tool interface showing statistical visualizations for weight and diameter (displayed as violin and box plots) and die axis position, with the mint filter set to Valentia.

The analysis tool generates three separate visualizations based on the selected filters. The first displays weight distributions as combined violin and box plots for all resulting types in a continuous sequence. The second shows diameter distributions, also as combined violin and box plots. The third presents die axis position distributions using a representation appropriate to angular data. For the weight and diameter visualizations, clicking a median dot displays detailed data for that type below the plots (Fig. 2). For die axis plots, clicking the center dot provides the same detailed view. Beyond the analysis tool, the catalogue itself integrates these statistics: each type page includes a statistical summary at the end, following the documented coins.

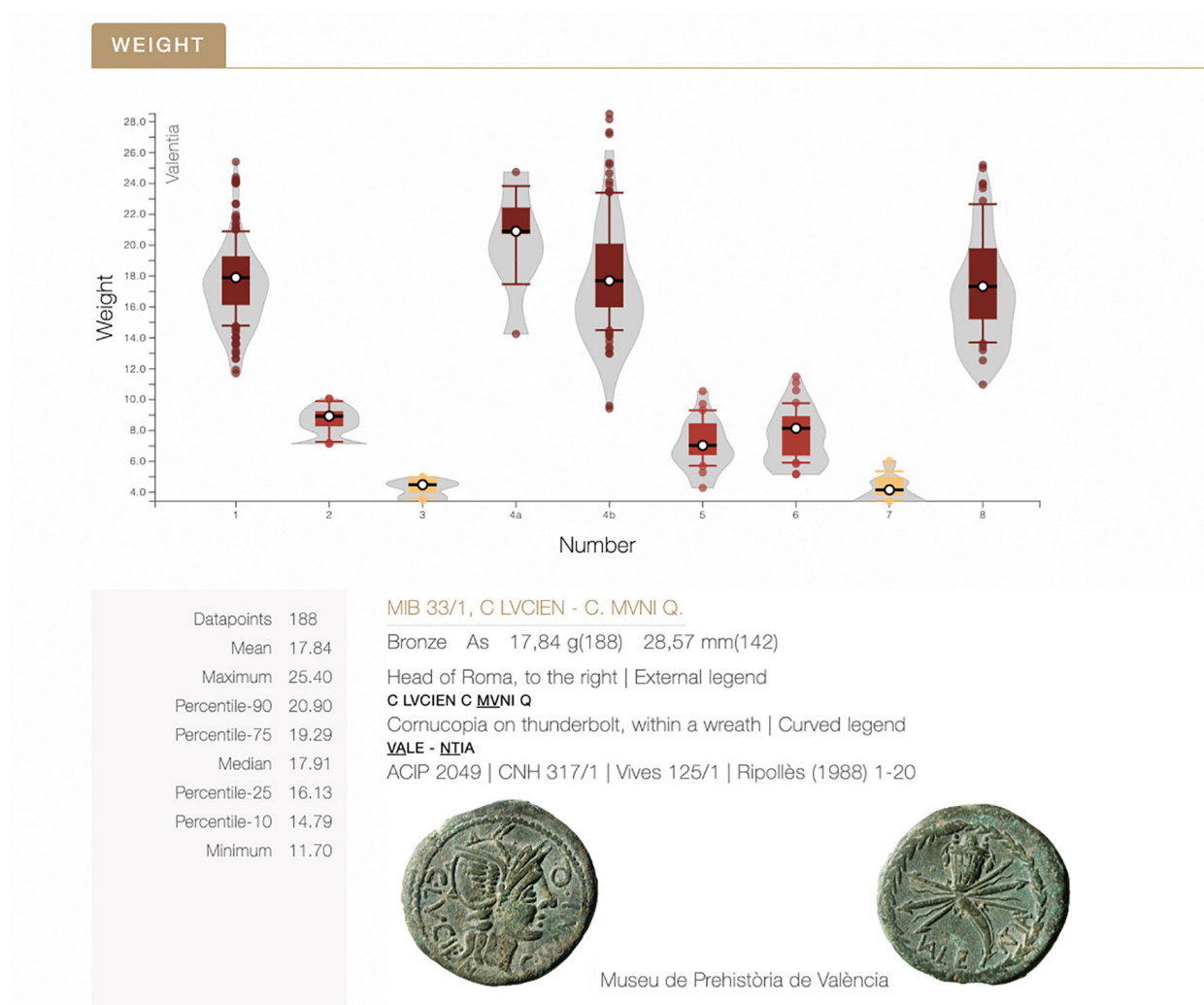


Fig. 2. Weight violin plots for coin types from Valentia, with a selected type's complete statistical data displayed below the visualisation.

We selected violin plots combined with box plot elements and specific summary statistics for visualising weight and diameter data. Violin plots integrate a box plot with a rotated kernel density plot on each side, where the width of each section is proportional to the number of data points in that range. This representation refines traditional histograms by estimating the underlying probability density function, providing a smooth approximation of the data sample. This approach is particularly suitable for numismatic datasets, as it simultaneously displays central tendency, spread, and the full distribution of measurements.

WEIGHT

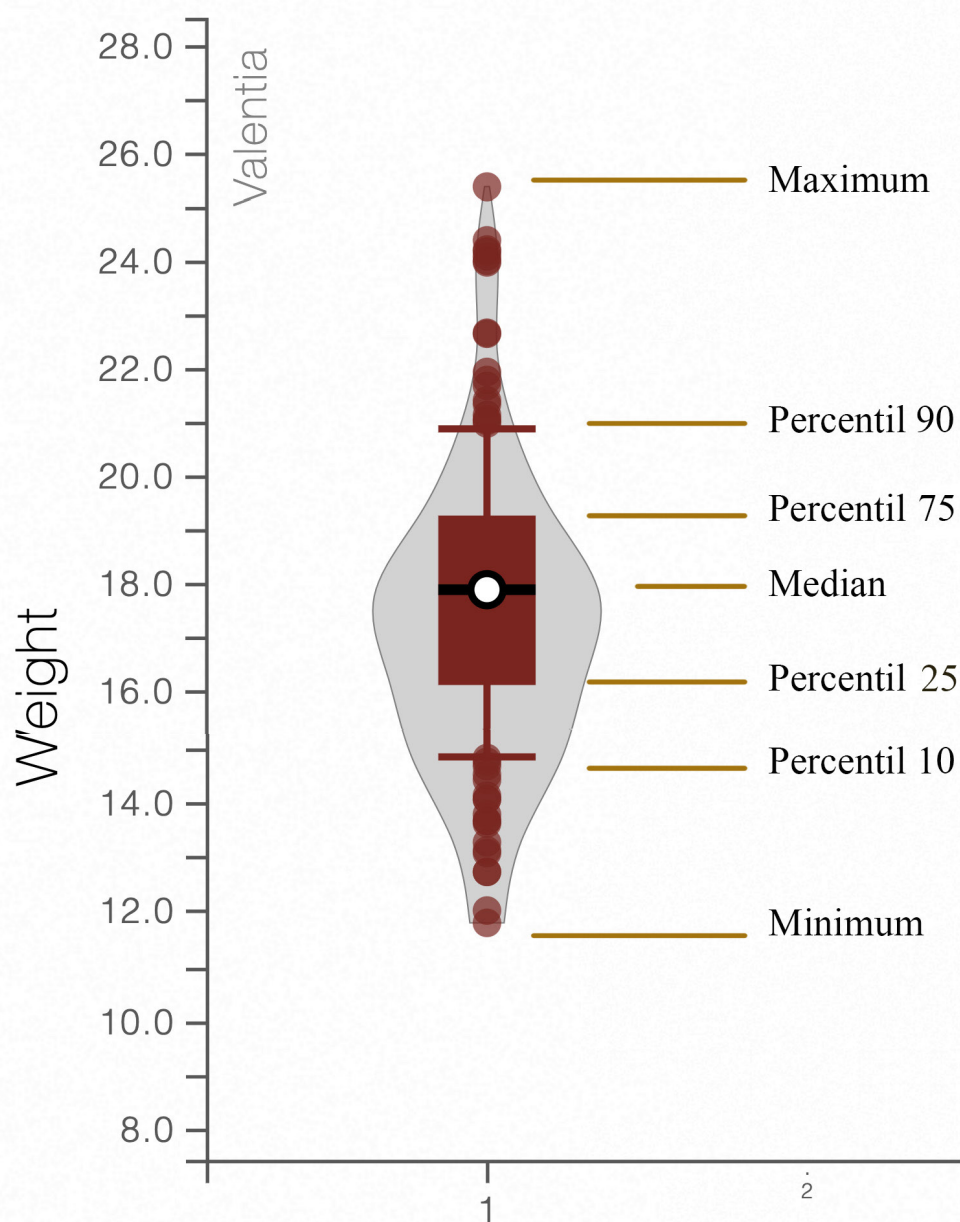


Fig. 3. Guide to interpreting violin plots in MIB, showing annotated statistical components for a Valentia coin type.

Figure 3 illustrates the specific elements of our implementation for weight and diameter data. The white dot represents the median, while the red box in the center shows the interquartile range (Q1 to Q3). The whiskers extend from the 10th to the 90th percentiles and are drawn as solid lines, with each whisker covering 15% of the distribution on its respective side of the box. Data points beyond the whiskers appear as outliers, identified using the interquartile range method. The kernel density estimation on each side shows the distribution shape: wider sections indicate higher probability regions, while narrower sections show lower probability areas.

The control panel allows users to customize the weight and diameter visualizations. Box plots and violin plots can be displayed separately or overlapping. Users can toggle gridlines to facilitate reading, adjust the width of boxes and violins, and show or hide specific components such as whiskers and outliers. For violin plots, eight shape variations are available, including Basis and Bump-Y representations. Beyond these global settings, selecting a specific type by clicking its violin or box reveals a type-specific customization menu where users can fine-tune the violin resolution, similar to adjusting bin size in histograms.

The diagrams also serve as a data quality control tool, revealing input errors that appear as extreme outliers. For example, misplaced decimal points in weight values or diameter measurements incorrectly entered in centimeters rather than millimeters are easily detected through the visualizations.

This development enhances the comprehensive digital catalogue that monedaiberica.org (MIB) provides for ancient coinages of the Iberian Peninsula, with the analysis tool now displaying statistical parameters for all types and variants.

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