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Pottery, Standards, and Sustainability: Digital Archiving with iDAI.field and the SPP Recording Scheme: Digital Archiving with iDAI.field and the SPP Recording Scheme

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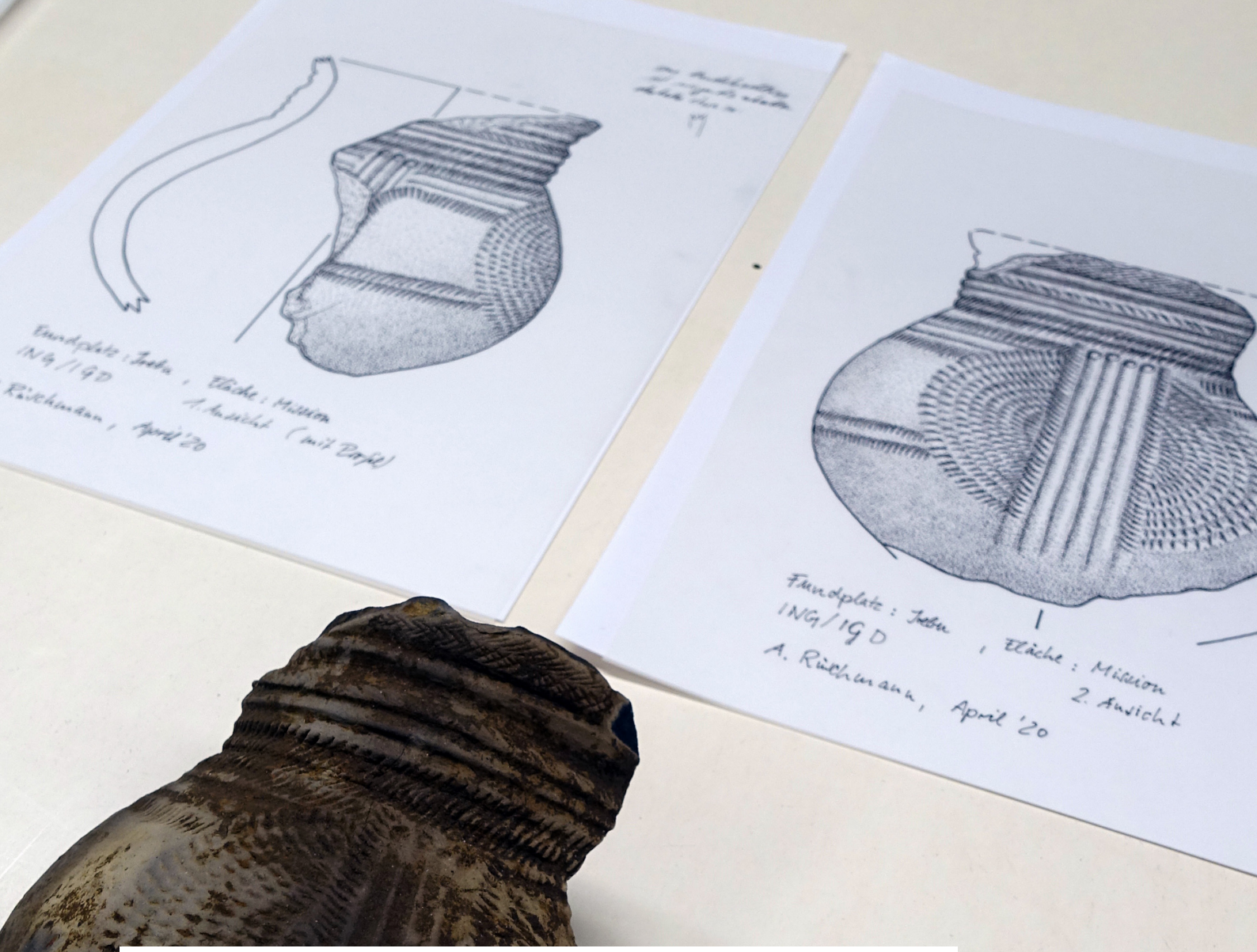

ABSTRACT

Pottery, Standards, and Sustainability

Digital Archiving with iDAI.field and the SPP Recording Scheme

Tom Noack – Johanna Sigl

This article presents a workflow for the standardized documentation and digital archiving of archaeological pottery data in the German Archaeological Institute's database system iDAI.field, based on the recording scheme by Jesse and Nowotnick (2021). The configuration for iDAI.field enables direct data entry following the scheme, while the Field-Pottery-Converter allows the transformation of legacy datasets from the standardized Excel spread-sheets into the structured format of the database application for sustainable storage. This process ensures consistent documentation, reduces manual errors, and enhances interoperability across projects. The resulting datasets are prepared for long-term preservation and can be published via iDAI.field Web, contributing to accessible, reusable archaeological data in line with the FAIR principles.

KEYWORDS

Pottery Documentation, iDAI.field, Archaeological Data Management, FAIR Principles, Standardized Recording

TOM NOACK – JOHANNA SIGL

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Introduction

1 Pottery is one of the artifact categories that plays a central role in archaeology worldwide. During data collection, various parameters of each individual artifact are documented. This ensures that artifacts can be safely archived, while also allowing for further study and statistical analysis. Results of pottery analyses or even raw pottery data of individual sites can then be compared to other sites – theoretically. In the reality of archaeological data recording parameters are not consistently recorded, or identical parameters are named differently. Recording strategies are dependent on the background of the processor, the question of research or the project's data requirements. Thus, cross-regional or cross-project comparisons are dif-ficult or even impossible. A standardized basic recording strategy using a defined standard vocabulary is the only way to solve this problem.

2 To collect such basic requirements for pottery recording in the wider area of (Sub-)Saharan Africa was precisely the goal of researchers working in projects within the framework of the DFG priority program 2143 Entangled Africa ('Intra-African relations between rainforest and Mediterranean, ca. 6,000–500 BP'). The aim was to establish a common minimum standard for pottery documentation. The result was the definition of the minimum number and type of necessary values that should be recorded when documenting pottery and the standardized vocabulary to do so. This makes it possible to compare different sites and constitutes a standard for pottery documentation in, at a minimum, the targeted areas of Africa in the priority program or even across the continent (Jesse – Nowotnick 2021).

3 However, the establishment of this standard still does not prevent another issue: data collected at archaeological sites is often only stored locally on a computer of the researcher or project in one or more Excel spreadsheets, with no long-term archiving and publishing solution for the raw data. This contradicts modern data management requirements, especially the FAIR (Findable, Accessible, Interoperable, Reusable) principles. Due to the close cooperation between the Entangled Africa projects and the German Archaeological Institute (DAI), the idea arose to use the software iDAI.field

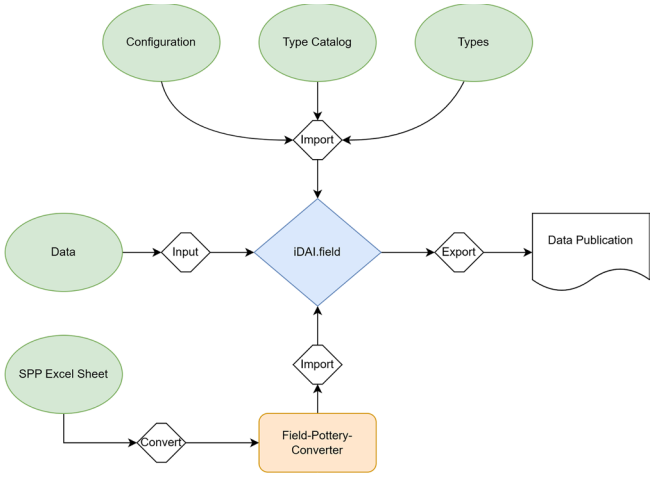

Fig. 1: Transfer options of pottery data to iDAI.field.

(Field) to pave the way for the long-term archiving of pottery data, which had been collected following the standard of Jesse and Nowotnick (2021). The iDAI.field software suite also incorporates the possibility to publish data online and thus fully serves the mentioned FAIR principles. To facilitate the seamless import of pottery data from an Excel spreadsheet following the standard by Jesse and Nowotnick (2021), a new configuration for Field Desktop, the base software of the iDAI.field suite, and an associated type catalog was created. In a second step, a program (Field-Pottery-Converter) was developed to convert the data collected in the standardized Excel spreadsheet (latest version published here: https://doi.org/10.5281/zenodo.15980304) into import files readable by iDAI.field. With the use of the standardized spreadsheet, the mentioned configuration and the conversion program archaeologists and archivist are able to facilitate modern archaeological data management for pottery data with only a few clicks.

4 This article presents the multi-step workflow to import pottery data based on the standardized spreadsheet published by Jesse and Nowotnick (Jesse – Nowotnick 2021). It is meant as a basic user manual for pottery recording in iDAI.field following the mentioned standards, but also incorporates technical details on the developed configuration and program. After general remarks on data management with iDAI.field, this manual starts with the creation and import of the project configuration and the type catalogue for Field Desktop. This forms the basis for either direct data entry into the desktop application or the import of existing pottery data from CSV-saved spreadsheets. The spreadsheets are produced with minimal user effort by the Field-Pottery-Converter. The imported data in the end provides the foundation for the subsequent publication of the dataset (see Fig. 1). Steps towards publication involve direct contact with the DAI data management team and thus will only be touched in this article exemplary but not dealt with in depth.

Research Data Management with iDAI.field – General Remarks

5 Long-term archiving of archaeological data involves more than just backing up data using software: integrity, authenticity and readability of the data need to be ensured for an infinite time for a software solution to count as full-fledged data archive.

6 The iDAI.field software suite was developed as a modern excavation documentation system and incorporates various applications, among them the desktop-based principle recording software ‘Field Desktop’, the mobile application ‘Field Mobile’, the sharing server ‘Field Hub’ and the web-publication platform ‘iDAI.field web’. The iDAI.field software – particularly in its current iteration with Field Hub and iDAI.field Web – has evolved significantly beyond its earlier FileMaker-based version and now supports core aspects of long-term data preservation, including the use of open formats like JSON and the mentioned web-based publication of structured excavation data. These developments enhance data accessibility, transparency, and reusability, and align with best practices in research data management. As part of the NFDI4Objects initiative (NFDI = Nationale Forschungsdaten Infrastruktur), the DAI is now actively

advancing the final components of true digital archiving for iDAI.field. Through Task Area 5, the consortium is establishing long-term archiving (LTA) workflows that link excavation-focused systems of the iDAI.world like iDAI.field with established archival infrastructure – in particular, the IANUS research data centre – ensuring formal Open Archival Information System (OAIS)-compliant ingest, preservation, and access pipelines (cf. NFDI4Objects, esp. the consortium).

7 Out of the iDAI.field software suite we will focus in this article on the applications 'Field Desktop' and, to a minor extend, on 'iDAI.field web'.

8 Field Desktop can be downloaded from the online platform of the repository (https://field.idai.world). It offers a large number of pre-defined standard configurations for various aspects of archaeological fieldwork documentation, amongst them for the recording of data on artifacts such as pottery. At the same time the recording parameters can be individually defined in each project configuration to fit individual requirements and or data types. Field Desktop can be used both during the excavation as well as after the excavation and even to digitalize legacy data (Hohl et al. 2023). With the below described setup of Field Hub the long-term preservation of the data on the DAI's server is accomplished. Furthermore, it allows the data to be linked with additional (meta)data within iDAI.field and other repositories of the iDAI.world. Last but not least the DAI offers the service of publication of partially finished datasets, e.g. serving as searchable and sustainable supplements in the scope of articles or finalized datasets directly from the desktop application of the program to the online platform of the repository. Even though this service is currently only available for publication projects, which have undergone the process of acceptance in one of the DAI's publication formats, it is a valuable option to follow recent data management requirements.

iDAI.field Project Configuration for Recording Pottery and the Development of the Field-Pottery-Converter

9 As mentioned above, Field Desktop offers a large number of pre-defined standard configurations, amongst them those suitable for the recording of data on pottery. These were however not fully compliant with the standard for recording pottery from African archaeological contexts developed by Jesse and Nowotnick (Jesse – Nowotnick 2021).

10 Therefore, the first step in the creation of a suitable configuration on the basis of the mentioned recording scheme was to compare the existing fields in Field Desktop with the attributes published by the two authors. Ideally, as few new parameters as possible should be created to maintain comparability across projects within iDAI.field. Still, a significant number of attributes had to be redefined as a second step to fit the proposed standard and create a basis for comparability of projects, which will use the published standard in the future. In addition, many formerly not defined attributes had to be stored within a predefined value list to ensure that users keep to the standardized vocabulary in the three chosen languages given by the publication from 2021. For example, the attribute 'Basic vessel form' is used to determine whether a vessel is classified as 'open', 'closed', 'other', or 'nd'. In the new Field Desktop configuration, the appropriate entry can be selected from a dropdown menu. For other attributes, more than one choice may be possible and this can be done with multiple choice fields (see Fig. 2). In addition, there are free text fields for attributes that cannot be specified using drop down or multiple choice fields as well as for any other describing.

11 As already explained, iDAI.field was developed to record data during an excavation. Additionally several projects have used it to configure and standardize their

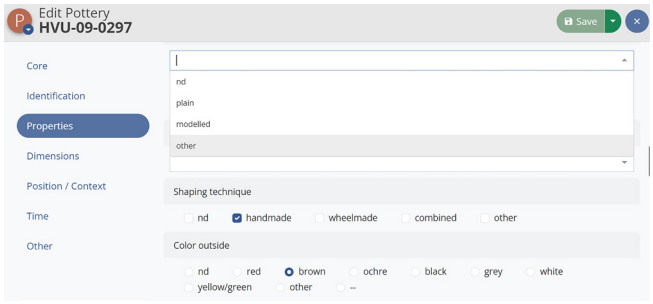

Fig. 2: Screenshot of a sample entry in iDAI.field with parts of the SPP recording scheme.

	A	B
1	relations.isChildOf	identifier
2	Hamadab	T 2009-04
3	Hamadab	3005
4	Hamadab	1614
5	Hamadab	1615
6	Hamadab	1240
7	Hamadab	1604
8	Hamadab	1607
9	Hamadab	1245
10	Hamadab	HW62d
11	Hamadab	1617
12	Hamadab	1632

Fig. 3: Excerpt from the Trench / Survey Area table that was created with the Field-Pottery-Converter for sample data from Hamadab project in Sudan (Data: U. Nowotnick © DAI): trench or survey area identifiers in column B are listed in an 'isChildOf' relation of the pro-ject's location in column A.

legacy data for publication (see published projects in the map at https://field.idai.world). With the iDAI.field project configuration presented here, pottery finds can be entered and stored directly in Field Desktop based on the SPP recording scheme.

12 However, many archaeologists are used to entering find data in Excel and are very comfortable with this medium, which is why Jesse and Nowotnick (Jesse – Nowotnick 2021) originally published an Excel spreadsheet that serves as the basis for the recording scheme. But, Excel is not designed for long-term data storage or archiving in an academic sense or for potential data publication, aspects which are on the other hand possible with iDAI.field. A single Excel spreadsheet alone is not even a database, meaning that certain values and the relationships between them cannot be adequately represented. E.g., to indicate that several recorded pottery vessels were found in the same archaeological feature, the name of the feature has to be recorded repeatedly in Excel, i.e. in each line representing a single vessel. In a database system like iDAI.field each feature governs a linked list of finds in a hierarchical 'isChildof' – 'isParentof' relationship. Thus, the feature name pops up in each pottery entry and can be selected to study the parameters of the feature, but each entry is listed only once under the feature. Therefore, to accommodate researchers who prefer initial data recording in Excel but will aim at complying with modern data management standards, an easy tool had to be created to transform the Excel data records to a format which is readable by Field Desktop. This was the rationale behind the development of the Field-Pottery-Converter. This tool can be used to process legacy data in Excel format so that it can be transferred to Field Desktop in a few short steps. It is meant to replace the manual transfer of data from the Excel table into the database system iDAI.field by copying and pasting or retyping and therewith to reduce errors in data transfer.

13 From a technical perspective, the Excel spreadsheet is converted by Field-Pottery-Converter to a series of CSV files. For this purpose, the Excel table is processed and converted using the Python module 'pandas' (The pandas development team 2024; McKinney 2010). The resulting spreadsheets are understandable for Field Desktop and can be directly imported sequentially.

14 The Field-Pottery-Converter starts by separating the name or names of the location or locations of excavation or survey areas into a new file. Each trench and survey area is then extracted into a second file, in which it is assigned to the specific location, e.g. Hamadab, listed also in the first file by the 'isChildof' relation (see Fig. 3). The third table assigns features to their respective trenches or survey areas (as short-listed in the second file). The final table contains all the values and attributes of the pottery assemblage. The individual values of each vessel are assigned to a specific feature (as short-listed in the third file). If the vessels do not belong to a feature context, they are assigned to a trench or survey area (cf. second or first file).

15 To make it as easy as possible to use the Field-Pottery-Converter, a user interface has been created using the Python library wxPython (The wxPython Team 2024). When the program is started, a window opens that allows the user to select the Excel table to be converted and the storage location for all the CSV files. Once the location has been selected, the program runs through several functions, displaying several successive windows. These windows allow the user to name the newly created CSV files. They have input fields and provide additional information about the next steps. When the last window is closed, the Field-Pottery-Converter automatically opens the

folder containing the newly created CSV files and the program terminates. Within the target folder, the files are located in four different subfolders named ‘Site’, ‘Trench/Survey area’, ‘Feature’ and ‘Pottery’. This is for better sorting, if several Excel tables are to be converted.

16 After the conversion has been successfully completed, the user can then import the files into Field Desktop. The main requirement in this process is to keep to the correct order of files during import, which is described in detail in the below user manual (https://doi.org/10.5281/zenodo.15980304).

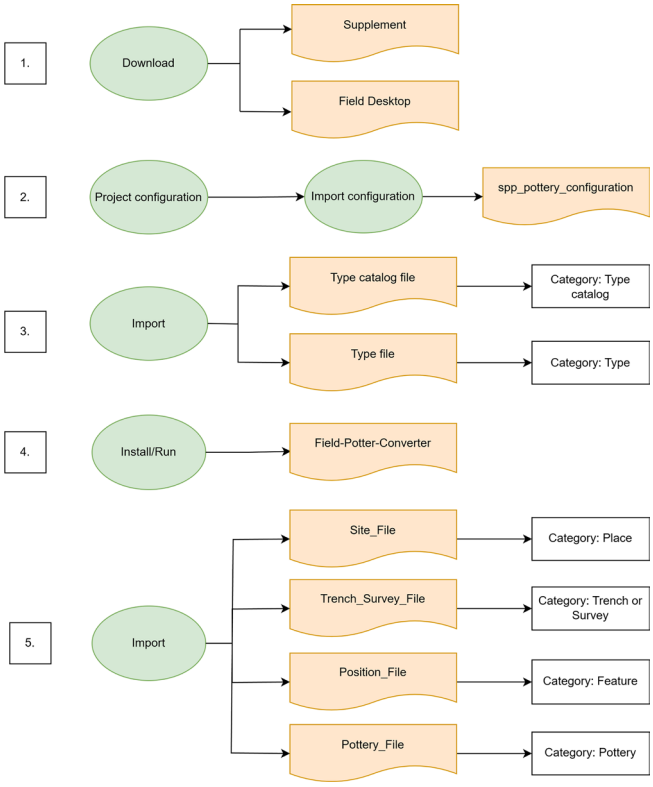

Fig. 4: Follow this diagram for a step-by-step import of pottery data using the Field-Pottery-Converter.

From Excel or Raw Data to Recorded Data: A User Manual

17 The below described process is provided schematically in Fig. 4 of this article.

- Step 1: Downloads: a) Supplements: Please download all supplements provided with this article from https://doi.org/10.5281/zenodo.15980304. b) Field Desktop can be downloaded from the online platform of the repository and installed as software on any computer running the most common operating systems. For the installation process please follow the guidelines given on the website.
- Step 2: Project configuration in Field Desktop: After installation of Field Desktop the newly developed pottery configuration needs to be imported. An import file was prepared, containing the configuration of the standard recording scheme developed by Jesse and Nowotnick (Jesse – Nowotnick 2021) in an iDAI.field-readable form (successfully tested last with Field Desktop version 3.5.1): see ‘spp_recording_configuration.configuration’ in the supplements. Open Field Desktop and therein select ‘Project configuration’ in the ‘Tools’ tab. A new tab will show up next to ‘Tools’ called ‘Project configuration’, which contains the ‘Import configuration’ button. Select, ‘File’ as a source and choose the file ‘spp_recording_configuration.configuration’ for import. After successful import you can find the configuration by selecting ‘All’ in the topright dropdown button and scrolling down to the category ‘Find’. The category ‘Pottery’ should be labeled with an ‘*’, which indicates that it has been changed from the original configuration provided during download. Before leaving the project configuration, press the ‘Save’ button to fully implement the new configuration into the project!
- Step 3: Import the Type Catalogue to Field Desktop: As part of the publication by Jesse and Nowotnick (Jesse – Nowotnick 2021), a type catalogue of the various pottery decorations was published. We prepared files containing this type catalogue readable for Field Desktop (‘spp_type_catalog’) and the decoration types contained therein (‘spp_types_decoration’). These files have to be imported to ensure that the later imported pottery data is automatically linked to the defined types and vice versa.This time select the ‘Import’ button under the ‘Tools’ tab. Initially, the file ‚spp_type_catalog‘ must be selected to be

imported as a new resource, and the ‚Type catalogue' option must be chosen from the drop-down menu that appears under the header ‚Category' towards the bottom of the window. All other settings remain as they are and no further changes need to be made. The import process can then be initiated by hitting 'Start import' in the top right corner. The program will confirm the successful import, but not change the window. Subsequently, the file entitled 'spp_types_decoration' and the category 'Types' can be selected for import, and the 'Start import' function has to be engaged once more. After successful import the type catalogue can be viewed by selecting 'Tools' – 'Type management'.

18 The configuration is now ready to use, if direct entry of data into iDAI.field is aimed at. Please refer to the user manual of Field Desktop provided on the online platform of the repository concerning its use! For converting and importing data recorded with the standardized recoding scheme of Jesse and Nowotnick (Jesse – Nowotnick 2021) in Excel two further steps are necessary:

- Step 4: Converting Excel files with the Field-Pottery-Converter: Initiate the Field-Pottery-Converter from the .exe-file 'iDAIfield_Converter' provided in the supplements. Follow the instructions of the program.
- Step 5: Importing data to Field Desktop: To import the converted data files, the same steps as mentioned before for the import of the type catalogue are followed. In the import section the newly created CSV files are be imported one at a time, starting with the site file. This is selected from the 'Site_data' folder at the chosen storage location. The 'Site' field is selected from the 'Category' drop down. It is important that all other settings should be left unchanged, and no further modifications should be made! The import is then performed using the 'Start import' button. The file from the 'Trench_Survey_data' folder follows. Under 'Category' 'Trench' or 'Survey Area' is selected, depending on whether it is excavation data or survey data. The third file to be imported is from the 'Feature_data' folder. This file is assigned to the 'Feature' category. The final import file is the file containing the actual pottery data. Accordingly, the 'Pottery' category is selected here.

19 After the last import, the whole process is complete and all pottery data is saved in Field Desktop.

Possible Problems During Import and Their Solutions

20 The standardized recording scheme according to Jesse and Nowotnick (Jesse – Nowotnick 2021)does not exclude the possibility of including additional data in the pottery recording. However, such data cannot be processed by the Field-Pottery-Converter and must therefore be manually transferred to iDAI.field. Once the import is complete, one or more warning messages may appear in the top right-hand corner of the Field Desktop window (Fig. 5). This happens if certain attributes do not match the vocabulary of the pottery standard created by Jesse and Nowotnick (Jesse – Nowotnick 2021). The user can click on this warning message and decide for each object and attribute which value should be stored in iDAI.field.

21 Ideally, data that is supposed to be transferred from Excel spreadsheets to iDAI.field in the above-described manner should be processed to adhere to the SPP recording scheme defined by Jesse and Nowotnick (Jesse – Nowotnick 2021) prior to the creation of import files by the Field-Pottery-Converter. The Converter provides a few basic cleaning processes automatically, but cannot eliminate all non-fitting data. For example, some columns and rows are deleted or merged resulting in the CSV files described above. An important step in this process is the handling of empty cells. Jesse

and Nowotnick (Jesse – Nowotnick 2021) defined in their base scheme for pottery documentation that an absent or undeterminable attribute should be marked with the entry 'nd' (not determinable). This ensures that there are no blank spaces in the table. However, in the hustle and bustle of pottery documentation, this step can sometimes be forgotten – for example, if a particular attribute is missing and the user quickly moves to the next column to enter the next attribute. Alternative placeholders, such as a hyphen, also are often used. Missing entries are not a general problem. If a cell in the table is empty, the corresponding attribute in iDAI.field simply remains without a value. Additionally, a series of alternative values were programmed into the Field-Pottery-Converter to understand that actually the value 'nd' was meant, among them '-', '—' and 'no context'. These values are automatically converted to 'nd' in the produced CSV-files and the standardized value is accordingly imported into iDAI.field.

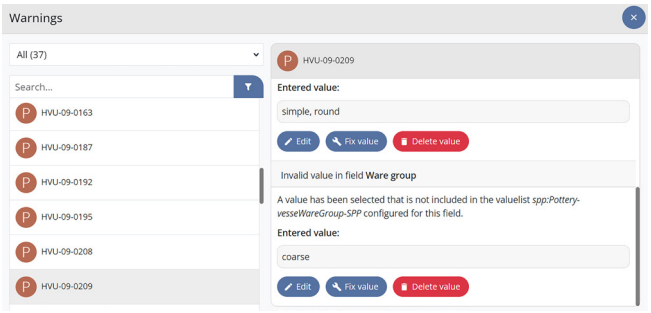

Fig. 5: Screenshot of the correction process in Field, in the event that individual entries and values do not correspond to the predefined configuration provided with this article.

22 A more serious problem is the entry of terms that are not specified by the SPP recording scheme. In the worst case, this can lead to an error message during the import process and thus to its failure. The original Excel file or the import file have then manually to be corrected. This major failure mostly happens in cases where identifiers of entries (= record numbers) are faulty. This may occur if multiple sherds are grouped into a single object and the same find number is assigned to several different sherds, i.e. lines in the table. According to Jesse and Nowotnick (Jesse – Nowotnick 2021), iinstead all sherds should be addressed collectively as a single vessel, consequently resulting in a single entry in the Excel table. In the event of an error of this kind, and in the case that the import is terminated by iDAI.field, it is essential to verify that no double values are employed as identifiers in the columns of the original Excel sheet under the headers 'vessel unit' (Excel file) and 'identifier (pottery file). If necessary, entries need to be merged to one and Field-Pottery-Converter and the Field Desktop import have to be run again. On the other hand, for values of certain describing properties Field Desktop offers the option to allow new terms. After the import process the program shows a summary of all imported objects, which have deviating terms under the warning sign in the top right corner (Fig. 5). The user can decide individually whether the new or the default term should be used.

23 A third problem is dealing with columns that should only contain numbers. An example of this would be 'weight'. The weight is to be given in grams, so all the fields contain numeric values only. During the conversion process, these number columns are formatted so that they cannot contain text values. Hyphens or other placeholders are not allowed. To simplify the conversion, typical placeholders such as hyphens or an 'nd' are automatically deleted. This is the only way to ensure a correct import into iDAI.field. If other terms or characters are used, an error will occur and the import will be terminated. These terms have to be corrected manually in the respective files. In addition to changing the cell contents and formatting, the column names must also be adjusted to ensure correct import. The names in the published SPP-Excel spreadsheet do not match the corresponding names that iDAI.field understands, i.e. they are not the names that should head the columns in the CSV files for import. However, the Field-Pottery-Converter will only understand the column names defined in the SPP recording scheme and convert them to the iDAI.field standards. If users define their own column headers then the columns will be ignored by the Field-Pottery-Converter. Without correction the columns may be imported incorrectly or not at all. Therefore, it is recommended that no changes are made to any of the predefined column headings in the Excel record table.

24 At this point, it should be emphasized again that the described simplified procedures only work when using the Excel spreadsheet published by Jesse and Nowotnick (Jesse – Nowotnick 2021). If the spreadsheet is substantially modified, there may be problems with the conversion.

Sharing Data with iDAI.field

25 As mentioned initially in this article, iDAI.field does not only incorporate the desktop version, which has been used to create the above data recording for pottery in a structured data-base system. As a whole iDAI.field represents a software suite and offers a comprehensive open-source solution for the documentation and dissemination of archaeological field data. Central to its collaborative capabilities is Field Hub, an optional synchronization server that facilitates centralized data management across multiple users and projects. Institutions can deploy Field Hub to enable researchers to synchronize their Field Desktop applications with a central server, ensuring consistent data integration and reducing redundancy in data handling. This setup supports various network configurations, including direct peer-to-peer synchronization and the use of a local 'pseudo server' in field environments with limited internet connectivity (Hohl et al. 2023; personal communication with F. Riebschläger, Field development team, 15.04.2025).

26 For the publication of archaeological data, iDAI.field Web serves as the designated platform within the DAI's infrastructure. This web-based application more or less mirrors the data and data structure of Field Desktop, and allows for the visualization and dissemination of excavation data, structured according to customizable data models that include archaeological categories, subcategories, and associated media, as we have described above for pottery data. However, access to iDAI.field Web is currently restricted to projects that have undergone the DAI's formal publication acceptance process, such as inclusion in official journals, series, or monographs. The responsibility for overseeing these publications lies with the respective editorial offices of the departments and commissions within the DAI (Hohl et al. 2023; personal communication with F. Riebschläger, Field development team, 15.04.2025).

27 While Field Desktop and Field Hub can be independently installed and utilized by external institutions, setting up iDAI.field Web requires more extensive IT support due to its dependencies on other DAI systems. Nevertheless, the open-source nature of the iDAI.field suite under the Apache License 2.0 encourages adaptation and use beyond the DAI, promoting broader collaboration in archaeological research. The suite's design accommodates diverse documentation needs, supporting various fieldwork methodologies and facilitating data sharing and publication in alignment with the FAIR principles (Hohl et al. 2023; personal communication with F. Riebschläger, Field development team, 15.04.2025).

Conclusion

28 In conclusion, the standardized recording scheme for pottery documentation established by Jesse and Nowotnick (Jesse – Nowotnick 2021) forms a crucial foundation for improving the comparability and accessibility of archaeological data. Through the integration of this scheme into the iDAI.field software suite, including the development of a dedicated project configuration and the Field-Pottery-Converter, it is now possible to efficiently transfer pottery data from Excel spreadsheets into a structured and sustainable

database environment This not only lays the foundation for long-term archiving but also enables the seamless linking of data with other archaeological information.

29 The use of iDAI.field, particularly in combination with Field Hub and iDAI.field Web, supports modern data management practices by offering flexible solutions for both individual researchers and collaborative projects. Although the system requires careful preparation of the data to ensure smooth imports, the established workflow significantly reduces the risks of data loss, misinterpretation, and redundancy, and makes pottery datasets accessible for future research and publication. Altogether, this approach contributes to more transparent, interoperable, and reusable archaeological documentation.

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