

A photograph of a coyote standing in a forest, looking to the left. The background consists of many thin tree trunks and some green foliage. The image is used as a background for the title and subtitle text.

Introduction to Camtrap DP

A frictionless data exchange format
for camera trapping data

Exploring camera-trap data
GBIF webinar, 9 November 2022

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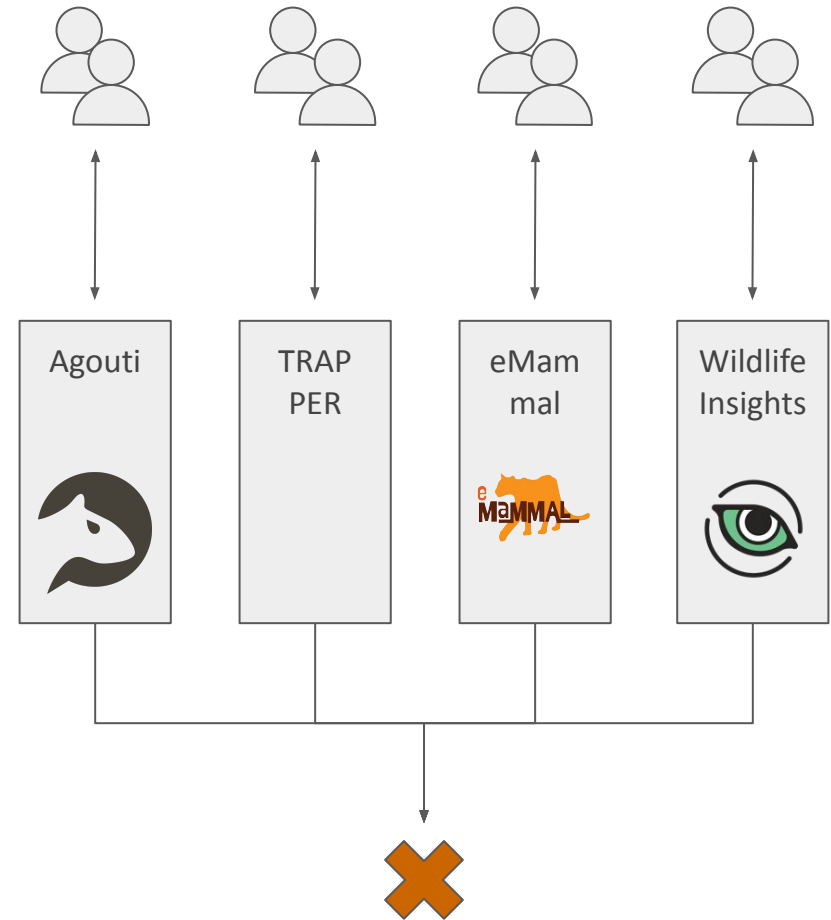
Camera trapping

- Wildlife monitoring technique
 - Non-invasive
 - Well-established
- Enables study of animal abundance, distribution, behaviour
- Data-intensive: lots of images or videos



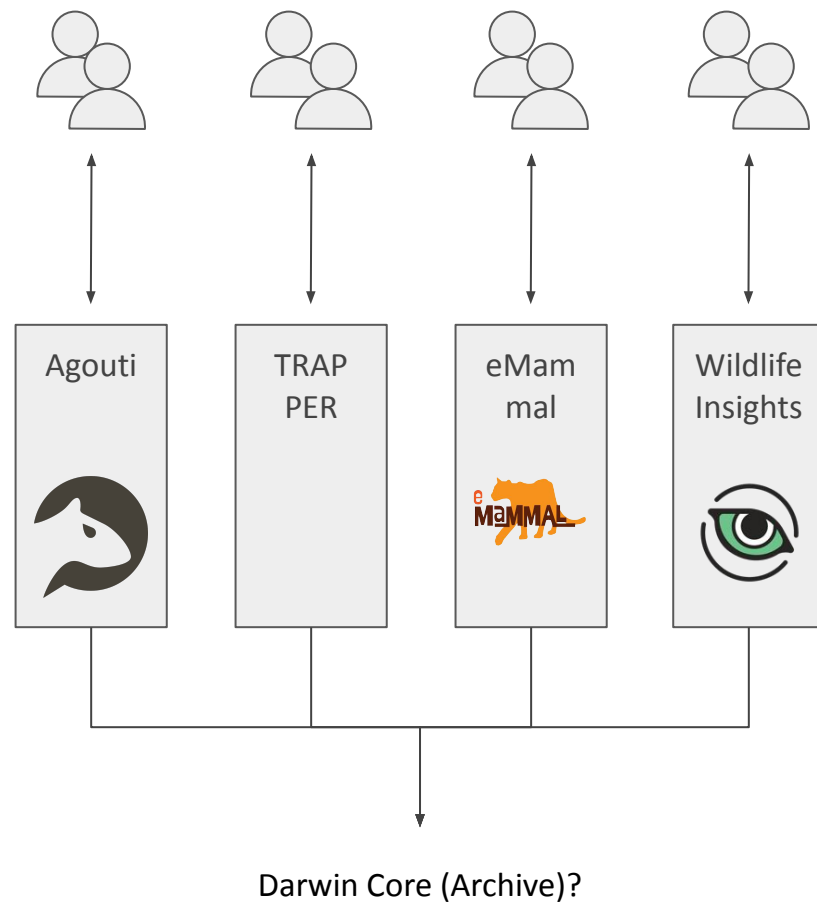
Data are well-managed, not shared

- Data management platforms
 - Upload and manage data
 - Annotate with species identifications (often using image recognition)
- Limited data exchange between platforms
- Limited data publication from platforms



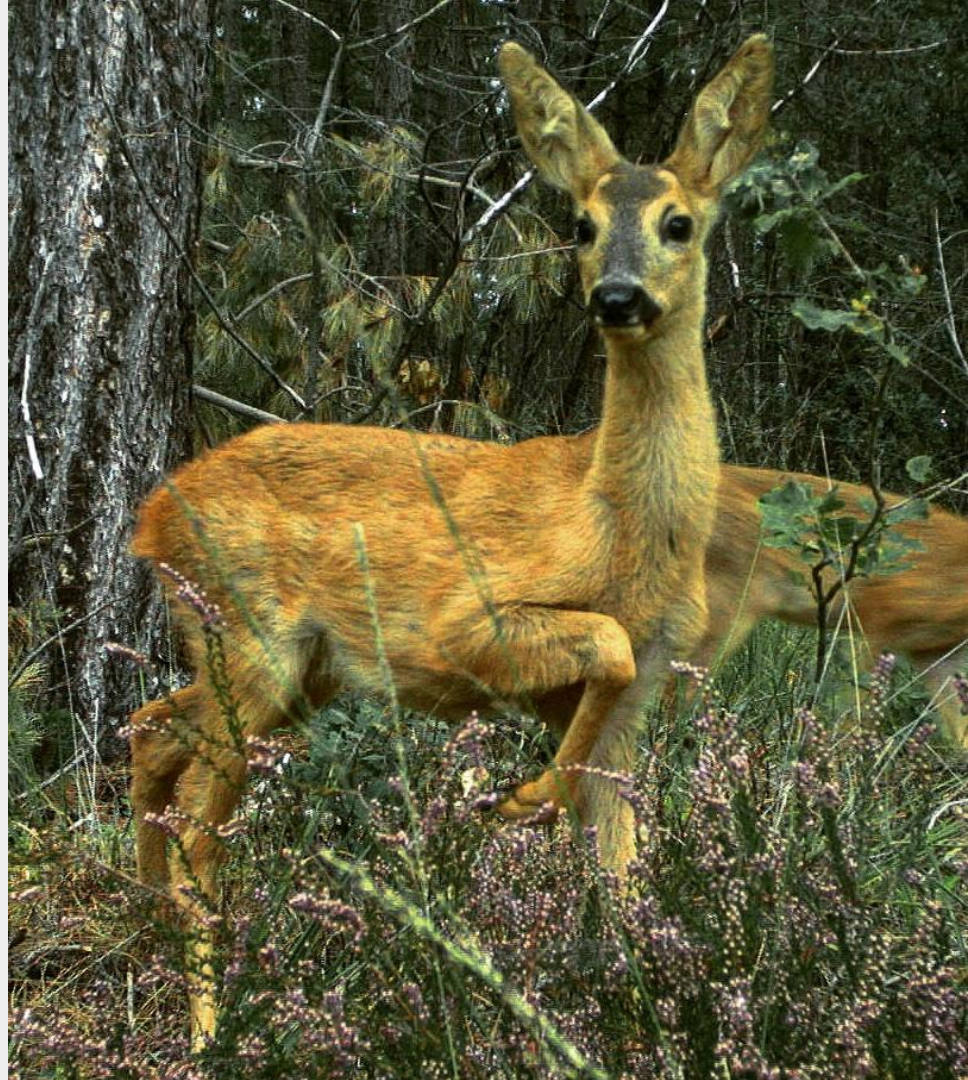
Darwin Core (Archive)?

- Does not capture full scope
 - Project setup
 - Camera setup
 - Blank, vehicle, unknown sequences of images
- Star schema too limited to capture all relationships
- Camera trap researchers do not recognize data model



Camtrap DP

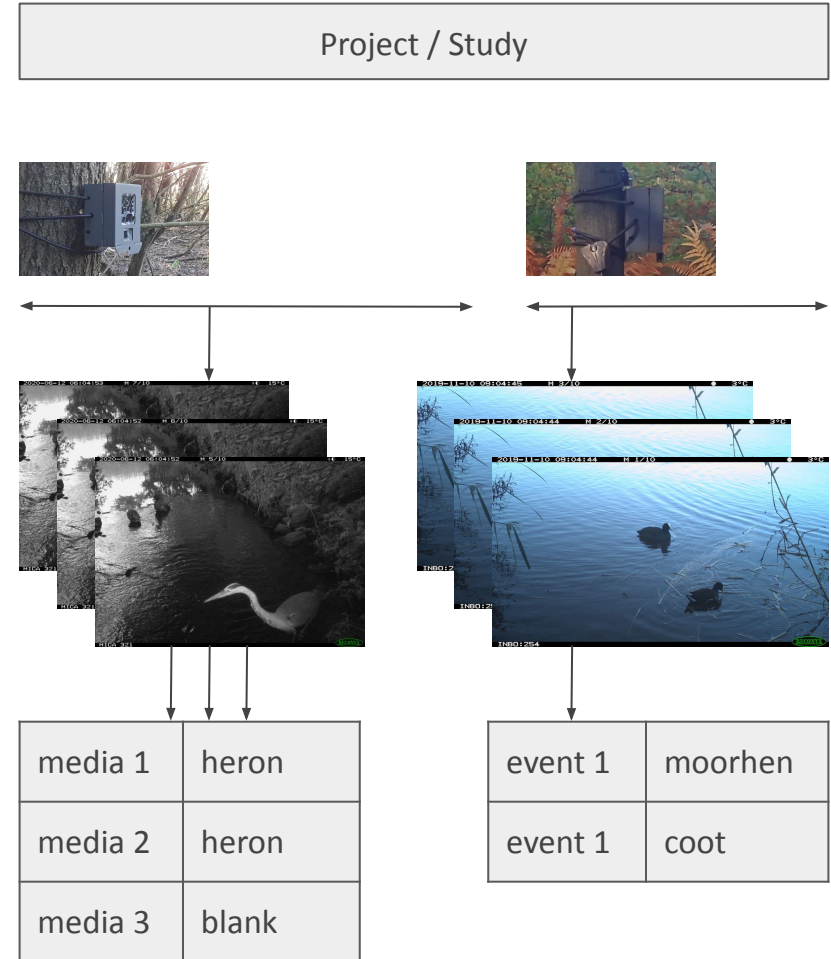
- “Camera Trap Data Package”
- Designed to capture all essential data and metadata of a single camera trap study
- **Model** to exchange camera trapping data
- **Format** to exchange camera trapping data



Camtrap DP model

- **Metadata** about project
- **Deployments**: start/end date, location, camera info
- **Media**: file path/url, timestamp, event (sequence)
- **Observations**: blank, or animal of certain species, count, sex, ...

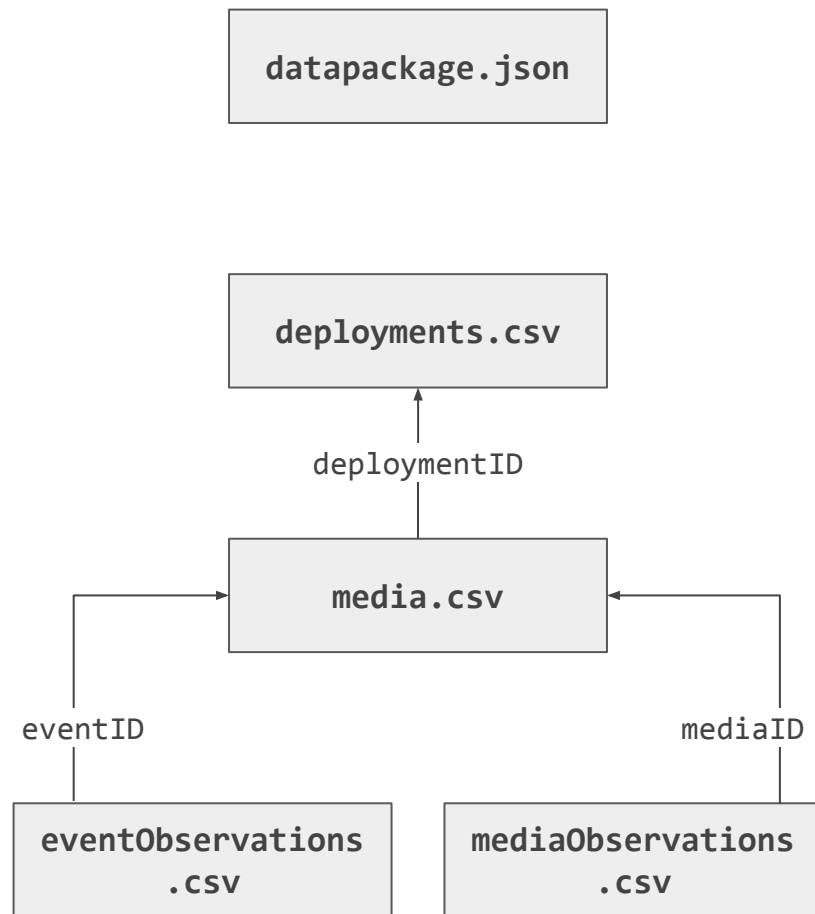
gbif.org/occurrence/3045046810
gbif.org/occurrence/3045043163



Camtrap DP format

- **Metadata** as **datapackage.json**
 - Project metadata
 - Package structure
- **Deployments** as csv
- **Media** as csv
- **Observations** as csv
 - Either at event or media level*

*Upcoming version



Using Frictionless Standards

- Developed by Frictionless Data
- Set of open specifications (JSON schemas) that can be combined
 - **Data Package** for datasets
 - **Data Resource** for data files
 - **Table Schema** for table fields
- Simple, machine-usable & extensible

specs.frictionlessdata.io

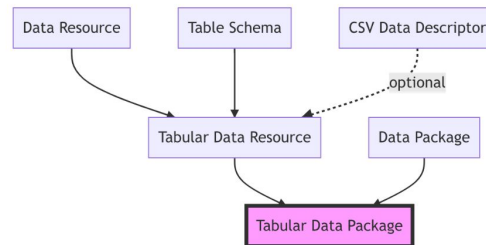
Frictionless Standards

At the core of [Frictionless](#) is a set of patterns for describing data including Table Schema (for tables), Data Resource (for files), and Data Package (for datasets).

Overview

What's a Data Package?

A Data Package is a simple container format used to describe and package a collection of data (a dataset).



Design Philosophy

Simplicity

Seek zen-like simplicity in which there is nothing to add and nothing to take away.

Extensibility

Design for extensibility and customisation. This makes hard things possible and permits future evolution – nothing we build will be perfect.

Human-editable and machine-usable

Specs should preserve human readability and editability whilst making machine use easy.

Camtrap DP development

- Open, versioned, collaborative
- Camtrap DP **profile** (extends Data Package)
 - Project metadata
 - Spatial, temporal, taxonomic scope
- **3 Table Schemas**
 - Fields, definitions, data types, controlled vocabularies (**enum**)
 - Borrowed terms (**skos:...**)
 - Relationships between tables

github.com/tdwg/camtrap-dp

tdwg / camtrap-dp Public

Unwatch 15 Fork 2 Star 18

Code Issues 34 Pull requests 4 Discussions Actions Projects Security Insights

main Go to file Add file Code About

peterdesmet Merge pull request #247 from tdwg/fix_type 25 days ago 446

.github/workflows	Remove custom workflow, revert to Deploy from a ...	28 days ago
.data	Correct symlink	13 months ago
.layouts	Move example to description + enable for metadata	last month
assets	Add image	2 years ago
example	Bump version	last month
pages	Use toc on data page	last month
tests	Merge remote-tracking branch 'origin/improved_au...	11 months ago
.gitignore	Gitignore gemfile	28 days ago
Gemfile	Add source to Gemfile	28 days ago
LICENSE	Add MIT License and recommended citation	2 years ago
README.md	Split README in README (for repo) and index (for ...	13 months ago
_config.yaml	Use sans-serif font for website	last month
camtrap-dp-profile.js...	Fix typo	29 days ago
deployments-table-sc...	Harmonize definitions	last month
media-table-schema.j...	Harmonize definitions	last month
observations-table-sc...	Harmonize definitions	last month

README.md

Camtrap DP

Camera Trap Data Package (or Camtrap DP for short) is a community developed data exchange format for camera trap data.

Usage

Releases: 11 tags, Create a new release

Contributors: 6

Environments: 1, github-pages (Active)

Languages: Python 62.9%, HTML 36.7%, Ruby 0.4%

Camtrap DP development

- Suggestions via GitHub issues and pull requests
- Automated tests, against:
 - Frictionless specification
 - Example dataset
- Automated human-readable documentation

tdwg.github.io/camtrap-dp

Metadata

Metadata in Camtrap DP are expressed in a `datapackage.json` file. It follows the [Data Package](#) specifications and includes generic **Data Package properties** and specific **Camtrap DP properties**. Properties indicated with * are required (i.e. cannot be empty).

Source: `camtrap-dp-profile.json`

resources

See [Data Package specification](#). Camtrap DP further requires each object to be a [Tabular Data Resource](#) with a specific `name` and `schema`. See [Data](#) for the requirements for those resources.

Name	Definition	Type
<code>name</code>	Identifier of the resource. Constraints <ul style="list-style-type: none">enum: <code>deployments</code>, <code>media</code>, <code>observations</code>	
<code>profile</code> *	Constraints <ul style="list-style-type: none">const: <code>tabular-data-resource</code>	
<code>schema</code> *	URL of the used Camtrap DP Table Schema version (e.g. <code>https://raw.githubusercontent.com/tdwg/camtrap-dp/1.0/deployments-table-schema.json</code>).	

profile *

See [Data Package specification](#). Camtrap DP further requires this to be the URL of the used Camtrap DP Profile version (e.g.
`https://raw.githubusercontent.com/tdwg/camtrap-dp/1.0/camtrap-dp-`

On this page

[resources](#)
[profile](#) *
[name](#)
[id](#)
[created](#) *
[title](#)
[contributors](#) *
[description](#)
[version](#)
[keywords](#)
[image](#)
[homepage](#)
[sources](#)
[licenses](#)
[bibliographicCitation](#)
[project](#) *
[coordinatePrecision](#)
[spatial](#) *
[temporal](#) *
[taxonomic](#) *
[relatedIdentifiers](#)
[references](#)

How should your dataset reference Camtrap DP?


- In your **datapackage.json** link to a version of:
 - Camtrap DP Table Schemas (data)
 - Camtrap DP profile (metadata)

[github.com/tdwg/camtrap-dp/
tree/main/example](https://github.com/tdwg/camtrap-dp/tree/main/example)

```
{
  "resources": [
    {
      "name": "deployments",
      "path": "deployments.csv",
      "profile": "tabular-data-resource",
      "schema":
        "https://raw.githubusercontent.com/tdwg/camtrap-dp/0.4/
        deployments-table-schema.json"
    },
    {
      "name": "media",
      "path": "media.csv",
      "profile": "tabular-data-resource",
      "schema":
        "https://raw.githubusercontent.com/tdwg/camtrap-dp/0.4/
        media-table-schema.json"
    },
    {
      "name": "observations",
      "path": "observations.csv",
      "profile": "tabular-data-resource",
      "schema":
        "https://raw.githubusercontent.com/tdwg/camtrap-dp/0.4/
        observations-table-schema.json"
    }
  ],
  "profile":
    "https://raw.githubusercontent.com/tdwg/camtrap-dp/0.4/
    camtrap-dp-profile.json",
  "id": "1df9727c-dde9-498a-824e-cc4f19436117",
  "contributors": {},
  "project": {},
  "spatial": {},
  "temporal": {},
  "taxonomic": [],
}
```


Software to create


- Agouti
- TRAPPER
- Integrated Publishing Toolkit (IPT)


 AGOUTI


[Dashboard](#)


[Organizations](#)


 Overview


 Import


 Annotate

 Browse

 Project settings

 Sampling management

 User management

 Export data

[Dashboard](#) > [MICA - Management of Invasive Coypu and muskrat in Europe](#) > [Export data](#)

Export data

Create Export

Previous exports

Filename	Time of export	Status	Size	
mica-management-of-invasive-coypu-and-muskrat-in-europe-20221012105236.zip	12 October 2022 15:06:49	Completed	120.2MB	Download
mica-management-of-invasive-coypu-and-muskrat-in-europe-20221003133718.zip	3 October 2022 17:53:18	Completed	120.1MB	Download
mica-management-of-invasive-coypu-and-muskrat-in-europe-20220909104225.zip	9 September 2022 15:05:14	Completed	114.1MB	Download
mica-muskrat-and-coypu-20220826064114.zip	26 August 2022 11:01:40	Completed	109.3MB	Download
mica-muskrat-and-coypu-20220708094154.zip	8 July 2022 13:55:13	Completed	98.6MB	Download
mica-muskrat-and-coypu-20220614122226.zip	14 June 2022 16:33:20	Completed	91.8MB	Download
mica-muskrat-and-coypu-20220216194318.zip	16 February 2022 21:46:50	Completed	72.0MB	Download
mica-muskrat-and-coypu-20220131140731.zip	31 January 2022 16:11:34	Completed	68.0MB	Download
mica-muskrat-and-coypu-20220103125023.zip	3 January 2022 14:53:34	Completed	63.0MB	Download
mica-muskrat-and-coypu-20211103131449.zip	3 November 2021 14:27:42	Completed	53.6MB	Download
mica-muskrat-and-coypu-20211021150814.zip	21 October 2021 17:18:53	Completed	50.2MB	Download
mica-muskrat-and-coypu-20211021091949.zip	21 October 2021 11:32:04	Completed	50.2MB	Download
mica-muskrat-and-coypu-20210923082632.zip	23 September 2021 10:38:03	Completed	49.3MB	Download
mica-muskrat-and-coypu-20210811075753.zip	11 August 2021 10:37:01	Completed	46.6MB	Download
mica-muskrat-and-coypu-20210707160815.zip	7 July 2021 18:27:13	Completed	44.4MB	Download
mica-muskrat-and-coypu-20210601121907.zip	1 June 2021 14:31:23	Completed	42.9MB	Download
mica-muskrat-and-coypu-20210302172233.zip	2 March 2021 18:26:49	Completed	35.9MB	Download

<< < 1/1 > >>

Software to validate

- Frictionless Framework (Python)

can validate:

- Metadata
- Structure
- Fields
- Controlled vocabularies
- Relationships

```
frictionless validate datapackage.json
```

```
# ----
```

```
# valid: deployments.csv
```

```
# ----
```

```
# ----
```

```
# valid: media.csv
```

```
# ----
```

```
# ----
```

```
# valid: observations.csv
```

```
# ----
```

Software to read and analyse

- Frictionless Framework (Python)
- frictionless (R package)
- camtraptor (R package)
 - **read_camtrap_dp()**
 - **read_wi()**: import Wildlife Insights export as Camtrap DP
 - **write_dwc()**: export as DwC
 - **write_eml()**: export as EML
 - Filter, explore, visualize, ...

inbo.github.io/camtraptor

```
# devtools::install_github("inbo/camtraptor")
library(camtraptor)

dataset <- read_package(
  "https://raw.githubusercontent.com/tdwg/camtrap-dp/main/example/datapa
  ckage.json"
)
#> Please make sure you have the right to access data from this Data
  Package for your intended use.
#> Follow applicable norms or requirements to credit the dataset and
  its authors.

get_species(dataset)
# A tibble: 10 × 6
  taxonID taxonIDReference      scien...1 verna...2 verna...3 taxon...4
  <chr>    <chr>              <chr>    <chr>    <chr>    <chr>
1 DGP6    https://www.catalogueo... Anas p... mallard wilde ... NA
2 DGPL    https://www.catalogueo... Anas s... gadwall krakee... species
3 32FH    https://www.catalogueo... Ardea  great ... reigers genus
4 GCHS    https://www.catalogueo... Ardea  ... grey h... blauwe... species
5 RQPW    https://www.catalogueo... Castor... Eurasi... bever species
6 6MB3T    https://www.catalogueo... Homo s... human  mens species
7 3Y9VW    https://www.catalogueo... Martes... beech ... steenm... species
8 44QYC    https://www.catalogueo... Mustel... Europe... bunzing species
9 4RM67    https://www.catalogueo... Rattus... brown ... bruine... species
10 5BSG3    https://www.catalogueo... Vulpes... red fox vos species
# ... with abbreviated variable names 1scientificName,
# 2vernacularNames.en, 3vernacularNames.nl, 4taxonRank
```

Next steps

- Release Camtrap DP v1.0 ✨
- Submit paper describing format
- Update software
 - Agouti
 - Trapper
 - Camtraptor
 - ...
- Biodiversa+ funding to continue this work

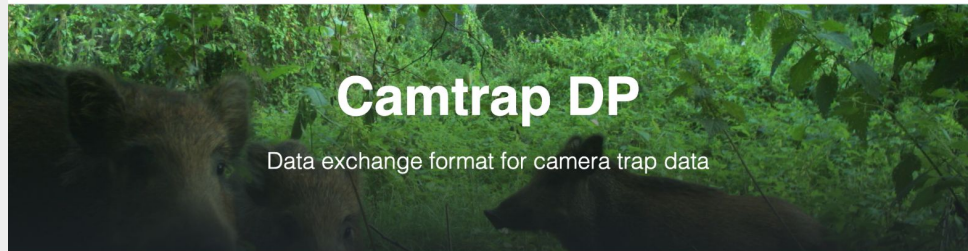
The screenshot shows the GitHub repository page for 'tdwg / camtrap-dp'. The repository is public and has 15 watchers, 2 forks, and 18 stars. The 'Issues' tab is selected, showing 34 issues. A milestone for version 1.0 is active, with a progress bar indicating 84% completion. The milestone has 25 open issues and 133 closed issues. The open issues are listed below, each with a title, labels, and a comment count.

Issue Title	Labels	Comments
Is there a usecase for the _id columns?	level:deployments, level:media, level:observations, term:deprecate	10
Map deploymentID to parentEventID	level:media, level:observations, term:update	1
Restructuring the model	level:media, level:observations, structure:update, term:deprecate, term:new, term:update	28
Add file-based example		
Add speed, distance and angle for observations	community:feedback, level:observations, term:new	3
Rename classificationConfidence to classifierProbability, and note that it's usually omitted for human classifications		12
setup and pickup as observationType	level:observations, term:update	5
calibration as observationType	level:observations, term:update	3
Rename classificationConfidence to classifierProbability	level:observations, term:update	1
Add bounding box	level:observations, term:new	1

Summary

- Capture essential data and metadata of a camera trap study
- Data exchange **model** and **format**
- Uses Frictionless Standards
- Built-in validation
- Open, versioned and collaborative
- Version 1.0 coming soon

tdwg.github.io/camtrap-dp



Camera Trap Data Package (or **Camtrap DP** for short) is a community developed data exchange format for camera trap data.

Usage

A Camtrap DP is a **Frictionless Data Package** that consists of:

File	Description
<code>datapackage.json</code>	Metadata regarding the data package and camera trap project.
<code>deployments.csv</code>	Table with camera trap deployments .
<code>media.csv</code>	Table with media files captured by the camera traps.
<code>observations.csv</code>	Table with observations based on the media files.

Example

Example dataset following Camtrap DP specifications.

Validation

To allow validation, the `datapackage.json` of your dataset should reference the used version of Camtrap DP, both in **profile** and the resources' **schema**:

```
{
  "name": "...",
  "profile": "https://raw.githubusercontent.com/tdwg/camtrap-dp/<version>",
  "resources": [
    {
      "name": "deployments",
      "schema": "https://raw.githubusercontent.com/tdwg/camtrap-dp/<version>/resources/deployments.schema.json",
      "media": "media"
    }
  ]
}
```


Thank you

tdwg.github.io/camtrap-dp



Desmet P (2021) Introduction to Camtrap DP: A frictionless data exchange format for camera trapping data. Presentation at the Exploring camera-trap data GBIF webinar.

<https://bit.ly/camtrap-dp-gbif-2022>



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