TransektCount 4.0

1. Introduction

TransektCount in an Android app to support transect counters in nature preserving projects according to the Butterfly Monitoring Scheme methodology in Europe (Fig. 1). It allows a species-specific counting per transect section. Transect sections can be selected manually or determined automatically via GPS. It can substitute your field book and pencil, and if applicable a camera for documentary pictures of interesting species.

The integrated database is organized according to a transect inspection. That means, there will be used a new database instance per inspection. Databases can be individually created and adapted regarding transect sections and expected butterfly species within the app. The recorded data (meta data, counts and remarks) may either be read on the results page or transferred to a PC for better reading or your own processing.

The app is published on https://github.com/wistein/TransektCount with source code and documentation. It is open source and has no tracking or advertising functions, but demands for permits which are needed for the app's serviceability: Import of DB or GPX files, export of results in DB or CSV files and optionally requesting location data by GPS.

Fig. 1: Starting page

2. Setting Up

Before initial use you should adapt the settings to your liking (Fig. 2).

Initially ignore item "**Find transect sections by GPS**", as certain preconditions have to be met before (see **5. GPS Usage**).

Then you should edit the prepared species list of the 1. transect section with the section editor (Fig. 3 and Fig. 4). Add further species by clicking the (+)-button in the head line of "Transect Sections".
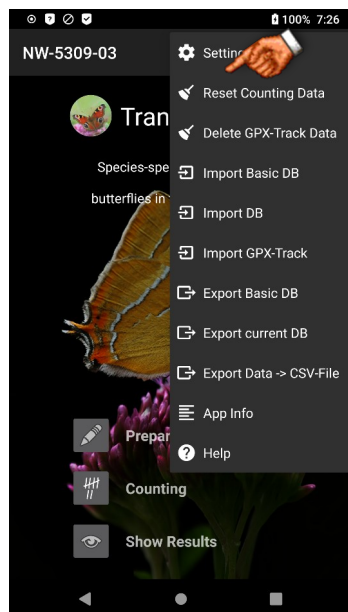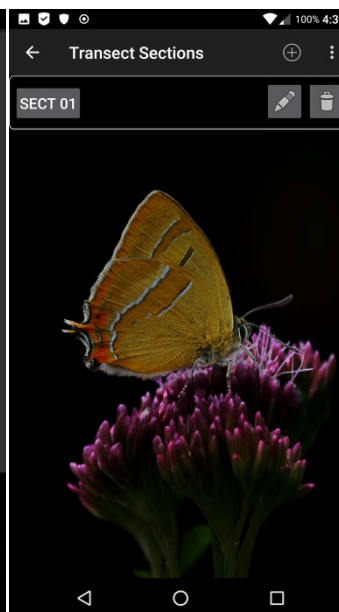

Fig. 2: Starting page menu

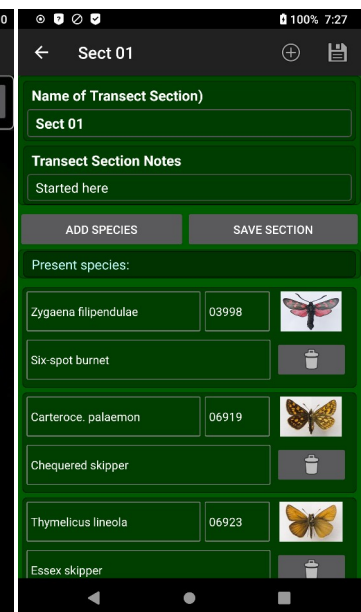Fig. 3: Initial list of transect sections

Fig. 4: Edit section data

Alternatively you can import and adapt a self-created Basic DB for your transect. Examples for downloading are provided on https://github.com/wistein/TransektCount/tree/master/docs. Copy them to the public directory **Documents/TransektCount/** and import and edit them in TransektCount suitably. The app data directory is created during the first app call. When uninstalling TransektCount you will not loose your data as this directory remains untouched.

To edit the species list of the first section click the pencil button in the section line of "**Transect Sections**" (Fig. 3). Use the (+)-button in the head line of the section editor (Fig. 4) to select species from the blue scroll-down list of not yet selected species. Repeat this for all species to consider within the transect and save the changes by a click of "**SAVE SECTION**" or the save icon.

At the end of this list you may select a placeholder for a not determined species (NN). This may later be edited by entering its scientific name, common name and code (five digits with leading zeros, see the following table). For that you may consult "Liste kodierter Schmetterlinge - List of coded butterflies - TransektCount" on https://github.com/wistein/TransektCount/tree/master/docs.
This list can be changed or supplemented anytime afterwards. Changes always affect all existing section lists.

For the automatic, GPS-controlled change, all section lists must contain the same species. Therefore, when a section is subsequently edited, all other sections are automatically changed in the same way to maintain consistency.

```
Sect 01
---------------------------
...
Pieris rapae           06998
Small White
Pieris napi            07000
Green-veined white
Pieris na./ra.-compl. 07000*
Small whites complex
...
```
Detail of section list "Sect 01"

The codes will be used as an option to sort the list and as a reference to show corresponding butterfly icons. The codes derive from the numbering scheme of Karsholt/Razowski, as used e.g. in the German Lepiforum (https://lepiforum.org/).

The appended *-symbol at code 07000 marks a species complex whose code advisably should be the largest code of its members.

In the next step, you should enter the permanent meta data like transect-No. or inspectors name. Click on "**PREPARE INSPECTION**" and save the input by clicking the save icon.

Once this list is complete, you can copy it for all remaining transect sections by the counting page menu function: "**Duplicate Section List**", and name each section accordingly, if possible in the order you will walk the transect, e.g.: Sect 02, Sect 03,… (s. Fig. 5).

When you have created the section lists for all transect sections and entered the main meta data, the database is ready for export as a "Basic Database" by the function "**Export as Basic DB**" in the main menu of the starting page. By that you have a copy of the empty database saved as "Basic Database" (transektcount0.db) within the Apps **Documents/TransektCount/** directory.

The Basic DB does not contain any inspection related data and serves als a template for future inspections. It can also be exported again later, e.g. after changes of lists. Exporting as Basic DB ignores all counts, notes and inspection-related meta data.

To prepare a certain monitoring inspection you will only need to enter the inspection-specific meta data (temperature, wind, clouds, date and time.

If you want to use the GPS function of the phone for automatic switching between transect sections you need a GPX file with the tracks of all transect sections.

You may create such a GPX file on a PC by Garmin's BaseCamp software. Import this file by "**Import GPX Track**". Then activate the option "**Find transect section by GPS**" in Settings and grant "**Location**" permit.

How to prepare GPS usage for GPS-controlled switching of transect sections is described in detail in "**5. GPS Usage**".

Fig. 5: Transect section list   Fig. 6: Counting page

Older Smartphones may produce a wrong display of a long transect sections list (the last delete icon is crossed out) as their amount of RAM is not sufficient. More info under **6.3 Messages**.
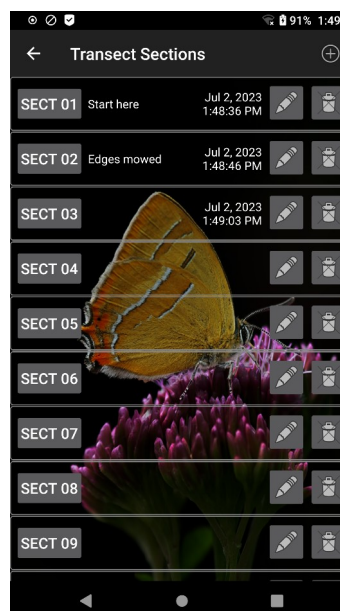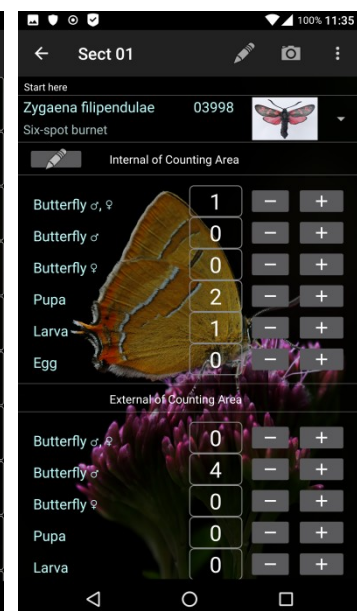
3. Usage

Start with "**Prepare Inspection**". Enter the relevant meta data of the transect inspection. The current date and time can be entered by just clicking the corresponding field. If want to enter a different date or time you may longer press these fields and use the pop-up dialog.

Then use "**COUNTING**". Without GPS usage the transect section list appears (Fig. 5). Select the relevant transect section. The counting page for the first species in the sorted section list appears (Fig. 6). Select the respective species by clicking the butterfly icon (Fig. 7). As counting of butterflies ought to be distinguished between those within the imaginary counting area (a cubus with edges of 5 m length in front of the inspecting person) and butterflies outside this area you have 2 separate sets of counters for each species.

To count just tip on the appropriate (+)-Button of the corresponding species category (♂♀, ♂, ♀, pupa, larva or egg). The (-)-buttons allow for corrections.

Each count is stored immediately. While storing the first count in a section the current date and time will be stored for the section either. The date and a possible section remark

Fig. 7: Select species to count   Fig. 8: Edit species

will then be shown in the list of sections and indicate a successful inspection of that section. To select another species just tip on the butterfly icon of the scroll down list on top of the counting page (Fig. 7).

The **Pencil**-button in the app bar of the counting page (as well as the section's Pencil-button of the section list) opens the section editing page (Fig. 4) for adding remarks for the section or editing the name of the section. Added or deleted species will be considered for all sections. The section related remarks will be shown on top of the counting page and within the section list.

The **Pencil**-button beneath the species name row of the counting page opens the species editing page (Fig. 8) that lets you add remarks for each species and set its counters to any value. Here you may also set pop-up alerts which show up while reaching a set number of butterflies on the corresponding internal counters (sum of all ♂ and ♀) e.g. to realize already on site if a certain species is more abundant than on a previous inspection.

If you enter a species related remark this will be shown on the counting page in an extra line beneath the counting field and on the results page.

To move back one page you can use the arrow in the upper left corner. To go back one level use ◄ in the bottom area.

When you have large lists or have collected big amounts of data the app may delay the start of pages, especially the results page, as this needs heavy calculations. This will be indicated by a short popup message "View gets calculated!"

Finally, there is a page showing your results (Fig. 9 and 10). Here, beneath the meta data of the inspection you see the totals per category followed by all the species which got counts. You can enter this page from the
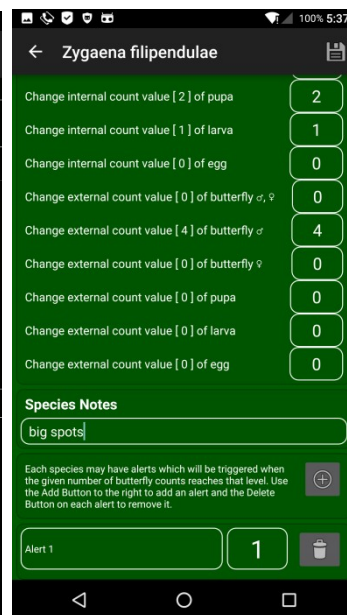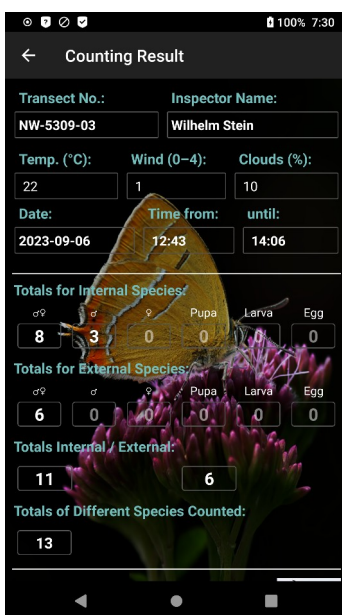

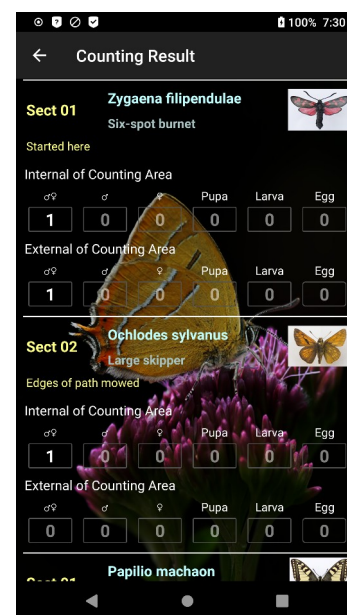Fig. 9: Results page (head)   Fig. 10: Results page (detail)

Starting page with the "**SHOW RESULTS**" Button or the **eye** symbol in the app bar.

4. Further Functions

The main menu on the starting page (Fig. 2) has Settings, Reset, Import, Export, Info and Help functions.

Under "**Settings**" page (Fig. 11) you may adapt the look an feel in some aspects to your wishes, e.g. background picture, sorting, left-/right-handed counting or sounds. Here you can also activate the GPS function for automatic selection of the current transect section, provided a prepared GPX track file with tracks of all transect sections has been imported. For detailed information see "**5. GPS Usage**".

For preparing a new inspection you may use "**Reset Data**" to reset the inspection-specific meta data and count data. All other transect data including GPS track data remains untouched.

With "**Reset Counting Data**" you can reset the inspection-specific meta data and all counting data. Transect-specific data and GPS track data remains untouched.

Android-specifically, TransektCount stores the data always in a single, equally named SQLite DB file in the app's own internal storage area. As this file cannot be read or changed directly by the user, importing and exporting the data to files in a user readable storage area is necessary.

By "**Export Basic DB**" you may export the internal DB data into a "Basic DB" file (**transektcount0.db**) without any inspection-

Fig. 11: Settings (excerpt)   Fig. 12: Import file selection

specific data to **Documents/TransektCount/**. This is reasonable, when to take into account changes of the transect structure or new species you may have entered (see "**2. Setting Up**").

"**Import Basic DB**" always reloads this file into the internal DB in case you have erroneously entered e. g. wrong structural data.

Exporting the current database (**Export Current DB**) writes a copy of the complete DB to **Documents/TransekCount/transektcount_YYYY-MM-DD_hhmmss.db**.

For your own purpose you can rename the exported TransektCount DB files by a file manager into e.g. transektcount1.db, transektcount2.db, etc. (Mind: The .db file name must start with the string "**transektcount**", otherwise it cannot be imported).

You may import any previously exported TransektCount DB (Fig. 12). This supports monitoring of different transects with different sections an species lists.

"**Import GPX Track**" reads a prepared GPX Track file (e. g. transektcount_t1.gpx) from directory "**Documents/TransektCount/**". In "**5. GPS Usage**" is shown how to create and handle GPX files.

Under "**App Info**" you may find the email address of the author, license notes, the history and further info.

IT-affine users may transfer the exported "transektcount_YYYY-MM-DD_hhmmss.db" file to a PC (siehe **6.1 Tips**). With a free tool like "SQLiteBrowser" (http://sqlitebrowser.org) you may examine and edit manually or per SQL script the db file. Some useful example SQL scripts are published in the docs directory of the GitHub TransektCount project site https://github.com/wistein/TransektCount/tree/master/docs.
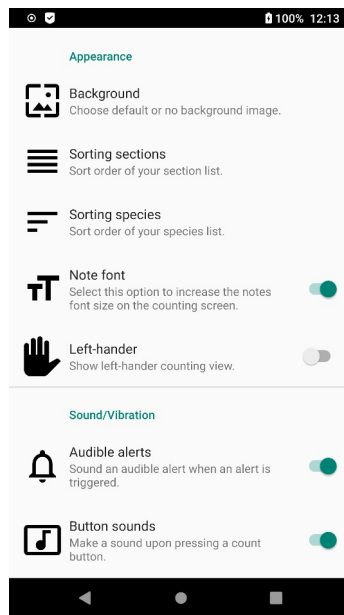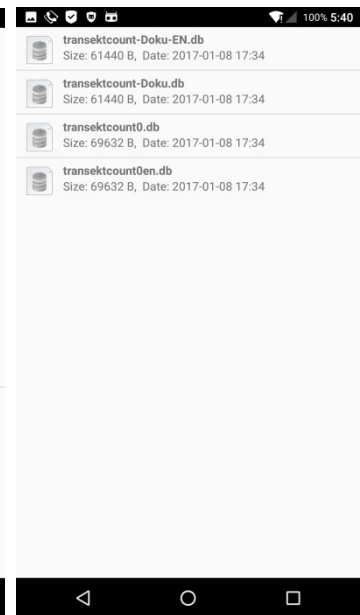
The function "**Export Data -> CSV File**" (CSV = Comma Separated Values) writes the meta data and the counting results into a pre-formatted spreadsheet-readable CSV file "transektcount_YYYY-MM-DD_hhmmss.csv" to "Documents/TransektCount/".
This directory allows accessing the files by spreadsheet apps, like
- Collabora (obtainable free of charge from F-Droid) or
- PlanMaker (SoftMaker, a. o. there is a limited version free of charge).

The .csv file may be imported into a spreadsheet program for further processing as a

- comma-delimited text file with
- file origin "Unicode UTF-8",
- quotations marks for text field recognition
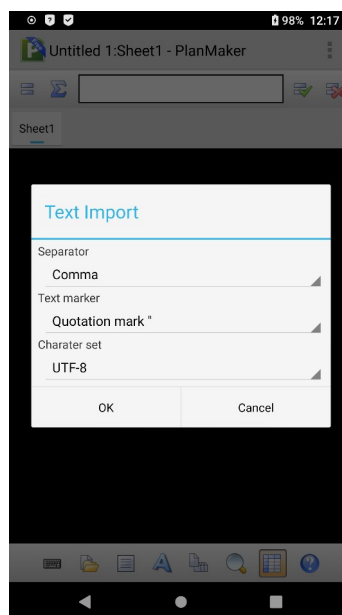- and all data as text.

The exported table is prepared for an easy transmission of the results into a Monitoring web page like https://www.tmd-daten.de/platform-tmd/tmd/tmd-top/index.do

Fig. 13: Text import parameters

Fig. 14: Imported CSV table

Fig. 13 shows the import format parameters for a correct representation.
Fig. 14 shows a part of the imported CSV table data in a free Android speadsheet app.

While using the app without the GPS function switched active, the function "**Duplicate Section List**" in the menu of the "Counting" page allows you to create a new section lists by duplicating the current one. This function is recommended to use while creating a new transect Basic DB (as described in "**2. Setting Up**"). When GPS is activated this function is not available, as it would corrupt the internal database. GPS usage demands for a new section a corresponding track beeing integrated in the GPX track file.

The counting page is temporarily switched off by means of the proximity sensor when the phone is pocketed or closely held to the body. This saves energy, prohibits unwanted input and recalls the app into its current state immediately.

The menu of the counting page provides a "Share" function for sending notes using a standard app like SMS or email.

5. GPS Usage

Automatic section recognition in the transect is performed by comparing the current position with the saved track coordinates of the sections. If the current position is no further than e.g. 5 m (default setting) away from a section track point, the section is set for registration. GPS inaccuracies and possibly slight overlaps between 2 neighboring transect sections must unfortunately be accepted.

Smaller distances would lead to more frequent error results due to the general GPS inaccuracy. If no track point is detected within a radius of 10 m, the recording is saved under "External".

The distance radius of the presetting can be set between 3 and 10 m to adapt to the GPS accuracy.

A suitable GPX file can be created on the PC using freely available software and maps.

Using the free BaseCamp program from Garmin, the track sections can be marked and named on free maps based on OpenStreetMap.
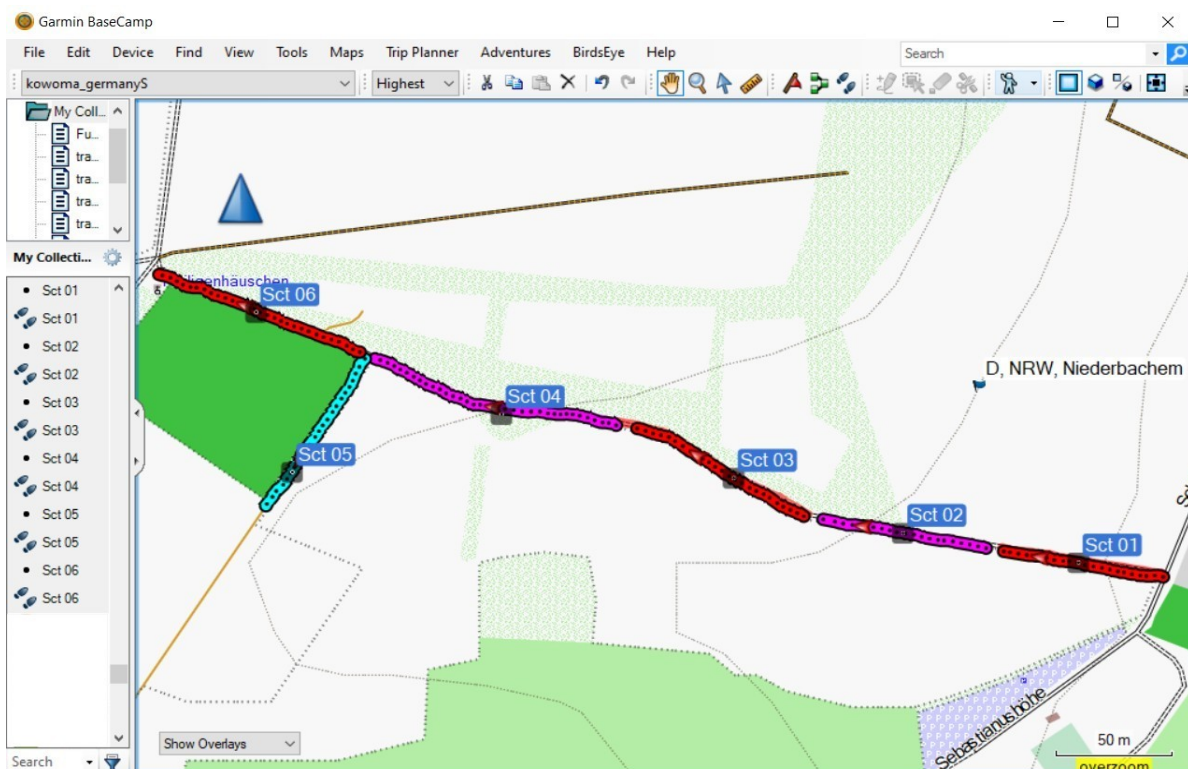
Fig. 15: Track creation in BaseCamp (section names and colours serve only the illustration)

The result can then be exported as "**transektcount_xxx.gpx**" (with xxx as a placeholder for a transect name).

If possible, it is advisable to record the track with your smartphone on site as a control supplement in preparation for manually creating the GPX file. The recorded tracks should correspond as closely as possible to the route on the map. Larger deviations, which are similar for several recordings, indicate inaccuracies in the map.

The track sections should be drawn in BaseCamp at a zoom of 20 m, as this ensures optimum distances of approx. 1 m between the individual track points and sufficient accuracy for the coordinate comparison for section determination within the app.

The transect sections should be drawn in the same number and order as they are listed in TransectCount. During import, they are assigned to the existing transect sections in this order.

As the number of transect sections must be equal to the number of tracks, adding a new transect section is only possible as long as no tracks have been imported. Therefore, existing tracks must first be deleted from the database using the "Delete GPX Track Data" function if a transect section is to be added.

After adding a new section, the track file assigned to the transect must also be supplemented with the track of the new section in BaseCamp and re-imported.

The GPX track file created with BaseCamp must then be copied to "**Documents/transektcount/**" on the smartphone. There it is expected by the app during import.

Finally, activate the item "**Find transect section via GPS**" under Settings and, if necessary, adjust the sensitivity under "**Maximum GPS deviation allowed**".

When a transect section is deleted, the corresponding track is also deleted from the database.

6. Installation hints

Two options:

1. From F-Droid store (released versions)

Get the app, but without docs or Basic database (Basic-DB) but with updates by the F-Droid app store:

> https://f-droid.org/en/packages/com.wmstein.transektcount

After installation via the F-Droid store, the documentation and basic DB (and, if applicable, regional or seasonal sample DBs from the author's GitHub pages (see below).
Copy these into the Documents/TransektCount directory, which is created at the 1ˢᵗ start of the app.

Since apps published on F-Droid are compiled by F-Droid with their signature, they are not mutually updateable from or with the corresponding developer versions.

2. From the author's GitHub project pages (current processing status)

App (transektcount_release_nnn.apk):

> https://github.com/wistein/TransektCount/tree/master/apk

Docs as well as Basic- and sample-DBs:

> https://github.com/wistein/TransektCount/tree/master/docs

On the smartphone activate the Android option "Unknown source" in "Settings -> Security" before Installation.

After downloading, install the app by clicking on its apk-file in the download folder.
Copy the Basic-DB and relevant sample DBs from the download folder into the APP data directory (Documents/TransektCount) that ist created by the first start of the app.

Important: Finally deactivate the option "Unknown source"!

Note on F-Droid:
Getting apps from F-Droid is at least as secure as getting them from the Google Play Store.
In contrast to the Play Store, all apps are also checked for data protection and compiled by F-Droid itself.

If an app does not meet all of F-Droid's requirements with regard to undesirable features, it is noted.

The source codes of the F-Droid apps are published and licensed as open source.

Note on updates:
In the case of major version jumps with functional additions, structural changes may have been made in the internal database of an app. After such a change, the database version is incremented. This is recognized by the app and the currently used DB is adapted internally.

However, the currently adapted DB version cannot be used after a downgrade to a previous app which uses a previous DB version.

All sample DBs are written and published in the current structure.

7. Annex

7.1 Tips

Transferring data between smartphone and PC

Connect the smartphone to the PC using a USB cable. In the smartphone settings, select data transfer under Connected devices for USB.

The smartphone is now displayed with its technical ID in Windows Explorer. In the "Internal shared memory" area, the "Documents/TransektCount" directory can be read and written to for data exchange.

7.2 Messages

When attempting to delete a section with a crossed-out delete symbol from the section list:

Section nn: To prevent DB corruption it is not possible to delete this section. Only the last section may be deleted. If this is the last section then your device has unfortunately not enough free RAM to execute the function.

Normally, the last transect section can be deleted (delete symbol is not crossed out). This effect occurs depending on the RAM size of the device. With current models, however, this restriction should only occur with very many transect sections. Other functions of the app are not affected by this restriction.

Possible solutions:

1. Reverse the sorting of the section list under Settings and try again.

2. Reduce the DB by one section with "SqliteBrowser"
   Copy the exported DB to a PC and reduce it by one section using the "SqliteBrowser" tool.
   - Load the DB in SqliteBrowser.
   - Delete all entries with the highest "section_id" in the "counts" table.
   - Delete all rows in the "alerts" table.
   - Then note the name of the last entry in the "sections" table and delete the line.
   - Finally, in the "tracks" table, delete all rows with this name in the "tsection" column.
   - Save the changes.
   Copy the modified DB back to the Android device. Repeat the process if necessary.

3. Reduce the DB by one section with second Android device with more RAM
   Either connect the two devices directly via USB or WLAN or connect both to a PC and copy the DB from there to the "Documents/TransektCount/" directory of the other device.
   - Import into TransektCount there,
   - delete the last section,
   - export the DB and copy it back.
   - Repeat the process if necessary.

4. Set up the DB again
   - Create the species list in section 1 and fill it with the desired species.
   - Duplicate section and name new section accordingly.
   - Export DB.
   - Check the section list to see whether the last section can be deleted.
   - If yes, create another section by duplicating, test and export if ok.
   - If not, the DB can use a maximum of one section less.
   - Repeat until the maximum number of sections is reached.

5. Use the DB with this flaw.
   There are no other known functional limitations.

7.3 Glossary

Counting area:
The counting area corresponds to a cube of 5 m edge length in front of the observation point within a transect section. Individuals sighted are recorded separately inside and outside this imaginary cube. Due to its Germany-wide standardization (also applies to various European countries), recording in the internal counting area is decisive for comparative evaluations.

CSV file:
Comma-separated values file. Text-based file format for exchanging data in tabular form (e.g. for importing TransektCount result data into spreadsheet programs).

File directories of TransektCount:
The public app-specific files directory (for DB files and exported CSV files) is:

   "Documents/TransektCount/"

Data stored here can also be read by other apps. The data is not automatically deleted when the app is uninstalled.

The previous app-specific directory for the DB files:

   "Android/data/com.wmstein.transektcount/files/"

is no longer used from TransektCount version 4.0.0, as data stored here cannot be read by other apps in newer Android versions and was deleted when the app got uninstalled.

GitHub:
Is a file hosting site for software development projects including version control. It is free of charge for Open Source Projects. It was named after the version control and source code management system Git. Run by GitHub, Inc. from San Francisco, USA. Since Dezember 2018 the company belongs to Microsoft. According to Microsoft GitHub will remain an independent platform.

Numbering scheme according to Karsholt/Razowski:
The entomologists O. Karsholt and J. Razowski developed a numbering scheme for European butterfly species, which is used in the German Lepiforum and elsewhere. According to this numbering scheme, codes are used in TransektCount to identify the species. However, this restricts the use of TransektCount to European faunal areas, as there is no comparable scheme that is valid worldwide.

Open Source:
Source code of software, which can be edited and used publicly. Open source software can mostly be used free of charge and does not contain propriately licensed or closed source elements.

Transect:
A predetermined route along which someone counts and notes the occurrence of certain species. This route is divided into sections of approx. 50 m in length that are as homogeneous as possible in terms of vegetation. In particular, the individuals within a defined → **counting area** are counted.

7.4 References

TransektCount project:
The repository of the TransektCount project is situated on https://github.com/wistein/TransectCount.
It contains all published files with source code, configuration of the Android Studio Development platform,
documentation and installable APK files.

Documents:
You find documents, example databases, SQL scripts for manipulating TransektCount DBs and other
information under https://github.com/wistein/TransectCount/tree/master/docs.