

# Data preparation steps for WWF LPR assessment of Butterflies and moths

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## Received datasets

The following datasets were received:

- Natuurpunt / Natagora: data from waarnemingen.be / observations.be; butterflies and moths; Belgium
- DEMNA: butterflies and moths; Walloon region
- INBO: vlinderdatabank; only butterflies; Flanders

## Data cleaning on separate datasets

### Natuurpunt / Natagora

#### Filtering

- We removed duplicate rows (copied observations, i.e. two observers where the second copied from the first)
- We kept only the following lifestages: UNKNOWN, IMAGO (and assume that most UNKNOWN are IMAGO)
- We removed the following variables: authority, soortid\_waarnemingen, levensstadium, gedrag\_methode, lifestage, behaviour\_method
- In case every variable has the same values except a different number of individuals counted, we keep only the maximum number of individuals observed per day.

```
## Warning: Missing values are always removed in SQL.  
## Use `MAX(x, na.rm = TRUE)` to silence this warning  
## This warning is displayed only once per session.
```

#### Harmonisation of species names

All species names are parsed via GBIF and checked against the GBIF taxonomic backbone. Synonyms are replaced by the accepted species name. Note that the Catalogue of Life has 96% overlap with the GBIF taxonomic backbone.

```
## [1] "All column names present"  
  
## Registered S3 method overwritten by 'crul':  
##   method           from  
##   as.character.form_file http
```

All names could be parsed.

The following names are synonyms in the GBIF taxonomic backbone:

naam_lat	species	rank	synonym
Antispila petryi	Antispila treitschkiella	SPECIES	TRUE
Chortodes fluxa	Photodes fluxa	SPECIES	TRUE
Chortodes pygmina	Denticucullus pygmina	SPECIES	TRUE

naam_lat	species	rank	synonym
Conobathra repandana	Acrobasis repandana	SPECIES	TRUE
Conobathra tumidana	Acrobasis tumidana	SPECIES	TRUE
Cydia pallifrontana	Grapholita pallifrontana	SPECIES	TRUE
Cymatophorina diluta	Cymatophorina diluta	SPECIES	TRUE
Elachista distigmatella	Elachista dispilella	SPECIES	TRUE
Epinotia huebneriana	Lepteucosma huebneriana	SPECIES	TRUE
Eupithecia absinthiata goossensiata	Eupithecia absinthiata	FORM	TRUE
Hypsopygia nostralis	Ocrasa nostralis	SPECIES	TRUE
Lithacodia uncula	Deltote uncula	SPECIES	TRUE
Lysandra bellargus	Polyommatus bellargus	SPECIES	TRUE
Lysandra coridon	Polyommatus coridon	SPECIES	TRUE
Macrosaccus robiniella	Phyllonorycter robiniella	SPECIES	TRUE
Mythimna sicula f scirpi	Mythimna sicula	FORM	TRUE
Nebula salicata	Coenoteophria salicata	SPECIES	TRUE
Pempelia formosa	Rhodophaea formosa	SPECIES	TRUE
Pempelia obductella	Moitrelia obductella	SPECIES	TRUE
Pempeliella dilutella	Delplanqueia dilutella	SPECIES	TRUE
Platyperigea kadenii	Caradrina kadenii	SPECIES	TRUE
Polypogon plumigeralis	Pechipogo plumigeralis	SPECIES	TRUE
Proxenus hospes	Athetis hospes	SPECIES	TRUE
Shargacucullia lychnitis	Cucullia lychnitis	SPECIES	TRUE
Shargacucullia scrophulariae	Cucullia scrophulariae	SPECIES	TRUE
Shargacucullia verbasci	Cucullia verbasci	SPECIES	TRUE
Sinibotys butleri	Crocidophora butleri	SPECIES	TRUE
Trachycera marmorea	Acrobasis marmorea	SPECIES	TRUE

The species\_id is taken from the field speciesKey (which resolves synonyms).

We keep only species that have matchType EXACT or FUZZY and which are of rank SPECIES.

### Harmonisation of spatial reference formats

The dataset contains the following spatial information:

- x\_coordinate and y\_coordinate: decimaldegree in WGS84 format
- geographic\_uncertainty: positional uncertainty in meters (the delivered data were already filtered to include only records where the geographic\_uncertainty was less than 1000 meters)

We proceed as follows:

- determine the UTM1 square that intersects with the coordinates
- map the UTM1 square to the corresponding EEA 1 km x 1 km reference grid square
- aggregate the data (multiple observations of the same species, ..., same square, on the same day will be aggregated to the maximum number of individuals counted)

The mapping of the UTM1 square to the corresponding EEA 1 km x 1 km reference grid square was calculated in advance. To do this, we calculated the centroid of each UTM1 square in ETRS89-LAEA coordinates and determined the reference grid square that intersected with that centroid.

### Harmonisation of field names

species\_id year month day site\_id count (stage\_id)

## Observations: 2,512,043

## Variables: 8

```
## $ species_id <int> 1956599, 1956599, 1859046, 4524740, 1920712, 189484...
## $ year      <dbl> 2000, 2000, 2000, 2000, 2000, 2000, 2000, 2000, 200...
## $ month     <dbl> 1, 1, 1, 2, 2, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, ...
## $ day       <int> 4, 5, 25, 6, 27, 2, 8, 10, 10, 10, 10, 10, 10, ...
## $ julian_day <dbl> 4, 5, 25, 37, 58, 62, 68, 70, 70, 70, 70, 70, 70, 7...
## $ site_id   <chr> "1kmE3930N3134", "1kmE3930N3134", "1kmE3976N3011", ...
## $ count     <dbl> 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 2, 1, 4, 1, 1, 1, 1, ...
## $ source    <chr> "waarnemingen.be/observations.be", "waarnemingen.be..."
```

## DEMNA butterfly and moths data

### Filtering

```
## Parsed with column specification:
## cols(
##   source_file_id = col_double(),
##   spec_id = col_double(),
##   spec_id_orig = col_double(),
##   topo = col_character(),
##   taxprio = col_character(),
##   gr1 = col_character(),
##   gr2 = col_character(),
##   full_date = col_double(),
##   n = col_double(),
##   unit = col_character(),
##   det = col_double(),
##   validation = col_double(),
##   data_source = col_character(),
##   floutage = col_double()
## )

## Parsed with column specification:
## cols(
##   source_file_id = col_double(),
##   spec_id = col_double(),
##   spec_id_orig = col_double(),
##   topo = col_character(),
##   taxprio = col_character(),
##   gr1 = col_character(),
##   gr2 = col_character(),
##   full_date = col_double(),
##   n = col_double(),
##   unit = col_character(),
##   det = col_double(),
##   validation = col_double(),
##   data_source = col_character(),
##   floutage = col_double()
## )
```

- removed observations without precise date (month or year resolution):
- Removed “duplicate” rows. In the original database, these are not duplicates, but:
  1. Observations of different individuals of different sexes the same date in the same location
  2. Observations of different individuals of the same species at the same date in the same UTM square but at different locations
- Removed observations before 1980 (definitely too few) and those from 2019 (incomplete year).

- We drop the det field (which contains an identifier for observer) and validation field (we do not filter based on the validation field because common species are never formally validated in the database - pers.comm. Yvan Barbier)
- In case every variable has the same values except a different number of individuals counted, we keep only the maximum number of individuals observed per day.
- We keep only the records that have as unit: “Couple”, “Eggs laying”, “Presence”, “Specimens”, “Territory”, “unknown” (assuming that all these units correspond with IMAGO lifestage) Check dates (format YYYY-MM-DD):

### Harmonisation of species names

All species names are parsed via GBIF and checked against the GBIF taxonomic backbone. Synonyms are replaced by the accepted species name. Note that the Catalogue of Life has 96% overlap with the GBIF taxonomic backbone.

## [1] "All column names present"

Several species do not have an exact matchtype:

taxprio	rank	matchType
Thymelicus lineolus	SPECIES	FUZZY
Pieris sp.	NA	NONE
Anarta sp.	GENUS	HIGHERRANK
Cabera sp.	GENUS	HIGHERRANK
Archiearis sp.	GENUS	HIGHERRANK
Leptidea sp.	GENUS	HIGHERRANK
Apatura sp.	GENUS	HIGHERRANK
Stenoptilia zophodactyla	SPECIES	FUZZY
Pyrausta sp.	GENUS	HIGHERRANK
Hesperiidae	FAMILY	FUZZY
Colias sp.	GENUS	HIGHERRANK
Zygaena sp.	GENUS	HIGHERRANK
Thymelicus sp.	GENUS	HIGHERRANK
Pasiphila sp.	GENUS	HIGHERRANK
Acrolepiopsis assaetella	GENUS	HIGHERRANK
Hesperia sp.	GENUS	HIGHERRANK
Stigmella sp.	NA	NONE
Cydia sp.	GENUS	HIGHERRANK
Smerinthus ocellatus	SPECIES	FUZZY
Oligia sp.	GENUS	HIGHERRANK
Coleophora sp.	GENUS	HIGHERRANK
Yponomeuta rorellus	SPECIES	FUZZY
Yponomeuta sp.	GENUS	HIGHERRANK
Adela sp.	GENUS	HIGHERRANK
Pterophorus pterodactyla	SPECIES	FUZZY
Spilosoma luteum	SPECIES	FUZZY
Chloroclystis v-ata	GENUS	HIGHERRANK
Cnephasia sp.	GENUS	HIGHERRANK
Coleophora gryphipenella	SPECIES	FUZZY
Syncopacma sp.	GENUS	HIGHERRANK
Lithophane sp.	GENUS	HIGHERRANK
Cydalima perpectalis	SPECIES	FUZZY
Cydalima Perpectalis (Pyrale du buis)	NA	NONE
Ypsolopha sequela	SPECIES	FUZZY

(continued)

taxprio	rank	matchType
Dichrorampha sp.	GENUS	HIGHERRANK
Lysandra sp.	GENUS	HIGHERRANK
Acronicta sp.	GENUS	HIGHERRANK
Argynnis sp.	GENUS	HIGHERRANK
Hoplodrina sp.	GENUS	HIGHERRANK
Melitaea sp.	GENUS	HIGHERRANK
Mellicta sp.	GENUS	HIGHERRANK
Pyrgus sp.	GENUS	HIGHERRANK
Xanthorhoe sp.	GENUS	HIGHERRANK
Iolana sp.	GENUS	HIGHERRANK
Adscita sp.	GENUS	HIGHERRANK
Satyrrium sp.	NA	NONE
Perizoma sp.	GENUS	HIGHERRANK
Atrolata albofascialis	SPECIES	FUZZY
Catocala sp.	GENUS	HIGHERRANK
Polyommatus sp.	GENUS	HIGHERRANK
Limenitis sp.	GENUS	HIGHERRANK
Electrophaes sp.	GENUS	HIGHERRANK
Dahlica sp.	GENUS	HIGHERRANK
Epirrita sp.	GENUS	HIGHERRANK
Mythimna sp.	GENUS	HIGHERRANK
Phyllodesma tremulifolium	SPECIES	FUZZY
Macrosaccus robiniella	SPECIES	FUZZY
Cyclophora sp.	NA	NONE
Catoptria permutatella	SPECIES	FUZZY
Cyaniris sp.	GENUS	HIGHERRANK
Glyphipteryx equitella	SPECIES	FUZZY
Aplocera sp.	GENUS	HIGHERRANK
Archips sp.	GENUS	HIGHERRANK
Eriocrania sp.	GENUS	HIGHERRANK
Eudonia sp.	GENUS	HIGHERRANK
Stenoptilia sp.	GENUS	HIGHERRANK
Lycaena sp.	GENUS	HIGHERRANK
Nematopogon sp.	GENUS	HIGHERRANK
Boloria sp.	GENUS	HIGHERRANK
Phiaris comata	GENUS	HIGHERRANK
Nymphalis sp.	GENUS	HIGHERRANK
Phyllonorycter sp.	GENUS	HIGHERRANK
Euproctis sp.	GENUS	HIGHERRANK
Microstega pandalis	GENUS	HIGHERRANK
Elkneria pudibunda	SPECIES	FUZZY
Cuculia scrophulariae	SPECIES	FUZZY
Lasiommata sp.	GENUS	HIGHERRANK
Aricia sp.	GENUS	HIGHERRANK
Camptogramma infusata	GENUS	HIGHERRANK
Scoliopteryx sp.	GENUS	HIGHERRANK
Lampronia sp.	GENUS	HIGHERRANK
Horisme sp.	GENUS	HIGHERRANK
Ellema complana	SPECIES	FUZZY
Cuculia verbasci	SPECIES	FUZZY

(continued)

taxprio	rank	matchType
Chloroclystis sp.	GENUS	HIGHERRANK
Euxoa plecta	GENUS	HIGHERRANK
Mythimnia pallens	SPECIES	FUZZY
Gnophos obscuratus	SPECIES	FUZZY
Boarmia sp	NA	NONE
Carterocephalus sp.	GENUS	HIGHERRANK
Euxoa pelota	GENUS	HIGHERRANK
Gonepteryx sp.	GENUS	HIGHERRANK
Pseudoterpna sp.	GENUS	HIGHERRANK
Scolopteryx libatrix	SPECIES	FUZZY
Pechipogo sp	GENUS	HIGHERRANK
Harpya furcula	SPECIES	FUZZY
Melacosoma neustria	SPECIES	FUZZY
Brenthis sp.	GENUS	HIGHERRANK
Gygephila pastinum	NA	NONE
Thecla sp.	GENUS	HIGHERRANK
Hemaris sp.	GENUS	HIGHERRANK
Scythris sp.	NA	NONE
Psyche sp.	GENUS	HIGHERRANK
Ochlodes sp.	GENUS	HIGHERRANK
Plebeius sp.	GENUS	HIGHERRANK
Pararge sp.	GENUS	HIGHERRANK
Pammene regiana	NA	NONE
Phycitodes sp.	GENUS	HIGHERRANK
Hepialus sp.	GENUS	HIGHERRANK
Notodonta sp.	GENUS	HIGHERRANK
Nymphula nympheata	GENUS	HIGHERRANK
Chenille papillon	NA	NONE
Bucculatrix ulmella	SPECIES	FUZZY
Coleophora curriculipennella	GENUS	HIGHERRANK
Coleophora trochiello	SPECIES	FUZZY
Ectoedemia angustifasciella	SPECIES	FUZZY
Scotia hostilis	GENUS	HIGHERRANK
Eilema sp.	GENUS	HIGHERRANK
Eupithecia sp.	GENUS	HIGHERRANK
Thera sp.	GENUS	HIGHERRANK
Glaucopsyche sp.	GENUS	HIGHERRANK
Aphelia sp.	NA	NONE
Campaea margarita	SPECIES	FUZZY
Pseudoips prasinanus	SPECIES	FUZZY
Agrotis sp.	GENUS	HIGHERRANK
Agrotis recussa	SPECIES	FUZZY
Deltote sp.	GENUS	HIGHERRANK
Agonopterix sp	GENUS	HIGHERRANK
Cucullia sp.	GENUS	HIGHERRANK
Amphipoea sp.	GENUS	HIGHERRANK
Idaea sp.	GENUS	HIGHERRANK
Mesapamea sp.	GENUS	HIGHERRANK
Amphipyra sp.	GENUS	HIGHERRANK
Orthosia sp.	NA	NONE

(continued)

taxprio	rank	matchType
Oria sp.	GENUS	HIGHERRANK
Caryocolum sp.	GENUS	HIGHERRANK
Bryotropha sp.	GENUS	HIGHERRANK
Monopis sp.	GENUS	HIGHERRANK
Oegoconia sp.	GENUS	HIGHERRANK
Bucculatrix sp.	GENUS	HIGHERRANK
Incurvaria sp.	GENUS	HIGHERRANK
Pterophoridae sp.	FAMILY	HIGHERRANK
Noctua sp.	GENUS	HIGHERRANK
Xestia sp.	GENUS	HIGHERRANK
Noctuidae sp.	FAMILY	HIGHERRANK
Cnephasia sp.	GENUS	HIGHERRANK
Hesperiinae sp.	NA	NONE
Lamaspilis marginata	SPECIES	FUZZY
Phyllodesma ilicifolium	SPECIES	FUZZY
Bactra sp.	GENUS	HIGHERRANK
Achropleura plecta	NA	NONE
Lamproteryx suffumata	SPECIES	FUZZY
Atolmis rubicollis	SPECIES	FUZZY
Diacrisia sannia	SPECIES	FUZZY
Paracemia phegea	NA	NONE
Diachrysia stenochrysis	SPECIES	FUZZY
Coleophoridae sp.	FAMILY	HIGHERRANK
Coliophoridae sp.	NA	NONE
Acleris sp.	GENUS	HIGHERRANK
Oligotrichia striata	SPECIES	FUZZY
Erebia sp.	GENUS	HIGHERRANK
Epirrhoe sp.	GENUS	HIGHERRANK

Keeping those that are of rank species and matchType exact or fuzzy:

Some of the remaining species are synonyms.

taxprio	species	synonym
Neozephyrus quercus	Favonius quercus	TRUE
Plebeius agestis	Aricia agestis	TRUE
Shargacucullia verbasci	Cucullia verbasci	TRUE
Semiothisa clathrata	Chiasmia clathrata	TRUE
Caloptilia syringella	Gracillaria syringella	TRUE
Shargacucullia scrophulariae	Cucullia scrophulariae	TRUE
Ammobiota festiva	Arctia festiva	TRUE
Orgia antiqua	Orgyia antiqua	TRUE
Plebeius argus	Plebejus argus	TRUE
Polyommatus semiargus	Cyaniris semiargus	TRUE
Pterophorus pterodactyla	Paraplatyptilia petrodactylus	TRUE
Ectropis bistortata	Ectropis crepuscularia	TRUE
Epiblema uddmanniana	Notocelia uddmanniana	TRUE
Protodeltote pygarga	Deltote pygarga	TRUE
Zanclognatha tarsipennalis	Herminia tarsipennalis	TRUE
Plebeius argyrognomon	Plebejus argyrognomon	TRUE
Polypogon strigilata	Pechipogo strigilata	TRUE
Glaucopsyche arion	Phengaris arion	TRUE
Parastichtis ypsilon	Apterogenum ypsilon	TRUE
Trachycera marmorea	Acrobasis marmorea	TRUE
Shargacucullia lychnitis	Cucullia lychnitis	TRUE
Macrosaccus robinella	Phyllonorycter robinella	TRUE
Conobathra repandana	Acrobasis repandana	TRUE
Elkneria pudibunda	Calliteara pudibunda	TRUE
Adela degeerella	Nemophora degeerella	TRUE
Calliteara fascelina	Dicallomera fascelina	TRUE
Orgia pudibunda	Calliteara pudibunda	TRUE
Gnophos obscuratus	Charissa obscurata	TRUE
Mamestra thalassina	Lacanobia thalassina	TRUE
Parapoynx stagnata	Nymphula nitidulata	TRUE
Harpya furcula	Furcula furcula	TRUE
Lithacodia uncula	Deltote uncula	TRUE
Latronympha strigana	Lathronympha strigana	TRUE
Trachycera advenella	Acrobasis advenella	TRUE
Agrotis recussa	Agrotis segetum	TRUE
Chortodes pygmina	Denticucullus pygmina	TRUE
Idaea antiquaria	Idaea macilentaria	TRUE

The species\_id is taken from speciesKey (which resolves synonyms).

## Harmonisation of spatial reference formats

The DEMNA data contains UTM1 tags. We only need to map the UTM1 tags to the reference grid.

## Harmonisation of field names

```
## Observations: 247,493
## Variables: 8
## $ species_id <int> 1894840, 1930110, 4299368, 5135513, 1920496, 189828...
## $ year      <dbl> 2004, 2002, 1999, 2007, 2007, 2007, 2006, 2006, 200...
## $ month     <dbl> 3, 2, 9, 8, 8, 8, 6, 5, 6, 7, 8, 5, 7, 7, 8, 8, 7, ...
## $ day       <int> 30, 10, 11, 5, 5, 5, 24, 28, 10, 20, 11, 28, 19, 20...
## $ julian_day <dbl> 90, 41, 254, 217, 217, 217, 175, 148, 161, 202, 223...
```



```
## $ site_id      <chr> "1kmE3817N3095", "1kmE3818N3094", "1kmE3818N3094", ...
## $ count       <dbl> 1, 2, 1, 1, 1, 1, 5, 3, 4, 6, 1, 1, 5, 1, 1, 1, 2, ...
## $ source      <chr> "DEMNA", "DEMNA", "DEMNA", "DEMNA", "DEMNA", "DEMNA..."
```

## INBO butterfly data

### Filtering

- We removed records at UTM5 resolution
- We kept only records that have lifestage corresponding with IMAGO (i.e. “adult”, “adult mannetje” and “adult wijfje”)
- We removed records that have neither Lambert coordinates nor UTM1 tag
- We removed records not at day resolution
- We removed variable “Waarnemer”
- In case every variable has the same values except a different number of individuals counted, we keep only the maximum number of individuals observed per day.
- We removed observations older than 1980

### Harmonisation of species names

All species names are parsed via GBIF and checked against the GBIF taxonomic backbone. Synonyms are replaced by the accepted species name. Note that the Catalogue of Life has 96% overlap with the GBIF taxonomic backbone.

```
## [1] "All column names present"
```

All names could be parsed.

The following names are synonyms in the GBIF taxonomic backbone:

Wetenschappelijke naam	species	rank	synonym
Plebeius argus	Plebejus argus	SPECIES	TRUE
Plebeius idas	Plebejus idas	SPECIES	TRUE

The species\_id is taken from the field speciesKey (which resolves synonyms).

We keep only species that are of matchType EXACT or FUZZY and have rank SPECIES.

### Harmonisation of spatial reference formats

If the records have LamX/LamY:

- assign UTM1 tag
- map UTM1 tag to EEA reference grid

If the records only have UTM1 tag:

- map to EEA reference grid

### Harmonisation of field names

```
## Observations: 330,750
## Variables: 8
## $ species_id <int> 4535827, 4535827, 4535827, 4535827, 4535827, 453582...
## $ year      <dbl> 1993, 1993, 1993, 2002, 2002, 2002, 2002, 2002, 200...
## $ month     <dbl> 3, 3, 3, 3, 4, 4, 7, 7, 7, 8, 8, 8, 8, 9, 4, 4, 5, ...
## $ day       <int> 15, 15, 20, 27, 17, 25, 22, 29, 30, 4, 10, 13, 16, ...
## $ julian_day <dbl> 74, 74, 79, 86, 107, 115, 203, 210, 211, 216, 222, ...
## $ site_id   <chr> "1kmE3910N3107", "1kmE3911N3111", "1kmE3854N3095", ...
## $ count     <dbl> 2, 10, 2, 1, 4, 1, 1, 2, 1, 1, 2, 2, 2, 1, 1, 1, 1, ...
```

```
## $ source      <chr> "INBO", "INBO", "INBO", "INBO", "INBO", "INBO", "IN..."
```

## Combined datasets

Removed one species of order Trichoptera.

wrong species id	correct species id	species name
1946874	1946844	Ochlodes venata
4535447	6221746	Speyeria aglaia
5881450	4535827	Aglais io
4535434	7809779	Fabriciana adippe

Only the second number was used as species id; the records that had the first number were converted to the second number.

We exclude species that are much too rare for a SOM analysis (less than 200 records in total: this is very liberal; during the actual SOM analysis phase, much more species will likely be removed). A record is here a unique combination of km-square, year, month, day and datasource.

```
## Joining, by = "species_id"
```

species_id	n	species
4531690	198	Nymphula nitidulata
1988064	197	Menophra abruptaria
1789076	196	Hecatera dysodea
1890703	196	Pyrausta nigrata
4528813	196	Mompha jurassicella
1740185	195	Acleris laterana
1839893	195	Pleurota bicostella
4523570	195	Mesotype didymata
7446048	195	Anania stachydalis
1857829	193	Monopis crocicapitella
1847956	192	Parachronistis albiceps
1825156	191	Cerura vinula
1741340	190	Notocelia trimaculana
1744136	190	Orthotaenia undulana
1848669	188	Neofaculta ericetella
1852751	187	Blastobasis phycidella
1969954	187	Triphosa dubitata
4525777	187	Synanthedon myopaeformis
8313553	186	Eudemis porphyra
1739980	185	Acleris logiana
4522891	183	Cauchas fibulella
7675186	183	Choreutis nemorana
1740567	182	Lobesia reliquana
1772940	182	Euxoa tritici
1957012	182	Earophila badiata
1830241	181	Argyresthia conjugella
1845270	181	Ethmia bipunctella
1940838	181	Bembecia ichneumoniformis
1860983	180	Adela cuprella
5772349	180	Xestia ditrapezium

(continued)

species_id	n	species
1782726	179	Acronicta alni
1962516	179	Dysstroma citrata
1732452	178	Trichiura crataegi
4523883	178	Pasiphila chloerata
4534429	178	Globia sparganii
1891326	177	Agrotera nemoralis
5132183	176	Limenitis populi
1744498	175	Phalonidia manniana
1986452	175	Xanthorhoe biriviata
4530002	174	Cydia strobilella
8049962	174	Nascia ciliaris
1744731	173	Apotomis capreana
4528658	173	Alabonia geoffrella
1846236	171	Mompha raschkiella
8027817	171	Photedes extrema
1749635	170	Phyllocnistis unipunctella
1830802	170	Cedestis subfasciella
1792383	168	Photedes minima
1854237	168	Bankesia conspurcatella
1737753	167	Cydia nigricana
7901063	167	Yponomeuta sedella
1740120	165	Acleris rhombana
1745816	165	Epinotia brunnichana
1852956	165	Batrachedra praeangusta
5771243	165	Ancylis unculana
8352161	165	Spodoptera exigua
1857856	164	Monopis weaverella
5122037	164	Aristotelia ericinella
1751368	163	Bucculatrix ulmella
5772202	163	Mythimna pudorina
1759667	161	Lithophane socia
1789982	161	Agrochola litura
4524403	161	Aleucis distinctata
4532405	161	Lygephila pastinum
1858163	160	Tinea pellionella
1963306	160	Thalera fimbrialis
4534458	160	Lenisa geminipuncta
1993419	159	Thyris fenestrella
1749948	157	Phyllonorycter harrisella
1766210	157	Amphipyra tragopoginis
1850386	157	Gelechia muscosella
1963011	157	Orthonama vittata
1778596	155	Chilodes maritima
1888826	155	Pediasia fascelinella
4525422	154	Paraswammerdamia nebulella
4534681	152	Heliothis peltigera
1736565	151	Grapholita janthinana
1739381	151	Rhyacionia buoliana
1743867	151	Pandemis dumetana
1879630	151	Eudonia truncicolella

(continued)

species_id	n	species
1970512	150	Nycterosea obstipata
4529003	150	Pseudatemelia josephinae
5104641	150	Dichelia histrionana
1749929	149	Phyllonorycter maestingella
1884332	149	Catoptria permutatellus
1771385	148	Amphipoea oculatea
1856668	148	Nemapogon cloacella
4531284	148	Pempelia palumbella
5880563	148	Macaria signaria
1746775	147	Archips oporana
1749936	147	Phyllonorycter platani
1782841	147	Acronicta strigosa
1795452	147	Pachetra sagittigera
1846149	146	Mompha ochraceella
1959383	146	Philereme vetulata
1975793	146	Anticlea derivata
8262357	146	Eupithecia exigua
1841813	145	Scythris limbella
5122206	145	Athrips mouffetella
1870202	144	Anerastia lotella
5107644	144	Zygaena viciae
4522322	142	Heterogenea asella
5118896	142	Drymonia dodonaea
1838969	141	Luquetia lobella
1789849	140	Archanara dissoluta
5110200	140	Calamia tridens
5120675	140	Coleophora mayrella
1748456	139	Capua vulgana
1762244	139	Simyra albovenosa
1782948	139	Acronicta psi
1786525	139	Paradiarsia glareosa
8026858	139	Eupithecia pygmaeata
1779641	138	Pyrrhia umbra
1825539	138	Leucodonta bicoloria
1879452	138	Duponchelia fovealis
1772793	137	Pechipogo strigilata
1972434	137	Operophtera fagata
9784392	137	Zophodia grossulariella
5881471	136	Melitaea aurelia
1732565	135	Gastropacha quercifolia
1851347	135	Chrysoesthia drurella
5145260	135	Scopula immorata
1858775	134	Stenoptilia pterodactyla
1924713	133	Lampides boeticus
4529871	133	Phiaris micana
1847407	132	Dichomeris marginella
4532516	132	Paracolax tristalis
1825083	131	Notodonta torva
1877310	131	Dioryctria sylvestrella
1848610	130	Recurvaria nanella

(continued)

species_id	n	species
1851555	130	Hypatima rhomboidella
1849897	129	Scrobipalpa costella
1869459	129	Epermenia falciformis
1882437	128	Scoparia basistrigalis
4523880	128	Pasiphila debiliata
8532380	127	Anania perlucidalis
1736945	126	Gypsonoma oppressana
1744789	126	Pammene fasciana
1745579	125	Epinotia subocellana
1822613	125	Furcula bicuspis
1886587	125	Sitochroa verticalis
4529896	125	Pseudohermenias abietana
1745788	124	Epinotia rubiginosana
1797479	124	Catocala fraxini
1841460	124	Enolmis acanthella
4525487	124	Argyresthia bonnetella
1738839	123	Dichrorampha acuminatana
1741667	123	Cochylis hybridella
1829578	123	Acrolepia autumnitella
4528673	123	Metalampra cinnamomea
4530138	123	Bactra lancealana
1972185	122	Perizoma albulata
4522919	122	Nematopogon robertella
5103998	122	Eupoecilia ambiguella
1745558	121	Epinotia solandriana
1859177	121	Platyptilia gonodactyla
1751457	120	Bucculatrix thoracella
1852177	120	Acompsia cinerella
1940807	120	Pennisetia hylaeiformis
1822587	119	Furcula bifida
1833626	119	Oecophora bractella
1749869	118	Phyllonorycter roboris
1751298	117	Bucculatrix nigricomella
1795946	117	Apamea sublustis
1959395	117	Philereme transversata
1964195	117	Catarhoe cuculata
1967011	117	Rhodostrophia vibicaria
1983000	117	Eupithecia pulchellata
5104558	117	Paramesia gnomana
1750143	116	Phyllonorycter quercifoliella
1848150	116	Psoricoptera gibbosella
1849630	116	Teleiopsis diffinis
1861395	116	Endromis versicolora
4522927	116	Incurvaria oehlmanniella
1920491	114	Pieris manni
1745762	113	Epinotia granitana
1779334	113	Naenia typica
1784812	113	Hoplodrina respersa
4528692	113	Crassa tinctella
1874743	112	Ancylosis oblitella

(continued)

species_id	n	species
1848741	111	Bryotropha domestica
5101678	111	Malacosoma castrensis
5120577	111	Coleophora trifolii
1796463	110	Calophasia lunula
4523560	110	Epirrita autumnata
4527209	110	Ectoedemia decentella
4528679	110	Bisigna procerella
4535884	109	Bucculatrix bechsteinella
4522922	108	Nematopogon metaxella
4532508	108	Zanclognatha lunalis
5117189	108	Coscinia cribraria
1835432	107	Semioscopis steinkellneriana
1871160	107	Salebriopsis albicilla
5772199	107	Mythimna conigera
1830131	106	Argyresthia albistria
1847572	104	Isophrictis striatella
1736425	103	Spatalistis bifasciana
1754332	103	Rhagades pruni
1832927	103	Elachista apicipunctella
4528774	103	Dasycera oliviella
5149659	103	Cyclophora porata
1749883	102	Phyllonorycter nicellii
1889833	102	Palpita vitrealis
4531158	102	Acrobasis marmorea
4533360	102	Mniotype satura
1736411	101	Strophedra weirana
1759597	101	Lithophane semibrunnea
1766131	101	Amphipyra perflua
1776371	101	Polia bombycina
1792996	101	Peridroma saucia
1830879	101	Eidophasia messingiella
1983170	101	Eupithecia inturbata
1830408	100	Yponomeuta irrorella
1961040	100	Chlorissa viridata
5105088	100	Caloptilia populetorum
1736377	99	Lozotaenia forsterana
5771256	99	Ancyliis uncella
1751051	98	Acrocercops brongniardella
1857863	98	Monopis laevigella
1870988	98	Achroia grisella
4530148	98	Notocelia roborana
5121177	98	Coleophora alcyonipennella
1745630	97	Epinotia tetraquetra
1749650	97	Phyllocnistis xenia
1749744	97	Phyllonorycter ulmifoliella
1983387	97	Eupithecia insigniata
4522970	97	Boudinotiana notha
7734292	97	Schreckensteinia festaliella
1738317	96	Aethes rubigana
1739797	96	Acleris bergmanniana

(continued)

species_id	n	species
1857626	96	Tineola bisselliella
1887701	96	Diasemia reticularis
5103736	96	Eucosma metzneriana
4525530	95	Ypsolopha nemorella
1731598	94	Phragmataecia castaneae
1744693	94	Apotomis lineana
1796139	94	Apamea epomidion
4536472	94	Gillmeria pallidactyla
1749959	93	Phyllonorycter coryli
1849924	93	Scrobipalpa ocellatella
1911112	93	Coenonympha tullia
5141501	93	Sesia bembeciformis
1857828	92	Monopis monachella
1846885	91	Eulamprotes atrella
1978056	91	Jodis putata
5143391	91	Alcis bastelbergeri
5146496	91	Idaea sylvestraria
8424972	91	Phtheochroa rugosana
1861031	89	Adela violella
1734704	88	Lasiocampa trifolii
1749596	88	Phyllocnistis saligna
1768729	88	Conistra ligula
1783037	88	Acronicta menyanthidis
1848273	88	Anacamptis populella
5121517	88	Coleophora serratella
1830147	87	Argyresthia curvella
1849284	87	Carpatolechia alburnella
4533285	87	Polymixis lichenea
1736412	86	Strophedra nitidana
5769709	86	Stigmella aurella
1745724	85	Epinotia trigonella
1842485	85	Cosmopterix zieglerella
4525557	85	Ypsolopha alpella
5121212	85	Coleophora artemisicolella
1741748	84	Endothenia marginana
4534046	84	Sideridis turbida
1749975	83	Phyllonorycter muelleriella
9262981	83	Anarsia innoxia
1746027	82	Phtheochroa inopiana
1746856	82	Archips rosana
1846604	82	Pexicopia malvella
4523725	82	Hydria cervinalis
5109748	82	Cucullia scrophulariae
5145186	82	Scopula rubiginata
1744860	81	Pammene giganteana
1854347	81	Epichnopterix plumella
1860979	81	Adela croesella
1846107	80	Mompha locupletella
1848717	80	Bryotropha basaltinella
1964191	80	Catarhoe rubidata

(continued)

species_id	n	species
1982529	80	Eupithecia lanceata
4527903	80	Pseudotelphusa paripunctella
1739449	79	Cochylidia rupicola
1846159	79	Mompha propinquella
1860688	79	Incurvaria pectinea
4532095	79	Udea lutealis
1738687	78	Dichrorampha simpliciana
1745830	78	Epinotia cruciana
1848713	78	Bryotropha senectella
1861510	78	Acherontia atropos
5104829	78	Caloptilia falconipennella
5146510	78	Idaea laevigata
7993353	78	Eupithecia valerianata
1760891	77	Aporophyla nigra
1846896	77	Eulamprotes wilkella
4522791	77	Lampronia capitella
4531975	77	Paratalanta hyalinalis
1766418	76	Oligia versicolor
1941437	76	Chamaesphecia empiformis
5112254	76	Xestia agathina
5772206	76	Mythimna vitellina
5113030	75	Schrankia taenialis
1739128	74	Cnephasia incertana
1739461	73	Cochylidia implicitana
1883386	73	Cynaeda dentalis
4528547	73	Dichomeris derasella
5104781	73	Caloptilia rufipennella
5104862	73	Caloptilia roscipennella
5109661	73	Cucullia verbasci
5149784	73	Cyclophora ruficiliaria
1738739	72	Dichrorampha flavidorsana
1739272	72	Cnephasia stephensiana
1745787	72	Epinotia nanana
1749886	72	Phyllonorycter robiniella
1835457	72	Semioscopis avellanella
1845565	72	Ethmia dodecea
1850335	72	Gelechia sororculella
5119143	72	Ptilophora plumigera
1939688	71	Micropterix aureatella
1964637	71	Epirrhoe galiata
4530632	71	Periclepsis cinctana
1741756	70	Endothenia nigricostana
1744742	70	Apotomis sororculana
1852430	70	Stenolechia gemmella
1878782	70	Mecyna flavalis
4525543	70	Ypsolopha sylvella
5115818	70	Arctia villica
4531242	69	Ortholepis betulae
5103502	69	Eucosma obumbratana
5120767	69	Coleophora laricella



(continued)

species_id	n	species
1732685	68	Phyllodesma tremulifolia
1738050	68	Cymolomia hartigiana
1738429	68	Aethes tesserana
1741545	68	Olindia schumacherana
1820039	68	Leucoma salicis
1765954	67	Dicycla oo
4529900	67	Celypha aurofasciana
5147354	67	Idaea ochrata
5771232	67	Ancylis unguicella
1764987	66	Caradrina gilva
1799708	66	Hypenodes humidalis
1830372	66	Swammerdamia pyrella
1846729	66	Monochroa tenebrella
1875952	66	Phycitodes maritima
1744808	65	Pammene argyrana
1967273	65	Aspitates gilvaria
4532297	65	Dicallomera fascelina
1737893	64	Cydia succedana
1760246	64	Phytometra viridaria
1848686	63	Bryotropha desertella
1850506	63	Pseudotelphusa scalella
4525354	63	Orthotelia sparganella
1735532	62	Opostega salaciella
1738163	62	Isotrias rectifasciana
4534762	62	Meganola strigula
1744785	61	Pammene obscurana
1751236	61	Bucculatrix cidarella
1840570	61	Agonopterix purpurea
1878469	61	Ephestia unicolorella
1939658	61	Micropterix tunbergella
4531246	61	Dioryctria schuetzeella
4535904	61	Bucculatrix frangutella
5120465	61	Metriotes lutarea
1750157	60	Phyllonorycter geniculella
1848864	60	Metzneria lappella
1963463	60	Chloroclysta miata
1983548	60	Eupithecia innotata
4529630	60	Hypatopa binotella
1748321	59	Aphelia paleana
1829823	59	Glyphipterix forsterella
1856909	59	Dryadaula heindeli
1957746	59	Scotopteryx luridata
4529064	59	Depressaria radiella
4531296	59	Matilella fusca
1750076	58	Phyllonorycter rajella
1789755	58	Noctua orbona
1849294	58	Carpatolechia fugitivella
1875827	58	Nyctegretis lineana
1940768	58	Synanthedon sphecoformis
4302268	58	Spargania luctuata

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species_id	n	species
4528808	58	Mompha sturnipennella
1982406	57	Eupithecia lariciata
1983997	57	Eupithecia abietaria
1856692	56	Nemapogon wolffiella
1965208	56	Euphyia biangulata
1967597	56	Paradarisa consonaria
1745678	55	Epinotia abbreviana
1796113	55	Apamea anceps
1830243	55	Argyresthia pygmaeella
1842695	55	Pancalia leuwenhoekella
1983645	55	Eupithecia trisignaria
4528818	55	Mompha langiella
5120668	55	Coleophora alticolella
1737783	54	Cydia conicolana
1743588	54	Epiblema scutulana
1749921	54	Phyllonorycter corylifoliella
1831752	54	Bedellia somnulentella
1837390	54	Depressaria albipunctella
1840485	54	Agonopterix conterminella
5769164	54	Choreutis pariana
5770922	54	Denisia stipella
5771230	54	Ancylis tineana
1740005	53	Acleris hyemana
1798372	53	Hyppa rectilinea
1846894	53	Eulamprotes unicolorella
1850008	53	Sophronia semicostella
1854792	53	Proutia betulina
1739931	52	Acleris literana
1849945	52	Scrobipalpa acuminatella
1978375	52	Ecliptopera capitata
6097235	52	Epiblema sticticana
1846117	51	Mompha miscella
1739748	50	Acleris ferrugana
1840502	50	Agonopterix assimilella
1847097	50	Dichomeris ustalella
1858637	50	Cnaemidophorus rhododactyla
4526048	50	Narycia duplicella
5121658	50	Coleophora otidipennella
5772446	50	Polia hepatica
1839851	49	Pleurota aristella
1847610	49	Anarsia spartiella
1856684	49	Nemapogon ruricolella
1858762	49	Stenoptilia zophodactylus
5105176	49	Caloptilia fidella
5116669	49	Eilema pygmaeola
5121339	49	Coleophora flavipennella
5126675	49	Anania funebris
1841158	48	Batia lambdella
1982525	48	Eupithecia subumbrata
8251618	48	Phycitodes binaevella

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species_id	n	species
1737552	47	Hedya ochroleucana
1977068	47	Rheumaptera hastata
4525856	47	Pyropteron affine
4531060	47	Moitrelia obductella
7521885	47	Bryophila raptricula
8254441	47	Leucoptera spartifoliella
1736485	46	Grapholita lobarzewskii
1741147	46	Cochylimorpha straminea
1831168	46	Plutella porrectella
1847296	46	Dichomeris alacella
1870249	46	Aphomia zelleri
4527957	46	Stenolechiodes pseudogemmellus
4534540	46	Crypsedra gemmea
5108761	46	Callopietria juvenina
1747738	45	Bactra furfurana
1749954	45	Phyllonorycter klemannella
1848426	45	Brachmia inornatella
1875869	45	Selagia spadicella
4525425	45	Paraswammerdamia albicapitella
5120916	45	Coleophora albitarsella
5121920	45	Syncopacma larseniella
5148436	45	Thera variata
5769761	45	Stigmella microtheriella
5769799	45	Stigmella splendidissimella
7624468	45	Drymonia velitaris
1738883	44	Retinia resinella
1739284	44	Cnephasia asseclana
1742346	44	Ptycholomoides aeriferana
1744748	44	Apotomis sauciana
1792061	44	Egira conspicillaris
1830359	44	Swammerdamia caesiella
1833004	44	Elachista rufocinerea
1852311	44	Thiotricha subocellea
1854286	44	Luffia ferchaultella
1875633	44	Vitula biviella
1892254	44	Eurrhyncha hortulata
1983999	44	Eupithecia simplicata
4529913	44	Celypha rivulana
4532239	44	Eublemma purpurina
5105158	44	Caloptilia elongella
1744829	43	Pammene albuginana
1759055	43	Lacanobia contigua
1786902	43	Antitype chi
1840621	43	Agonopterix scopariella
1852118	43	Phthorimaea operculella
4529861	43	Phiaris palustrana
5110670	43	Eremobia ochroleuca
8273859	43	Coleophora striatipennella
1731826	42	Eriocrania semipurpurella
1737368	42	Clepsis pallidana

(continued)

species_id	n	species
1740053	42	Acleris aspersana
1765765	42	Melanchra pisi
1856005	42	Niditinea fuscella
1875865	42	Selagia argyrella
4527342	42	Pseudopostega auritella
8193671	42	Anania terrealis
1739775	41	Acleris shepherdana
1749894	41	Phyllonorycter esperella
1873639	41	Khorassania compositella
4524393	41	Phibalapteryx virgata
4534538	41	Litoligia literosa
5106940	41	Zygaena transalpina
5121105	41	Coleophora hemerobiella
1750051	40	Phyllonorycter trifasciella
1795957	40	Apamea aquila
1846133	40	Mompha idaei
1862728	40	Hyles gallii
1881208	40	Xanthocrambus saxonellus
4528099	40	Tuta absoluta
4529854	40	Phiaris bipunctana
5120990	40	Coleophora caespititiella
5148394	40	Thera vetustata
5769737	40	Stigmella tityrella
5771258	40	Ancylis upupana
8426357	40	Zygaena lonicerae
1743619	39	Epiblema costipunctana
1750106	39	Phyllonorycter oxyacanthae
1826022	39	Odontosia carmelita
1850781	39	Platyedra subcinerea
1878490	39	Ephestia kuehniella
1983888	39	Eupithecia phoeniceata
5121027	39	Coleophora lutipennella
5148247	39	Theria rupicaprararia
5772180	39	Mythimna litoralis
7391741	39	Satyrium spini
7642240	39	Merrifieldia baliodactylus
8345820	39	Notocelia incarnatana
1737924	38	Cydia inquinatana
1749050	38	Callisto denticulella
1771531	38	Tholera cespitis
1850533	38	Helcystogramma lutatella
1858531	38	Stenoptinea cyaneimarmorella
1869852	38	Apomyelois bistriatella
1737342	37	Clepsis senecionana
1737966	37	Cydia cosmophorana
1738819	37	Dichrorampha agilana
1739919	37	Acleris umbrana
1740155	37	Acleris schalleriana
1838805	37	Borkhausenia luridicomella
1841616	37	Scythris scopolella

(continued)

species_id	n	species
1850267	37	Teleiodes sequax
1877361	37	Dioryctria simplicella
1949784	37	Pyrgus armoricanus
1983441	37	Eupithecia satyrata
4522925	37	Incurvaria praelatella
4525364	37	Cedestis gyssemiella
4529225	37	Spuleria flavicaput
5102287	37	Odonestis pruni
5116416	37	Nudaria mundana
1759686	36	Lithophane lamda
1850108	36	Caryocolum blandella
1957266	36	Larentia clavaria
5103421	36	Eucosma hohenwartiana
1740518	35	Lobesia littoralis
1746666	35	Eana argentana
1750056	35	Phyllonorycter comparella
1848202	35	Ptocheuusa paupella
1849795	35	Scrobipalpa salinella
1852159	35	Mirificarma interrupta
1940717	35	Synanthedon andrenaeformis
1983558	35	Eupithecia plumbeolata
5109498	35	Cucullia chamomillae
6097243	35	Coleophora lineolea
8235840	35	Crambus silvella
1736727	34	Gravitarmata margarotana
1744714	34	Apotomis semifasciana
1751299	34	Bucculatrix ainsliella
1773309	34	Euxoa cursoria
1840408	34	Agonopterix ciliella
1848868	34	Metzneria metzneriella
1860063	34	Crombrugghia distans
5120696	34	Coleophora ibipennella
5121698	34	Coleophora pyrrhulipennella
5771797	34	Platytes cerussella
6097241	34	Coleophora pennella
7975250	34	Eucosma aspidiscana
1738777	33	Dichrorampha plumbana
1739816	33	Acleris comariana
1769958	33	Eurois occulta
1859872	33	Capperia britanniodactylus
9782192	33	Ancylosis cinnamomella
1750244	32	Phyllonorycter lautella
1795854	32	Apamea lateritia
1832862	32	Elachista biatomella
5126052	32	Homoeosoma sinuella
7851302	32	Nemophora ochsenheimerella
1736504	31	Grapholita gemmiferana
1738514	31	Aethes hartmanniana
1738722	31	Dichrorampha alpinana
1738829	31	Dichrorampha aeratana

(continued)

species_id	n	species
1743546	31	Epiblema hepaticana
1749984	31	Phyllonorycter sorbi
1771204	31	Agrotis ripae
1771437	31	Amphipoea fucosa
1833153	31	Elachista subocellea
1860408	31	Prochoreutis myllerana
1962972	31	Chesias rufata
4530424	31	Endothenia gentianaeana
4532471	31	Catocala fulminea
5144787	31	Scopula tessellaria
5146862	31	Idaea dilutaria
1737761	30	Cydia illutana
1739290	30	Cnephasia longana
1750144	30	Phyllonorycter tenerella
1750159	30	Phyllonorycter leucographella
1830262	30	Argyresthia sorbiella
1830498	30	Pseudoswammerdamia combinella
1840360	30	Agonopterix nervosa
1842196	30	Sorhagenia rhamniella
1852150	30	Mirificarma mulinella
1869803	30	Hypochalcia ahenella
4529248	30	Chrysoclista linneella
4530230	30	Pseudococcyx turionella
5121686	30	Coleophora glaucicolella
5149315	30	Eustroma reticulata
7919870	30	Catoptria mytilella
1744822	29	Pammene germmana
1745636	29	Epinotia signatana
1751464	29	Bucculatrix noltei
1759661	29	Lithophane furcifera
1778127	29	Senta flammea
1959467	29	Dyscia fagaria
4529186	29	Agonopterix alstromeriana
5102471	29	Stigmella tiliae
5103176	29	Ancylis badiana
5121915	29	Syncopacma taeniolella
5149787	29	Cyclophora puppillaria
5770942	29	Denisia similella
7698610	29	Stigmella aceris
1772169	28	Plusia putnami
1783016	28	Acronicta tridens
1851203	28	Neofriseria peliella
1859483	28	Hellinsia carphodactyla
1878470	28	Ephestia elutella
1982867	28	Eupithecia selinata
4525187	28	Coptotriche angusticolllella
5119513	28	Zelleria hepariella
5771239	28	Ancylis myrtillana
5772309	28	Chloantha hyperici
6097239	28	Coleophora spinella

(continued)

species_id	n	species
7753668	28	Scopula emutaria
1743768	27	Celypha cespitana
1779435	27	Brachionycha nubeculosa
1862719	27	Hyles euphorbiae
4522793	27	Lampronia fuscata
4524951	27	Charissa obscurata
5121046	27	Coleophora discordella
5121495	27	Coleophora peribenanderi
5123582	27	Phylloporia bistrigella
1750072	26	Phyllonorycter emberizaepenella
1766814	26	Chersotis multangula
1770573	26	Sedina buettneri
1780926	26	Polymixis flavicincta
1833084	26	Elachista atricomella
1846715	26	Monochroa lucidella
1983111	26	Eupithecia egenaria
4533347	26	Mniotype adusta
4535888	26	Bucculatrix chrysanthemella
5109599	26	Cucullia absinthii
5121287	26	Coleophora argentula
5769789	26	Stigmella hemargyrella
5772186	26	Mythimna sicula
7508270	26	Mompha conturbatella
1751290	25	Bucculatrix demaryella
1814630	25	Dysauxes ancilla
1842542	25	Cosmopterix scribaiella
1846207	25	Mompha divisella
1878513	25	Ephestia parasitella
1982526	25	Eupithecia expallidata
4525266	25	Eriogaster lanestris
4529924	25	Celypha rosaceana
5104797	25	Caloptilia hemidactylella
5120751	25	Coleophora alnifoliae
5137915	25	Leptidea reali
1738790	24	Dichrorampha sedatana
1738794	24	Dichrorampha vancouverana
1744777	24	Pammene populana
1748900	24	Aspilapteryx limosella
1749775	24	Phyllonorycter stettinensis
1788635	24	Catephia alchymista
1792414	24	Autographa bractea
1833096	24	Elachista pollinariella
1840345	24	Agonopterix angelicella
1853066	24	Blastodacna hellerella
1853587	24	Sterrhopterix fusca
1859471	24	Hellinsia didactylites
1988602	24	Colostygia multistrigaria
4530228	24	Pseudococcyx posticana
5884571	24	Rhyparia purpurata
1739072	23	Cnephasia genitalana

(continued)

species_id	n	species
1741590	23	Cochylis molliculana
1749105	23	Micrurapteryx kollariella
1749158	23	Parornix anglicella
1749801	23	Phyllonorycter sagitella
1751216	23	Tinagma perdicella
1760857	23	Aporophyla australis
1767608	23	Abrostola asclepiadis
1831780	23	Ochsenheimeria taurella
1840478	23	Agonopterix subpropinquella
1846657	23	Monochroa cytisella
1858778	23	Stenoptilia bipunctidactyla
1884212	23	Donacula mucronella
1979430	23	Hydriomena ruberata
1982790	23	Eupithecia semigraphata
4525177	23	Prochoreutis sehestediana
4527297	23	Ectoedemia septembrella
5121613	23	Coleophora deauratella
5146659	23	Idaea serpentata
5769735	23	Stigmella floslactella
1790625	22	Rhyacia simulans
1845368	22	Ethmia terminella
1856730	22	Nemapogon clematella
1857577	22	Trichophaga tapetzella
1858868	22	Oxyptilus chrysodactyla
1859952	22	Oidaematophorus lithodactyla
1971986	22	Horisme radicularia
4522952	22	Antispila treitschkiella
4529848	22	Phiaris schulziana
4530798	22	Gynnidomorpha alismana
5102527	22	Stigmella ulmivora
5121032	22	Coleophora albidella
5121136	22	Coleophora lusciniapennella
5123339	22	Tebenna micalis
5147150	22	Idaea inquinata
5769716	22	Stigmella lemniscella
6097225	22	Elachista subalbidella
6097246	22	Coleophora follicularis
7903078	22	Zygaena carniolica
8292872	22	Syngrapha interrogationis
1731837	21	Eriocrania sparrmannella
1737770	21	Cydia coniferana
1744763	21	Pammene rhediella
1749908	21	Phyllonorycter kuhlweiniella
1750097	21	Phyllonorycter joannisi
1782777	21	Acronicta megacephala
1837420	21	Depressaria depressana
1850998	21	Chionodes distinctella
1873780	21	Sciota hostilis
1882210	21	Loxostege sticticalis
1969339	21	Gnophos furvata



(continued)

species_id	n	species
1982770	21	Eupithecia millefoliata
4524043	21	Coenoteophria salicata
4525505	21	Ypsolopha mucronella
4526094	21	Dahlica triquetrella
4527277	21	Ectoedemia hannoverella
4528563	21	Acompsia schmidtiiellus
4530214	21	Zeiraphera griseana
5112345	21	Xestia stigmatica
5147638	21	Trichopteryx polycommata
1732662	20	Phyllodesma ilicifolia
1739077	20	Cnephasia communana
1739999	20	Acleris lipsiana
1744541	20	Phalonidia affinitana
1749146	20	Parornix devoniella
1750317	20	Dialectica imperialella
1784824	20	Hoplodrina superstes
1790692	20	Tyta luctuosa
1829363	20	Lyonetia prunifoliella
1850302	20	Gelechia nigra
1859421	20	Agdistis bennetii
1880143	20	Crambus uliginosellus
4527339	20	Pseudopostega crepusculella
5104772	20	Caloptilia betulicola
5121807	20	Coleophora trochilella
5122113	20	Aristotelia brizella
5769760	20	Stigmella plagicolella
5804895	20	Leptidea juvernica
6097245	20	Coleophora kuehnella
1759077	19	Lacanobia splendens
1830584	19	Ocnerostoma friesei
1840555	19	Agonopterix liturosa
1848672	19	Neofaculta infernella
1939449	19	Tischeria dodonaea
1957632	19	Scotopteryx mucronata
1988684	19	Colostygia olivata
4523556	19	Epirrita christyi
5121244	19	Coleophora lixella
6097240	19	Coleophora anatipenella
7940157	19	Aporophyla lutulenta
1735864	18	Ectoedemia rubivora
1737816	18	Cydia pactolana
1739788	18	Acleris lorquiniana
1744869	18	Pammene ignorata
1744901	18	Pammene trauniana
1749199	18	Parornix betulae
1749766	18	Phyllonorycter salicicolella
1749901	18	Phyllonorycter heegeriella
1759321	18	Paradrina selini
1786619	18	Episema glaucina
1851337	18	Chrysoesthia sexguttella

(continued)

species_id	n	species
1859100	18	Platyptilia calodactyla
1957706	18	Scotopteryx moeniata
1972342	18	Perizoma bifaciata
4525547	18	Ypsolopha vittella
5119809	18	Orophia sordidella
5145136	18	Scopula ternata
5147834	18	Venusia blomeri
7429212	18	Agriopis bajaran
1744835	17	Pammene ochsenheimeriana
1745079	17	Philedone gerningana
1748336	17	Aphelia viburniana
1750100	17	Phyllonorycter acerifoliella
1750288	17	Phyllonorycter strigulatella
1751207	17	Tinagma ocnorostomella
1751209	17	Tinagma balteolella
1783855	17	Polychrysia moneta
1789840	17	Archanara neurica
1847640	17	Anarsia lineatella
1859068	17	Buckleria paludum
1875940	17	Phycitodes albatella
1880062	17	Crambus hamella
4527235	17	Ectoedemia occultella
4529688	17	Pancalia schwarzella
5121758	17	Coleophora ochrea
5769255	17	Leucoptera malifoliella
5879654	17	Korscheltellus lupulinus
7851889	17	Crambus ericella
7982428	17	Eupithecia pimpinellata
8200050	17	Merrifieldia leucodactyla
1737811	16	Cydia servillana
1838232	16	Anchinia cristalis
1850087	16	Caryocolum kroesmanniella
1860671	16	Incurvaria koernerella
4525500	16	Ypsolopha horridella
5121026	16	Coleophora potentillae
5769751	16	Stigmella salicis
7812435	16	Nemophora cupriacella
8403618	16	Adscita geryon
1738440	15	Aethes bilbaensis
1739891	15	Acleris rufana
1743475	15	Gibberifera simplana
1746644	15	Eana incanana
1748942	15	Parectopa ononidis
1764531	15	Colobochyla salicalis
1783323	15	Omphaloscelis lunosa
1785887	15	Diachrysia chryson
1848657	15	Cosmardia moritzella
1849480	15	Nothris lemniscellus
1856494	15	Infurcitinea teriolella
1858893	15	Oxyptilus parvidactyla

(continued)

species_id	n	species
1952449	15	Sabra harpagula
1957718	15	Scotopteryx bipunctaria
4522799	15	Lampronia corticella
4522954	15	Antispila metallella
4524971	15	Charissa pullata
4530108	15	Pammene gallicana
4530501	15	Acleris kochiella
5102454	15	Stigmella samiatella
5121329	15	Coleophora solitariella
5121714	15	Coleophora milvipennis
5143944	15	Alsophila aceraria
1736511	14	Grapholita jungiella
1741765	14	Endothenia ustulana
1747549	14	Pelochrista caecimaculana
1749856	14	Phyllonorycter populifoliella
1750222	14	Phyllonorycter froelichiella
1788917	14	Papestra biren
1794599	14	Lycophotia molothina
1842186	14	Sorhagenia janiszewskae
1848283	14	Anacampsis obscurella
1875429	14	Euzophera fuliginosella
1965996	14	Timandra griseata
4531318	14	Delplanqueia dilutella
4535168	14	Phengaris arion
5102507	14	Stigmella anomaella
5102531	14	Stigmella hybnerella
5112336	14	Xestia castanea
5113597	14	Cryphia muralis
5121040	14	Coleophora salicorniae
5769712	14	Stigmella trimaculella
7445110	14	Orthosia opima
8162538	14	Epinotia pygmaeana
1731858	13	Heringocrania unimaculella
1743560	13	Epiblema cirsiaria
1743613	13	Epiblema turbidana
1747833	13	Bactra robustana
1751337	13	Bucculatrix ulmifoliae
1830145	13	Argyresthia semitestacella
1841603	13	Scythris potentillella
1852978	13	Batrachedra pinicolella
1854287	13	Luffia lapidella
1861213	13	Heliozela resplendella
1886951	13	Atralata albofascialis
1975751	13	Archiearis notha
1977007	13	Rheumaptera subhastata
1984949	13	Aplocera praeformata
4523577	13	Gagitodes sagittata
4526180	13	Apterona helicoidella
4528691	13	Epicallima formosella
4534463	13	Celaena haworthii

(continued)

species_id	n	species
5117399	13	Pelosia obtusa
5122232	13	Athrips rancidella
5130587	13	Nymphalis xanthomelas
5147011	13	Idaea deversaria
5769719	13	Stigmella speciosa
5769774	13	Stigmella basiguttella
5771236	13	Ancylis geminana
1731822	12	Eriocrania cicatricella
1738337	12	Aethes margaritana
1750136	12	Phyllonorycter schreberella
1771772	12	Polypogon tentacularia
1787504	12	Actebia praecox
1803163	12	Utetheisa pulchella
1841989	12	Scythris knochella
1850265	12	Teleiodes saltuum
1855617	12	Psychoides verhuella
1859534	12	Marasmarcha lunaedactyla
1878907	12	Agriphila deliella
1957565	12	Peribatodes ilicaria
1983052	12	Eupithecia venosata
5102462	12	Stigmella malella
5102596	12	Bohemannia quadrimaculella
5103443	12	Eucosma tripoliana
5120503	12	Coleophora paripennella
5120786	12	Coleophora saturatella
5769757	12	Stigmella sakhalinella
5880147	12	Dasystoma salicella
7892804	12	Catoptria fulgidella
1736484	11	Grapholita discretana
1738334	11	Aethes francillana
1738818	11	Dichrorampha plumbagana
1739042	11	Rhopobota myrtillana
1741621	11	Cochylis roseana
1745771	11	Epinotia maculana
1748805	11	Roeslerstammia erxlebelli
1749162	11	Parornix finitimella
1749164	11	Parornix scoticella
1749904	11	Phyllonorycter blancardella
1830804	11	Atemelia torquatella
1838676	11	Aplota palpella
1848753	11	Bryotropha galbanella
1848847	11	Metzneria aestivella
1857847	11	Monopis imella
1869775	11	Hypochalcia lignella
1885213	11	Crocidophora butleri
1890701	11	Pyrausta obfuscata
1940744	11	Synanthedon culiciformis
4524070	11	Lampropteryx otregiata
4529016	11	Pseudatemelia subochreella
4529915	11	Celypha rurestrana

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species_id	n	species
5119414	11	Leucoptera laburnella
5119808	11	Orophia ferrugella
5121351	11	Coleophora lithargyrinella
5121432	11	Coleophora binderella
5121476	11	Coleophora gryphipennella
5141677	11	Heteropterus morpheus
5149704	11	Cyclophora pendularia
5769795	11	Stigmella oxyacanthella
5772201	11	Mythimna favicolor
8215326	11	Acleris abietana
8668781	11	Anania fuscalis
1738222	10	Pseudosciaphila branderiana
1741348	10	Notocelia tetragonana
1741725	10	Endothenia ericetana
1749210	10	Parornix torquillella
1749762	10	Phyllonorycter lantanella
1749880	10	Phyllonorycter spinicolella
1749943	10	Phyllonorycter tristrigella
1750226	10	Phyllonorycter salictella
1750286	10	Phyllonorycter medicaginella
1829975	10	Glyphipterix equitella
1833108	10	Elachista utonella
1835393	10	Schiffermuelleria schaefferella
1835445	10	Semioscopis oculella
1850077	10	Caryocolum marmorea
1850827	10	Mesophleps silacella
1879655	10	Eudonia lineola
1882649	10	Scoparia subfusca
1888743	10	Pediasia aridella
1920258	10	Pontia daplidice
1939680	10	Micropterix mansuetella
1940639	10	Synanthedon scoliaeformis
4525268	10	Eriogaster catax
4525503	10	Ypsolopha lucella
4526100	10	Dahlica lichenella
5104291	10	Hysterophora maculosana
5120885	10	Coleophora calycotomella
5121379	10	Coleophora taeniipennella
5121711	10	Coleophora betulella
5125960	10	Homoeosoma nebulella
5769272	10	Pharmacis fusconebulosa
9743393	10	Eusphecia melanocephala
1731820	9	Eriocrania sangii
1732521	9	Gastropacha populifolia
1735844	9	Ectoedemia albifasciella
1738512	9	Aethes piercei
1749192	9	Parornix fagivora
1749282	9	Leucospilapteryx omissella
1750256	9	Phyllonorycter cerasicolella
1786360	9	Trichoplusia ni

(continued)

species_id	n	species
1830183	9	Argyresthia glabratella
1832915	9	Elachista adscitella
1848277	9	Anacamptis timidella
1848699	9	Bryotropha umbrosella
1850106	9	Caryocolum fraternella
1882905	9	Diplopseustis perieresalis
1911125	9	Coenonympha glycerion
4522810	9	Lampronia flavimitrella
4534257	9	Caradrina selini
5109614	9	Cucullia asteris
5120470	9	Goniodoma limoniella
5120901	9	Coleophora saponariella
5121509	9	Coleophora limosipennella
5121567	9	Coleophora ramosella
5121786	9	Coleophora currucipennella
5769783	9	Stigmella roborella
6097230	9	Elachista bifasciella
7794941	9	Cnephasia pasiuana
1735850	8	Ectoedemia argyropeza
1736512	8	Grapholita tenebrosana
1736574	8	Grapholita molesta
1744903	8	Pammene juniperana
1745623	8	Epinotia sordidana
1747809	8	Bactra lacteana
1750131	8	Phyllonorycter messaniella
1773163	8	Euxoa nigricans
1790816	8	Minucia lunaris
1830133	8	Argyresthia reticulata
1846663	8	Monochroa suffusella
1846678	8	Monochroa divisella
1846878	8	Eulamprotes superbella
1849477	8	Nothris verbascella
1850110	8	Caryocolum alsinella
1859480	8	Hellinsia osteodactylus
1859487	8	Hellinsia lienigianus
1860861	8	Nemophora violellus
1861205	8	Heliozela sericiella
1877038	8	Glyptoteles leucacrinella
1939717	8	Micropterix schaefferi
4524292	8	Epirrhoe molluginata
4525311	8	Digitivalva pulicariae
4527410	8	Scythris dissimilella
5102460	8	Stigmella nylandriella
5121013	8	Coleophora therinella
5121933	8	Syncopacma vinella
5147232	8	Idaea trigeminata
6097224	8	Elachista freyerella
6097244	8	Coleophora violacea
7964262	8	Eucosmomorpha albersana
9030748	8	Infurcitinea ignicomella

(continued)

species_id	n	species
9790007	8	Nemaxera betulinella
1745683	7	Epinotia caprana
1750046	7	Phyllonorycter pastorella
1760887	7	Aporophyla lueneburgensis
1790062	7	Agrochola nitida
1807969	7	Paidia rica
1830206	7	Argyresthia semifusca
1830582	7	Ocnerostoma piniariella
1846210	7	Mompha lacteella
1846689	7	Monochroa conspersella
1850076	7	Caryocolum vicinella
1850243	7	Teleiodes flavimaculella
1850394	7	Gelechia rhombella
1850895	7	Chionodes tragicella
1853800	7	Bacotia claustrella
1858765	7	Stenoptilia pneumonanthus
1859144	7	Platyptilia nemoralis
1861210	7	Heliozela hammoniella
1862293	7	Hippotion celerio
1862401	7	Daphnis nerii
1862765	7	Hyles livornica
1873890	7	Cadra cautella
1878500	7	Ephestia welseriella
1940598	7	Synanthedon flaviventris
1941377	7	Chamaesphecia tenthrediniformis
4522812	7	Lampronia luzella
4522964	7	Paracrania chrysolepidella
4525306	7	Digitivalva granitella
4529013	7	Pseudatemelia flavifrontella
4530033	7	Cydia microgrammana
4531968	7	Sclerocona acutella
4534398	7	Longalatedes elymi
5102570	7	Trifurcula immundella
5117200	7	Coscinia striata
5120608	7	Coleophora trifariella
5121622	7	Coleophora adspersella
5122109	7	Aristotelia subdecurtella
5122293	7	Pachythelia villosella
5146883	7	Idaea pallidata
5769734	7	Stigmella lapponica
7674502	7	Zygaena loti
7825213	7	Acronicta cuspis
8033146	7	Elachista albidella
1735855	6	Ectoedemia subbimaculella
1740374	6	Acleris notana
1743564	6	Epiblema graphana
1744224	6	Exapate congelatella
1747234	6	Pristerognatha fuligana
1750213	6	Phyllonorycter mespilella
1751427	6	Bucculatrix maritima

(continued)

species_id	n	species
1788418	6	Mesapamea didyma
1796183	6	Apamea oblonga
1830143	6	Argyresthia ivella
1830153	6	Argyresthia glaucinella
1832831	6	Elachista gangabella
1837430	6	Depressaria douglasella
1837515	6	Depressaria emeritella
1841954	6	Scythris laminella
1845337	6	Ethmia chrysopyga
1846643	6	Monochroa hornigi
1850114	6	Caryocolum fischerella
1856384	6	Montescardia tessulatellus
1858873	6	Oxyptilus pilosellae
1861862	6	Hemaris tityus
1878586	6	Gymnancyla canella
1884309	6	Catoptria lythargyrella
1968678	6	Nothocasis sertata
1978754	6	Campaea margaritata
4526050	6	Diplodoma laichartingella
4527211	6	Ectoedemia louisella
4534485	6	Apamea illyria
5103905	6	Eucosma balatonana
5105038	6	Caloptilia honoratella
5120584	6	Coleophora obscenella
5120592	6	Coleophora badiipennella
5120684	6	Coleophora sternipennella
5120800	6	Coleophora vestianella
5769720	6	Stigmella assimilella
7504501	6	Sideridis albicolon
7912559	6	Pyrausta porphyralis
1440923	5	NA
1731834	5	Eriocrania salopiella
1735839	5	Ectoedemia atricollis
1738732	5	Dichrorampha sylvicolana
1742371	5	Diceratura ostrinana
1743714	5	Zeiraphera ratzeburgiana
1744797	5	Pammene gallicolana
1750122	5	Phyllonorycter quinqueguttella
1771429	5	Amphipoea lucens
1787610	5	Hadena perplexa
1796666	5	Hydraecia petasitis
1798504	5	Dysgonia algira
1829974	5	Glyphipterix bergstraesserella
1830207	5	Argyresthia abdominalis
1832807	5	Perittia obscurepunctella
1832936	5	Elachista pullicomella
1840371	5	Agonopterix curvipunctosa
1841755	5	Scythris fuscoaenea
1849279	5	Carpatolechia fugacella
1849773	5	Scrobipalpa proclivella



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species_id	n	species
1849966	5	Scrobipalpa artemisiella
1850325	5	Gelechia rhombelliformis
1852136	5	Mirificarma lentiginosella
1853064	5	Blastodacna atra
1856130	5	Haplotinea insectella
1856440	5	Infurcitinea argentimaculella
1860865	5	Nemophora minimella
1875896	5	Phycitodes saxicola
1941864	5	Paysandisia archon
1982541	5	Eupithecia pusillata
1983988	5	Eupithecia analoga
4527213	5	Ectoedemia sericopeza
4527497	5	Scythris crassiuscula
5102445	5	Stigmella pyri
5102497	5	Stigmella catharticella
5102541	5	Stigmella regiella
5108992	5	Spudaea ruticilla
5119443	5	Leucoptera lotella
5120771	5	Coleophora prunifoliae
5121029	5	Coleophora versurella
5121284	5	Coleophora ahenella
5121304	5	Coleophora vacciniella
5133088	5	Danaus plexippus
7508312	5	Satyrium acaciae
7588222	5	Aphelia unitana
7869428	5	Capperia fusca
9760332	5	Ochromolopis ictella
1736623	4	Crociosema plebejana
1737862	4	Cydia indivisa
1739135	4	Cnephasia pumicana
1739471	4	Cochylidia heydeniana
1744539	4	Phalonidia udana
1745725	4	Epinotia fraternana
1746103	4	Phtheochroa sodaliana
1748202	4	Clavigesta sylvestrana
1749580	4	Phyllocnistis citrella
1750130	4	Phyllonorycter dubitella
1750230	4	Phyllonorycter insignitella
1751353	4	Bucculatrix cristatella
1830186	4	Argyresthia arceuthina
1832925	4	Elachista dispilella
1833123	4	Elachista luticomella
1833125	4	Elachista poae
1841821	4	Scythris cicadella
1846683	4	Monochroa palustrellus
1846691	4	Monochroa lutulentella
1847566	4	Isophrictis anthemidella
1848730	4	Bryotropha similis
1849274	4	Carpatolechia notatella
1850127	4	Caryocolum tricolorella

(continued)

species_id	n	species
1850256	4	Teleiodes wagaе
1856023	4	Niditinea striolella
1858107	4	Tinea columbariella
1869505	4	Phaulernis fulviguttella
1978770	4	Campaea honoraria
4522795	4	Lampronia morosa
4522815	4	Lampronia rupella
4527229	4	Ectoedemia heringi
4527259	4	Ectoedemia turbidella
4529632	4	Hypatopa inunctella
4529771	4	Cosmopterix lienigiella
4529838	4	Phiaris umbrosana
4529926	4	Celypha siderana
4531316	4	Delplanqueia inscriptella
4533196	4	Xanthia ruticilla
5102459	4	Stigmella centifoliella
5104927	4	Caloptilia semifascia
5105000	4	Caloptilia fribergensis
5113621	4	Cryphia domestica
5120533	4	Coleophora trigeminella
5121324	4	Coleophora siccifolia
5122230	4	Athrips pruinosa
5145648	4	Scopula umbelaria
5714690	4	Plebejus idas
5768179	4	Jordanita globulariae
5769710	4	Stigmella obliquella
5880260	4	Elachista alpinella
6097233	4	Lycia zonaria
7717983	4	Ptilocephala plumifera
8214931	4	Lacanobia aliena
8353808	4	Coleophora coracipennella
8361973	4	Orgyia antiquoides
9473121	4	Blastobasis glandulella
1736560	3	Grapholita orobana
1738433	3	Aethes dilucidana
1738771	3	Dichrorampha obscuratana
1741730	3	Endothenia lapideana
1741771	3	Endothenia oblongana
1744893	3	Pammene splendidulana
1746174	3	Doloploca punctulana
1749190	3	Parornix carpinella
1749608	3	Phyllocnistis labyrinthella
1749846	3	Phyllonorycter hilarella
1750034	3	Phyllonorycter junoniella
1772956	3	Euxoa obelisca
1782319	3	Atypha pulmonaris
1787751	3	Hadena albimacula
1799701	3	Pseudeustrotia candidula
1822787	3	Clostera anastomosis
1830209	3	Argyresthia laevigatella

(continued)

species_id	n	species
1830284	3	Argyresthia thuiella
1832845	3	Elachista chrysodesmella
1832989	3	Elachista consortella
1841596	3	Scythris ericivorella
1846166	3	Mompha terminella
1846202	3	Mompha bradleyi
1848950	3	Prolita solutella
1849273	3	Carpatolechia decorella
1849742	3	Scrobipalpa nitentella
1849815	3	Scrobipalpa instabilella
1849856	3	Scrobipalpa atriplicella
1850085	3	Caryocolum blandulella
1850377	3	Gelechia scotinella
1850878	3	Chionodes fumatella
1852831	3	Blastobasis adustella
1855836	3	Eudarcia pagenstecherella
1858093	3	Tinea dubiella
1858598	3	Agnathosia mendicella
1860767	3	Nemophora associatella
1865660	3	Actias selene
1869512	3	Phaulernis dentella
1882511	3	Scoparia conicella
1884329	3	Catoptria osthelderi
1886084	3	Heliothela wulfeniana
1890522	3	Pyrausta ostrinalis
1891063	3	Psammotis pulveralis
1939427	3	Tischeria decidua
1940835	3	Bembecia scopigera
1949929	3	Pyrgus serratulae
1982458	3	Eupithecia laquaearia
1985522	3	Cleorodes lichenaria
4527225	3	Ectoedemia spinosella
4527972	3	Altenia scriptella
4530418	3	Endothenia pullana
4530800	3	Gynnidomorpha vectisana
5102455	3	Stigmella glutinosae
5102515	3	Stigmella betulicola
5102559	3	Stigmella alnetella
5103227	3	Ancylis comptana
5109480	3	Cucullia lychnitis
5109931	3	Spodoptera littoralis
5120798	3	Coleophora fuscocuprella
5120852	3	Coleophora niveicostella
5120880	3	Coleophora atriplicis
5120971	3	Coleophora tanacetii
5122439	3	Canephora hirsuta
5149474	3	Aplasta ononaria
5769028	3	Cleora cinctaria
5769713	3	Stigmella continuella
5769718	3	Stigmella confusella

(continued)

species_id	n	species
5769770	3	Stigmella incognitella
5770924	3	Denisia albimaculea
6199273	3	Aletia pallens
7410907	3	Elachista quadripunctella
8001799	3	Limenitis reducta
8021674	3	Commophila aeneana
8174448	3	Elachista gleichenella
8393082	3	Melitaea didyma
1735847	2	Ectoedemia angulifasciella
1736529	2	Grapholita pallifrontana
1738373	2	Aethes williana
1740762	2	Acroclita subsequana
1741551	2	Eriopsela quadrana
1742402	2	Stictea mygindiana
1744509	2	Phalonidia gilvicomana
1748922	2	Parectopa robiniella
1749797	2	Phyllonorycter cavella
1750086	2	Phyllonorycter scopariella
1759295	2	Paradrina clavipalpis
1770869	2	Agrotis cinerea
1778143	2	Eugraphe sigma
1789842	2	Archanara sparganii
1795930	2	Apamea furva
1796044	2	Apamea ophiogramma
1825261	2	Eligmodonta ziczac
1830144	2	Argyresthia dilectella
1832840	2	Elachista nobilella
1832984	2	Elachista differens
1837401	2	Depressaria daucella
1840380	2	Agonopterix kaekeritziana
1841666	2	Scythris inspersella
1845970	2	Oegoconia uralskella
1846696	2	Monochroa rumicetella
1846886	2	Eulamprotes immaculatella
1850460	2	Gelechia turpella
1852787	2	Blastobasis lacticolella
1855843	2	Eudarcia kasyi
1856768	2	Triaxomera fulvimitrella
1856873	2	Lichenotinea pustulatella
1857068	2	Opogona sacchari
1859878	2	Capperia trichodactyla
1860765	2	Nemophora fasciella
1860888	2	Nemophora congruella
1874295	2	Acrobasis sodalella
1875930	2	Phycitodes inquinatella
1877092	2	Epischnia prodromella
1880931	2	Ancylolomia palpella
1893137	2	Arethusana arethusana
1932752	2	Cacyreus marshalli
1958671	2	Semiothisa liturata

(continued)

species_id	n	species
1961037	2	Chlorissa cloraria
1972187	2	Perizoma blandiata
1973733	2	Itame brunneata
1982404	2	Eupithecia extraversaria
1983694	2	Eupithecia denotata
1987737	2	Asthena anseraria
1992368	2	Alucita grammodactyla
4525751	2	Chamaesphecia nigrifrons
4529006	2	Pseudatemelia latipennella
4529027	2	Telechrysis tripuncta
4529074	2	Depressaria libanotidella
4529738	2	Anatrachyntis badia
4531088	2	Pempeliella ornatella
4534057	2	Sideridis reticulata
4534686	2	Heliothis viriplaca
4534778	2	Nola subchlamydula
5102448	2	Stigmella magdalenae
5102449	2	Stigmella atricapitella
5102495	2	Stigmella prunetorum
5108665	2	Callopietria floridensis
5119393	2	Leucoptera lustratella
5119506	2	Zelleria oleastrella
5120538	2	Coleophora orbitella
5120685	2	Coleophora lassella
5120707	2	Coleophora saxicolella
5120789	2	Coleophora coronillae
5120922	2	Coleophora pratella
5121021	2	Coleophora conspicuella
5121109	2	Coleophora asteris
5121183	2	Coleophora juncicolella
5121271	2	Coleophora clypeiferella
5121327	2	Coleophora tamesis
5121672	2	Coleophora adjunctella
5121824	2	Coleophora vitisella
5125104	2	Lemonia dumi
5127140	2	Phlyctaenia coronata
5128034	2	Dryas iulia
5147441	2	Idaea degeneraria
5769740	2	Stigmella myrtillella
5769750	2	Stigmella carpinella
5771482	2	Choristoneura lafauryana
5772169	2	Mythimna unipuncta
5772269	2	Ammoconia caecimacula
5879783	2	Thaumatotibia leucotreta
5880257	2	Elachista albifrontella
6097278	2	Bohemannia pulverosella
7634721	2	Polyommatus thersites
7877231	2	Thiodia citrana
8244670	2	Neosphaleroptera nubilana
8958850	2	Syncopacma ochrofasciella

(continued)

species_id	n	species
9220953	2	Chiasmia aestimaria
9658891	2	Paraplatyptilia petrodactylus
9819403	2	Antigastra catalaunalis
1735818	1	Ectoedemia intimella
1735823	1	Ectoedemia arcuatella
1736514	1	Grapholita internana
1736533	1	Grapholita coronillana
1737131	1	Epiphyas postvittana
1737850	1	Cydia interscindana
1739010	1	Rhopobota stagnana
1739043	1	Rhopobota ustomaculana
1739495	1	Selenodes karelica
1739605	1	Sparganothis pilleriana
1739866	1	Acleris permutana
1740258	1	Acleris quercinana
1740623	1	Lobesia botrana
1741253	1	Cochylimorpha alternana
1741611	1	Cochylis posterana
1744542	1	Phalonidia curvistrigana
1744772	1	Pammene spiniana
1745805	1	Epinotia subsequana
1746613	1	Eana osseana
1749573	1	Phyllocnistis valentinensis
1749791	1	Phyllonorycter anderidae
1750166	1	Phyllonorycter issikii
1751268	1	Bucculatrix albedinella
1782579	1	Phlogophora scita
1784359	1	Polyphaenis sericata
1785895	1	Diachrysia stenochrysis
1786980	1	Grammodes stolidia
1787279	1	Athetis hospes
1787614	1	Hadena rivularis
1787770	1	Hadena confusa
1792330	1	Photodes pygmina
1797333	1	Catocala nymphagoga
1798802	1	Hypena obsitalis
1817797	1	Hyphantria cunea
1829657	1	Orthotaelia sparganella
1830823	1	Prays citri
1831799	1	Ochsenheimeria vacculella
1832819	1	Elachista bisulcella
1832876	1	Elachista littoricola
1832953	1	Elachista bedellella
1833105	1	Elachista collitella
1833136	1	Elachista unifasciella
1833167	1	Elachista eleochariella
1833179	1	Elachista subnigrella
1837410	1	Depressaria chaerophylli
1837418	1	Depressaria ultimella
1837449	1	Depressaria pimpinellae

(continued)

species_id	n	species
1840528	1	Agonopterix cnicella
1841833	1	Scythris picaepennis
1845962	1	Oegoconia quadripuncta
1845963	1	Oegoconia novimundi
1846675	1	Monochroa moyses
1846713	1	Monochroa arundinetella
1847061	1	Dichomeris limosellus
1848766	1	Scrobipalpa tussilaginis
1848886	1	Metzneria aprilella
1848920	1	Prolita sexpunctella
1849209	1	Sitotroga cerealella
1849758	1	Scrobipalpa samadensis
1849764	1	Scrobipalpa obsoletella
1849959	1	Scrobipalpa pauperella
1850047	1	Caryocolum viscariella
1851209	1	Neofriseria singula
1851718	1	Gnorimoschema herbichii
1853081	1	Chrysoclista lathamella
1856686	1	Nemapogon variatella
1857517	1	Karsholtia marianii
1858100	1	Tinea pallescentella
1858641	1	Pselnophorus heterodactyla
1858743	1	Stenoptilia aridus
1858810	1	Stenoptilia stigmatodactylus
1859488	1	Hellinsia tephradactyla
1862701	1	Hyles vespertilio
1866356	1	Samia cynthia
1870568	1	Ocrasa nostralis
1872848	1	Pyralis regalis
1873051	1	Cryptoblabes gnidiella
1873215	1	Lamoria anella
1873919	1	Cadra calidella
1874229	1	Acrobasis porphyrella
1876941	1	Corcyra cephalonica
1881404	1	Metasia ophialis
1881834	1	Paratalanta pandalis
1886251	1	Spoladea recurvalis
1888579	1	Paracorsia repandalis
1890679	1	Pyrausta cingulata
1891013	1	Pyrausta falcatalis
1911168	1	Coenonympha hero
1940701	1	Synanthedon spuleri
1941817	1	Tascina metallica
1958682	1	Semiothisa notata
1959682	1	Lythria purpuraria
1962584	1	Tephronia sepiaria
1965841	1	Eulithis pyraliata
1967006	1	Rhodostrophia calabra
1977967	1	Cataclysmes rigata
4301036	1	Cosmopterix pulchrimella

(continued)

species_id	n	species
4522908	1	Nematopogon schwarziellus
4524221	1	Costaconvexa polygrammata
4525312	1	Digitivalva valeriella
4526057	1	Siederia listerella
4527265	1	Ectoedemia minimella
4527307	1	Ectoedemia weaveri
4527894	1	Dactylotula kinkerella
4528683	1	Epicallima bruandella
4529070	1	Depressaria pulcherrimella
4529758	1	Cosmopterix orichalcea
4530286	1	Lepteucosma huebneriana
4530406	1	Gypsonoma nitidulana
4532203	1	Eublemma ostrina
4532206	1	Eublemma parva
4532236	1	Eublemma candidana
4532929	1	Euchalcia modestoides
4533145	1	Xylena solidaginis
4533714	1	Agrotis bigramma
4535172	1	Phengaris teleius
4536316	1	Buszkoiana capnodactylus
5102480	1	Stigmella luteella
5102488	1	Stigmella viscerella
5102514	1	Stigmella crataegella
5102642	1	Choristoneura diversana
5103383	1	Eucosma lacteana
5104597	1	Aphelia ochreana
5109722	1	Cucullia lactucae
5113847	1	Aedia funesta
5119801	1	Stephensia brunnichella
5120585	1	Coleophora idaeella
5120663	1	Coleophora gallipennella
5120762	1	Coleophora hydrolapathella
5121016	1	Coleophora caelebipennella
5121057	1	Coleophora ornatipennella
5121217	1	Coleophora bornicensis
5121347	1	Coleophora deviella
5121483	1	Coleophora sylvaticella
5121611	1	Coleophora ochripennella
5121648	1	Coleophora wockeella
5121917	1	Syncopacma patruella
5130444	1	Junonia iphita
5144721	1	Scopula incanata
5146853	1	Idaea macilentaria
5147016	1	Idaea rubraria
5714680	1	Plebejus argyrognomon
5768149	1	Jordanita subsolana
5769726	1	Stigmella freyella
5769729	1	Stigmella sorbi
5769768	1	Stigmella perpygmaecella
5769815	1	Trifurcula headleyella



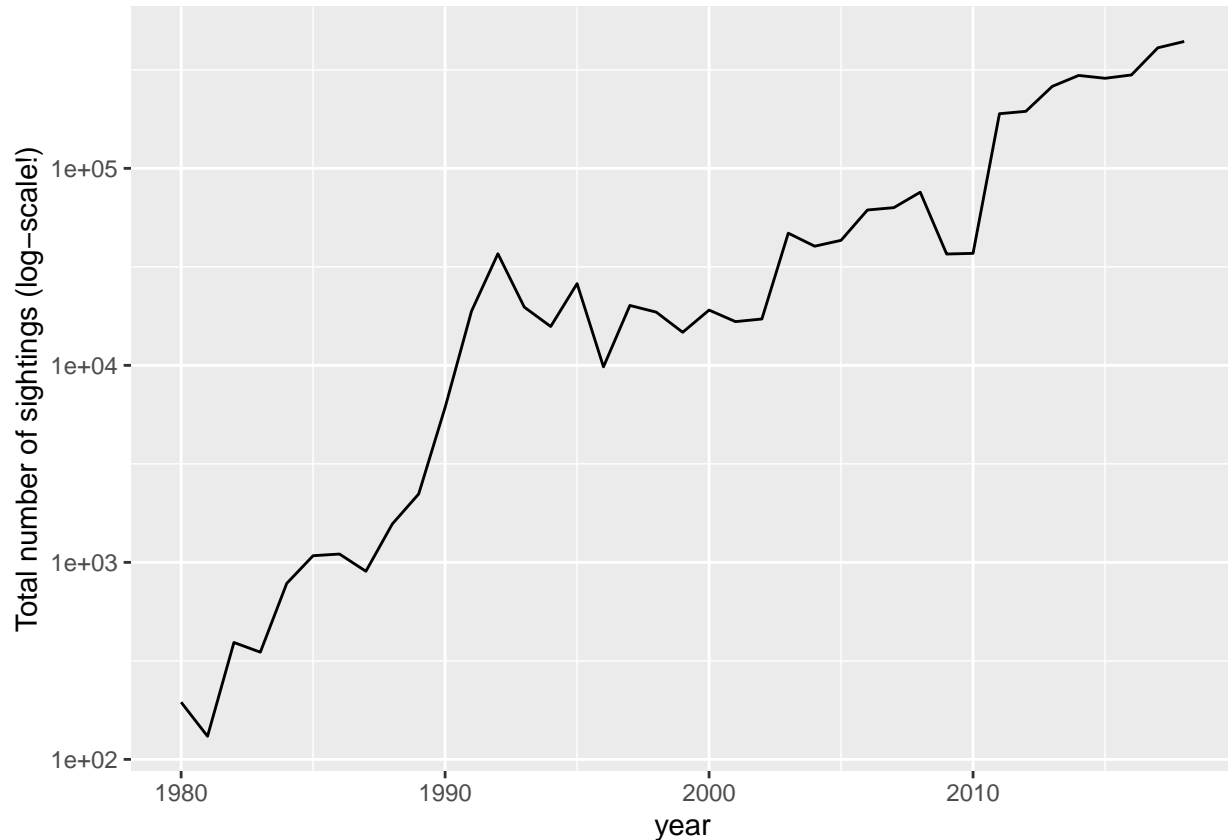
(continued)

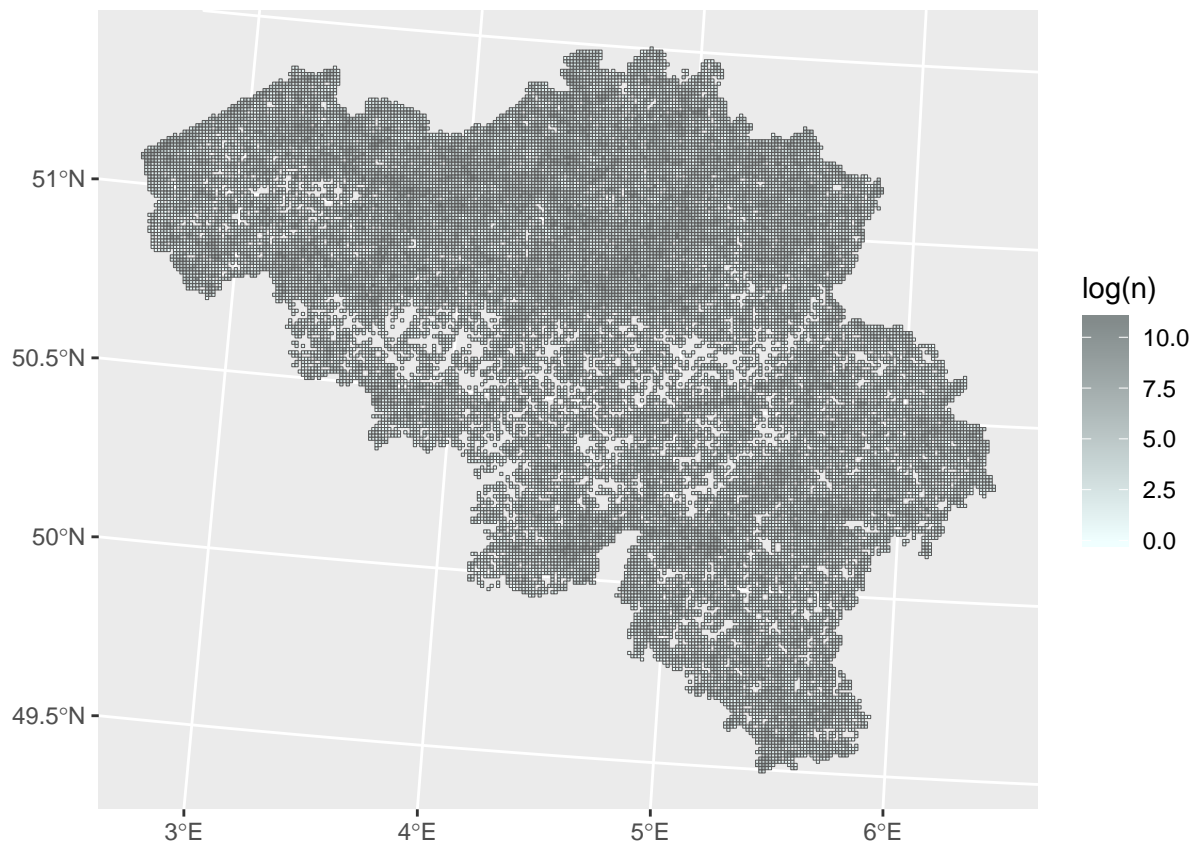
species_id	n	species
5772009	1	Arctia festiva
5883881	1	Hadula trifolii
6097226	1	Elachista exactella
6199347	1	Aletia albipuncta
7410701	1	Zygaena purpuralis
7547455	1	Merrifieldia tridactyla
7568130	1	Coleophora adjectella
7586066	1	Elachista lastrella
7657803	1	Orgyia recens
7797515	1	Acleris roscidana
7938704	1	Stigmella paradoxa
7990347	1	Grapholita lathyрана
8260255	1	Stigmella filipendulae

## Determination of closure periods

Separation between two flight periods is defined as a concavity in the density curve provided the distance from the concavity is at least 1/3 the maximum density value to the local peak left from the concavity and 1/5th to the local peak right from the concavity. In case of one generation, season\_start is 5% percentile and season\_end is 95% percentile. In case of more than one generation, the corresponding percentiles of the generation with most recordings is given.

## Total number of sightings by year and by site\_id





## Final tables

Extra filter to keep only grid cells in grid\_file\_FINAL.

The following tables were written to csv files (comma separated, and . as decimal mark):

butterflies\_observations\_finalgrid.csv, first ten rows:

```
## # A tibble: 1,628,656 x 8
##   species_id year month   day julian_day site_id source count
##   <int> <dbl> <dbl> <int>      <dbl>   <dbl> <chr>   <dbl>
## 1 1894840 1980     4     5         96    4202 INBO     1
## 2 1894840 1980     4     5         96   13453 INBO     1
## 3 1894840 1980     4    12        103    3577 INBO     2
## 4 1894840 1980     4    13        104    3552 INBO     9
## 5 1894840 1980     4    13        104    4270 INBO     1
## 6 1894840 1980     4    15        106    4963 INBO     1
## 7 1894840 1980     4    16        107    4269 INBO     2
## 8 1894840 1980     5     5        126    4269 INBO     1
## 9 1894840 1980     5    20        141    5075 INBO     5
## 10 1894840 1980     5    21        142    4964 INBO     1
## # ... with 1,628,646 more rows
```

butterflies\_observations\_finalgrid\_secondgeneration.csv, first ten rows:

```
## # A tibble: 573,539 x 8
##   species_id year month   day julian_day site_id source count
##   <int> <dbl> <dbl> <int>      <dbl>   <dbl> <chr>   <dbl>
```

```
## 1 1898544 1981 4 15 105 4202 INBO 1
## 2 1898544 1981 4 18 108 10221 INBO 1
## 3 1898544 1981 7 20 201 2568 INBO 1
## 4 1898544 1981 8 4 216 10221 INBO 1
## 5 1898544 1981 8 19 231 2568 INBO 1
## 6 1898544 1981 8 30 242 14304 INBO 1
## 7 1898544 1981 10 4 277 5111 DEMNA 1
## 8 1898544 1982 4 17 107 2568 INBO 1
## 9 1898544 1982 4 25 115 4202 INBO 2
## 10 1898544 1982 7 11 192 2568 INBO 1
## # ... with 573,529 more rows
```

moths\_observations\_finalgrid.csv, first ten rows:

```
## # A tibble: 1,397,281 x 8
##   species_id year month day julian_day site_id source count
##   <int> <dbl> <dbl> <int> <dbl> <dbl> <chr> <dbl>
## 1 1730978 1993 7 23 204 17457 DEMNA 1
## 2 1730978 2000 6 18 170 9051 waarnemingen.be/o~ 1
## 3 1730978 2000 6 19 171 9051 waarnemingen.be/o~ 2
## 4 1730978 2001 7 1 182 9051 waarnemingen.be/o~ 1
## 5 1730978 2001 7 3 184 9051 waarnemingen.be/o~ 1
## 6 1730978 2001 7 4 185 7154 waarnemingen.be/o~ 1
## 7 1730978 2001 7 27 208 20738 waarnemingen.be/o~ 2
## 8 1730978 2002 7 27 208 30790 DEMNA 1
## 9 1730978 2002 8 6 218 12006 waarnemingen.be/o~ 1
## 10 1730978 2003 6 7 158 19288 waarnemingen.be/o~ 1
## # ... with 1,397,271 more rows
```

moths\_observations\_finalgrid\_secondgeneration.csv, first ten rows:

```
## # A tibble: 253,306 x 8
##   species_id year month day julian_day site_id source count
##   <int> <dbl> <dbl> <int> <dbl> <dbl> <chr> <dbl>
## 1 1737491 2000 5 15 136 7739 waarnemingen.be/o~ 1
## 2 1737491 2000 6 2 154 7964 waarnemingen.be/o~ 1
## 3 1737491 2000 6 8 160 7739 waarnemingen.be/o~ 1
## 4 1737491 2000 8 9 222 7739 waarnemingen.be/o~ 1
## 5 1737491 2000 8 31 244 7739 waarnemingen.be/o~ 1
## 6 1737491 2001 6 14 165 8085 waarnemingen.be/o~ 2
## 7 1737491 2001 6 20 171 7856 waarnemingen.be/o~ 2
## 8 1737491 2001 6 24 175 8085 waarnemingen.be/o~ 3
## 9 1737491 2001 6 26 177 7154 waarnemingen.be/o~ 3
## 10 1737491 2001 6 29 180 8352 waarnemingen.be/o~ 1
## # ... with 253,296 more rows
```

butterflies\_species.csv, first ten rows:

```
## # A tibble: 85 x 6
##   species_id scientific_name species_name_NL species_name_FR season_start
##   <int> <chr> <chr> <chr> <dbl>
## 1 4535827 Aglais io dagpauwoog paon du jour 70
## 2 1894840 Aglais urticae kleine vos petite tortue 71
## 3 1919712 Anthocharis ca~ oranjetipje aurore 93
## 4 8138711 Apatura ilia kleine weersch~ petit mars cha~ 161
## 5 5131910 Apatura iris grote weersch~ grand mars cha~ 161.
## 6 1896841 Aphantopus hyp~ koevinkje tristan 167
```

```
## 7 1920218 Aporia crataegi groot geaderd ~ gazé 141
## 8 1902533 Araschnia leva~ landkaartje carte géograph~ 180
## 9 1909398 Argynnis paphia keizersmantel tabac d'espagne 173
## 10 1933095 Aricia agestis bruin blauwtje collier de cor~ 184
## # ... with 75 more rows, and 1 more variable: season_end <dbl>
```

butterflies\_species\_secondgeneration.csv, first ten rows:

```
## # A tibble: 15 x 6
##   species_id scientific_name species_name_NL species_name_FR season_start
##   <int> <chr> <chr> <chr> <dbl>
## 1 1902533 Araschnia leva~ landkaartje carte géograph~ 180
## 2 1933095 Aricia agestis bruin blauwtje collier de cor~ 184
## 3 5772890 Boloria dia akkerparelmoer~ petite violette 165
## 4 1925918 Celastrina arg~ boomblauwtje azuré des nerp~ 169
## 5 8203812 Colias alfacar~ zuidelijke luz~ fluoré 186
## 6 4535632 Lasiommata meg~ argusvlinder satyre 198
## 7 1929697 Lycaena phlaeas kleine vuurvli~ cuivré commun 182
## 8 5882898 Lycaena tityrus bruine vuurvli~ cuivré fuligin~ 189
## 9 5130682 Nymphalis anti~ rouwmantel morio 174.
## 10 8225376 Papilio machaon koninginnenpage le grand porte~ 182
## 11 8049830 Pararge aegeria bont zandoogje tircis 183
## 12 1920494 Pieris napi klein geaderd ~ piéride du nav~ 173
## 13 1898544 Polygonia c-al~ gehakkelde aur~ robert-le-diab~ 165
## 14 5140214 Polyommatus ic~ icarusblauwtje azuré commun 188
## 15 4299368 Vanessa cardui distelvlinder belle dame 189
## # ... with 1 more variable: season_end <dbl>
```

moths\_species.csv, first ten rows:

```
## # A tibble: 763 x 6
##   species_id scientific_name species_name_NL species_name_FR season_start
##   <int> <chr> <chr> <chr> <dbl>
## 1 1967873 Abraxas grossu~ bonte bessenvl~ la zérène du g~ 153
## 2 1967815 Abraxas sylvata porseleinvlind~ la zérène de l~ 178.
## 3 1767625 Abrostola trip~ brandnetelkapje la plusie de l~ 129
## 4 1767597 Abrostola trip~ donker brandne~ la noctuelle d~ 133
## 5 7681733 Acasis viretata groene blokspa~ la lobophore v~ 187
## 6 4531687 Acentria ephem~ duikermot <NA> 158
## 7 3276352 Achlya flavico~ lente-orvlinder le flavicorne 64
## 8 1739819 Accleris crista~ diamantborstel~ <NA> 54.5
## 9 1740183 Accleris emarga~ gehakkelde bla~ <NA> 191.
## 10 1739922 Accleris forssk~ kleine boogbla~ <NA> 167
## # ... with 753 more rows, and 1 more variable: season_end <dbl>
```

moths\_species\_secondgeneration.csv, first ten rows:

```
## # A tibble: 76 x 6
##   species_id scientific_name species_name_NL species_name_FR season_start
##   <int> <chr> <chr> <chr> <dbl>
## 1 7681733 Acasis viretata groene blokspa~ la lobophore v~ 187
## 2 4525339 Acrolepiopsis ~ preimot <NA> 162.
## 3 1782672 Acronicta rumi~ zuringuil la noctuelle d~ 186
## 4 1740482 Adoxophyes ora~ vruchtbladroll~ <NA> 198
## 5 1738422 Aethes smeathm~ kommabladeroller <NA> 195
## 6 1840301 Agonopterix pr~ zwartvelkkaart~ <NA> 170.
## 7 1770772 Agrotis puta puta-uil la noctuelle d~ 195
```

```
## 8      1984954 Aplocera effor~ sint-janskruid~ la petite rayu~      193
## 9      1984942 Aplocera plagi~ streepblokspan~ la triple raie~      196.
## 10     1747141 Argyrotaenia l~ bruinbandbladr~ <NA>                183
## # ... with 66 more rows, and 1 more variable: season_end <dbl>
```