## Trektellen.org — Store, share and compare migration data

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**Abstract:** Counting migrating birds is fascinating and this is why visible migration counts, seawatch counts and nocturnal flight call monitoring are popular. Making and keeping your results available in a standardized way for research and conservation can be time consuming but it is not when you add your counts to the database of Trektellen, either at your computer or directly in the field on an app. At the moment, counts from over 1,000 migration sites from Europe (and beyond) are entered on a regular basis. In addition, hundreds of bird ringing stations and 'nocturnal migration listening stations' are sharing their daily results. Since the inception of Trektellen in 2002, over 850,000 daily 'lists' of migrants have been submitted. The data is available as an information source in different formats (graphs, maps, tables).

### Introduction

Birdwatchers have been conducting migration counts for decades, but data from their efforts have been sparsely distributed and difficult to utilise before the recent time. However, new digitising tools have provided solutions for this.

Trektellen.org is an online database in which organisations such as bird clubs, and individuals, can store their migration counts in a standardized way. The website collects three types of data:

- Visible migration counts from a fixed station (like songbird or raptor migration counts and seawatch counts)
- Ringing results (only start and end time and number of birds caught are recorded)
- Nocturnal flight call monitoring

The data can be submitted both via the website or "live" from the watchpoint via a specially built Android app. The daily results are visible for anyone and can easily be compared to other watchpoints. Trektellen is a private (non-commercial) initiative of the main author of this article but has a formal relationship with organisations such as Sovon — Dutch Centre for Field Ornithology, Natuurpunt, Aves — Natagora and the British Trust for Ornithology (BTO). Trektellen is used by a wide range of institutions like bird observatories and other research and/or conservation organisations.

### Introduction and history

In 2000 Gerard Troost started a local website to publish counts from his local migration site "telpost Breskens" in the southwest of The Netherlands (www.trektellen.org/count/view/1). Because Breskens is one of the best visible migration sites in The Netherlands in spring, the website attracted lots of visitors, including people from French-speaking parts of Belgium, France and even the United Kingdom. Therefore all the results were translated (daily and manually) into English, which was a very time-consuming job. After a year, a member of the local bird club, Jethro Waanders, contacted Gerard with an offer of help. Jethro had already built a first concept of a database and based on this they worked together towards the first version of the database. After successfully using the database for three local watchpoints in autumn 2002 and spring 2003, a group of sea-watchers from Le Clipon, France, asked if they could use the software too. Because the system was included into the local birdwatching website it was time for a new website and a new name: "Trektellen" it was. The Dutch word Trektellen is made of two words. Trek: migration, and Tellen: counting. From then the system could be used by any group of birdwatchers who wanted to store and share their migration counts. Since then hundreds of sites have joined the network and submitted their recent counts. In addi-



Figure 1. Number of active migration watchpoints and total number of summarized observation hours per year (for 1970–1999 the mean per year is given).



Figure 2. Mean number of days with data for a migration watchpoint and number of active sites over the last 50 years.

tion, lots of historic data has been submitted or imported to the ever growing database. Last year (2019) over 100,000 hours of migration counts were submitted from 791 sites (Figure 1). The amount of data collected each year has grown but the average days with data for an individual migration watchpoint has been more or less stable over the last 45 years (Figure 2).

At the moment the site is available in 15 languages that cover most of Europe but also areas elsewhere Bulgarian, Czech, Danish, Dutch, English, Finnish, French, German, Hebrew, Italian, Polish, Portuguese, Spanish, Swedish and Thai.

Since 2005, additional types of data — different counts — can be stored in the database. Ringing stations wanted to use the system to quickly

share the daily results of their ringing sessions, and in 2018 the system was adapted to collect standardized counts of nocturnal flight call monitoring.

In Belgium, France, Germany, Iberia, Fennoscandia, United States and the United Kingdom the main coordination is done by country organizers. Outside these countries the contact is directly with the main Trektellen admin. All sites are created in the database by the national coordinator or the central admin at the request of a user. Most of the sites using Trektellen are in western Europe, although there are some sites in Eastern Europe too (Figure 3). There are approximately 15 sites in North America (not shown on Figure 3).



Figure 3. Migration watchpoints with a minimum of 10 days of data in 2019.

The counts in the Trektellen database are submitted via personal user accounts in the website or the app. Each user account needs to be linked to a site by an admin or site coordinator and most of the users can only submit data to one or two sites. While a site normally has multiple accounts linked to it, all users linked can edit all data from this site and the counters work together on the same dataset. For each site there can only be one count for a count period (if possible divided into small count blocks): this is an important difference between Trektellen and other bird recording portals. It prevents duplicate records of the same observation; even if there were 20 counters active at a site every bird will only be included in the count once.

### Data types — migration counts

Migration counts contribute by far the largest proportion of the data in the Trektellen database. What is a (visible) migration count? During this type of count an observer counts the "visible" migration of birds whose diurnal migratory flights can be observed directly. Many bird species migrate during daytime — some of these also migrate nocturnally. In the Mediterranean countries these counts are mainly done for species like raptors and storks but in other regions a much wider range of species are counted e.g. ducks and geese, waders, swallows/swifts, pipits, thrushes, etc.

The minimum level of the collected data contains:

- the location (predefined and fixed)
- start and end time of the count (nowadays most sessions are subdivided in sub-sessions of one hour)
- type of count (sometimes only specific species groups are counted like raptors and storks)
- count for each species and main direction of flight (e.g. north- or southbound)

Besides these data a lot of extra information can be collected within the header data, such as detailed data on weather, or site-specific fields.

At the level of individual species or even individual records level very specific data can be collected, including:

- Age/sex/plumage information
- Exact flight direction



Photo 1. Seawatcher counting migration in Cape May, NJ, USA using the Trektellen App (07-04-2017, Gerard Troost).

- Distance and flight height bands (site specific)
- Exact timestamps
- Group composition

Following the introduction of an (Android) app in 2015 the number of records collected per year doubled in 5 years to over 1.5 million in 2019 (c. 774,000 in 2014), accompanied by an increase in the level of associated data.

### Data types — ringing results

Many birds, such as warblers, chats and flycatchers are primarily nocturnal migrants. Their journeys begin after dusk, and usually finish well before dawn so it is impossible to count them during visible diurnal migration. Much of what we know about their movements comes from ringing phenology and subsequent ring recoveries. A lot of ringing stations catch birds in a standardized way (Constant Effort) because they always use the same length of nets. The number of caught (or re-captured) birds per metre of net is indicative of the number of (migratory) birds in the area of the ringing site. Sometimes tape recordings are used to lure and attract birds; if used this is recorded. While most of the ringing schemes only store the ring records itself (ring number and species info) the ringing effort is often not recorded. In addition, the daily records (expressed as the number of birds caught) from individually ringing sites are rarely publicly available. In 2019 over 10,000 "lists" (from a given location on a single date) were submitted from 263 ringing sites.

# Data types — Nocturnal flight call monitoring

Recording nocturnal flight calls and logging the intensity of movement and species composition at different locations provides valuable data for understanding bird movements at scales ranging from individual sites to continent-wide. These data are most valuable if some basic parameters are standardised. This datatype collects data collected via audio recording at night, with observers submitting records of the species and number of calls per species to Trektellen. Gillings et al. (2018) provide a protocol for the standardised monitoring of nocturnal flight calls, including definitions of which data should be collected. On a listening station the observer records all bird calls and analyses this recording later to deter-

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| sont type: all species<br>sonn de lage lander. Basels, doud-eever 5/8, vir<br>nonn de lage lander. Basels, doud-eever 5/8, vir<br>sonn de lage lander. Basels, doud-eever 5/8, vir<br>sonn de lage lander. Basels, doud-eever 5/8, vir<br>sonn de lage lander. Basels, doud-eever 5/8, vir<br>sanada Boose   | sibility 10000m, temperatun<br>alen, Robbin van Dijk, Adri G<br>Plover<br>str<br>bloer<br>i Guil * -<br>n duil * -<br>backed Guil * -<br>-<br>backed Guil * -<br>-<br>str<br>r<br>k 1, Coot 1, Lixle Ringed P<br>kethroet 1, WhiteShreet 2, 1<br>*<br>r<br>sebroet 1, Lixle Ringed P<br>sebroet 1, Unite Ringed P   | s 13 °C. La<br>Clements (r<br>1<br>2<br>3<br>2<br>2<br>32<br>13<br>1<br>2<br>3<br>3<br>4<br>12<br>3<br>3<br>4<br>12<br>3<br>3<br>4<br>12<br>3<br>3<br>4<br>12<br>3<br>3<br>4<br>12<br>13<br>11<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>12<br>13<br>13<br>11<br>11<br>11<br>11<br>11<br>11<br>11<br>11<br>11<br>11<br>11 | sedruk beven Biskaje, strak<br>tot.)<br>Svallow<br>House Martin<br>Stafling *<br>vellow wagtall sp.<br>Blue-headed wagtall<br>Orev Wagtall<br>alba wagtall<br>alba wagtall<br>alba wagtall<br>alba wagtall<br>sha wagtall<br>alba wagtall<br>alba wagtall<br>sha wagtall<br>alba wagtall<br>alba wagtall<br>alba wagtall<br>alba wagtall<br>alba wagtall<br>alba wagtall<br>sha wagtall<br>alba wagtall<br>sha wagtall<br>sha wagtall<br>sha wagtall<br>sha wagtall<br>sha wagtall<br>sha wagtall<br>sha wagtall<br>sha wagtall<br>sha wagtall<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch<br>Staffinch | Sw  | re wind<br>NE<br>86<br>100<br>317<br>2<br>1<br>1<br>3<br>5<br>3<br>1<br>2<br>2<br>1<br>6<br>4<br>4<br>4, Great  | Bresker     During Data     Differmation Migration use     Tubels 2010-2019     Nap     Piccures     Obanology     Crimph     Record counts                                     |
| oven de lage landen. Passage kultront unant 13.30.<br>berrvers (Irst period): Thomas Usten. Dirk van Stras<br>tanada Goose - 4 07 Little Ringed<br>arnada Goose - 4 07 Little Ringed<br>arnada Goose - 4 07 Little Ringed<br>ture Svan - 4 Radhank<br>belduck - 42 Oreenstank<br>Ule Svan - 1 Medtersman<br>Salvall 10 6 Black-heade<br>Wigeon - 1 Medtersman<br>Salvall 10 6 Black-heade<br>Wigeon - 1 Lesser Black-<br>Baland 6 3 Lesser Black<br>Jose - 1 Common Terr<br>Salvall - 1 Collean Otto<br>Salvall - 2 Hobby *<br>Daritovitark - 1 Goldean Otto<br>Salvall - 2 Hobby *<br>Salvall Marine - 1 Salvall<br>Common Buzzard - 2 Hobby *<br>Salvall Marine - 1 Salvall<br>Terr Marsh Warbler I, Iterine Warbler I, Leser Mic<br>Terra Ule Individues (1 - 1 Common Terr<br>Marsh Warbler I, Iterine Warbler I, Leser Mic<br>Salvall Marine - 1 Salvaller - 1 Collean Otto<br>Salvall Marine - 1 Salvaller - 1 Collean Otto<br>Salvaller - 1 Salvaller - 1 Salvaller - 1 Collean Otto<br>Salvaller - 1 Salvaller - 1 Collean Otto<br>S   | alen. Robbin van Dijk. Adn C<br>Plover<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s<br>s  | Clements (r<br>NE<br>1<br>2<br>3<br>3<br>2<br>3<br>3<br>4<br>12<br>3<br>3<br>4<br>12<br>3<br>3<br>4<br>12<br>3<br>3<br>6<br>6<br>6<br>2<br>1<br>1<br>1<br>1<br>2<br>3<br>5<br>3<br>6<br>6<br>6<br>1<br>1<br>2<br>3<br>2<br>3<br>2<br>13<br>1<br>2<br>3<br>2<br>3<br>2<br>13<br>1<br>2<br>3<br>2<br>3   | Svallov<br>House Martin<br>Starling *<br>Yellov wagtall sp.<br>Blue-headed wagtall<br>Grey Magtall<br>alba wagtall<br>alba wagtall sp.<br>Chaffinch<br>Greeffinch<br>Galdfinch<br>Siskin<br>Small Totolesshell<br>Red Adminel<br>Painted Lady<br>Bumblebee sp.<br>schtalled Godwit 2, Cuckoo<br>1, Stonechat 1, House Spa  | SW -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-              | NE<br>86<br>100<br>317<br>2<br>1<br>2<br>1<br>5<br>5<br>3<br>1<br>2<br>2<br>1<br>6<br>4<br>4, Great   | Information Migration site     Tucals 2019     Nap     Piccuras     Disaclegy     Cistaph     Record counts   |
| tanada Goose SW NE<br>aranade Goose 4 37 Little Ringed<br>aranade Goose - 4 Green Sandy<br>Irevisg Goose - 4 Green Sandy<br>Ite Svan - 4 Radshank<br>helduck - 42 Greenshank<br>Uigeon - 1 Mediterrane<br>slavali 10 6 Biack-heade<br>Vigeon - 1 Common Ter<br>Josef Laser Black<br>ight Heron - 1 Common Ter<br>trev Heron - 1 Collared Dov<br>Good - 2 Hobby *<br>Good - 2 Hobby *<br>Good - 3 Jackdaw<br>Common Buzzard - 2 Hobby *<br>Sand Martin - 6 Sand Martin<br>trev Buzzard - 2 Sand Martin<br>trevent: Pochard 3, Tufted Duck 1, Partridue 1, Goshe<br>t 3*, Marsh Warbler 1, Lesser We<br>brate: 7440 Individuals \$9 (+17) species. 10:30 hou<br>treve Jours and pret aan het begin en ande ete<br>interoaleven onde ge en vlogen ons regelematig om de<br>an het voorjaan Juni zasi? Weinee!  | Plover SW Plover - er * - er * - olper - d Gull * - d Gull * - backed Gull * - backed Gull * - backed Gull * - backed Gull * - n - t e - n k 1, Coot 1, Litsle Ringed P kethroat 1, Whitethroat 2, 1 % G gierzwahnutrek. Het aan evolking snel toenam (voor oren. Verder toe Is uninaamn   | NE<br>1<br>2<br>32<br>32<br>13<br>1<br>23<br>5<br>4<br>4<br>23<br>5<br>4<br>4<br>23<br>5<br>3<br>6<br>561<br>6<br>2<br>1<br>1<br>1<br>1<br>Nightingale   | Swallow<br>House Marcin<br>Starling "<br>Yellow waptall sp.<br>Blue-headed waptall<br>Grey Magtall<br>alba waptall sp.<br>Chaffinch<br>Greenfinch<br>Linnet<br>Goldfinch<br>Serin<br>Siskin<br>Small Totoleshell<br>Red Adminel<br>Painted Ledy<br>Bumblebee sp.<br>schriafied Godwit 2, Cuckoo<br>1, Stonechat 1, House Spa   | SW  | NE<br>86<br>100<br>317<br>2<br>1<br>2<br>1<br>2<br>1<br>5<br>5<br>3<br>1<br>2<br>2<br>1<br>6<br>4<br>4, Great   | <ul> <li>Information Migration etc</li> <li>Totals 2019</li> <li>Totals 2019</li> <li>Map</li> <li>Pictures</li> <li>Phonology</li> <li>Craph</li> <li>Record counts</li> </ul> |
| canada Goose     4     37     Little Hipod       pravja Goose     -     4     Green Sanky       pravja Goose     -     4     Green Sanky       uite Svan     -     4     Radihank       bielduck     -     42     Green Sanky       bielduck     -     42     Green Sanky       bielduck     -     42     Green Sanky       bielduck     -     43     Green Sanky       biggon     -     1     Mediterraney       biggon     -     1     Common Ter       bielduck     -     2     Stock Down       bielduck     -     1     Collared Dow       common Buzzerd     -     2     Stock Down       bielduck     -     1     Collared Dow       commen Buzzerd     1     -     Carrion Crow       commen Buzzerd     1     -     Carrion Crow       biotals:     740     Individuals, 58 (+17) species, 10:30 hour       biotals:     740     Indiv  | Plover<br>er"<br>  | 1<br>2<br>32<br>32<br>13<br>1<br>23<br>5<br>4<br>4<br>23<br>5<br>3<br>6<br>561<br>6<br>2<br>1<br>1<br>1<br>Nightingale   | Svallov<br>House Marcin<br>Starling <sup>2</sup><br>Vellov wagtall sp.<br>Blue-headed wagtall<br>Grev Magtall<br>alba wagtall<br>alba wagtall<br>alba wagtall<br>alba wagtall<br>sp.<br>Chaffinch<br>Greeffinch<br>Linnet<br>Goldfinch<br>Siskin<br>Small Tuttoleshell<br>Red Adminel<br>Painted Lady<br>Bumblebee sp.<br>schrtalled Godwit 2, Cuckoo<br>1, Stonechat 1, House Spa   | 32<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-           | 86<br>100<br>317<br>2<br>1<br>2<br>1<br>5<br>5<br>3<br>1<br>2<br>2<br>1<br>5<br>5<br>3<br>1<br>2<br>2<br>2<br>1<br>6<br>4<br>4, Great   | <ul> <li>Totals 2019</li> <li>Totals 2010-2019</li> <li>Map</li> <li>Piccures</li> <li>Phenolegy</li> <li>Craph</li> <li>Record counts</li> </ul>                               |
| arnade Goole - 10 Mendan Public<br>Jarnade Goole - 4 Green Sandy<br>Jure Svan - 4 Redihark<br>Jure Svan - 4 Redihark<br>Vale - 2 Greenshark<br>Sadwall 10 6 Blackheade<br>Ween - 1 Medicerame<br>Ween - 1 Medicerame<br>Sadwall - 0 6 Blackheade<br>Jackheade - 1 Medicerame<br>Sadwall - 10 6 Blackheade<br>Jackheade - 1 Medicerame<br>Jackheade - 1 Golden Ott<br>Jackheade - 1 Jackheade - 1 Golden Ott<br>Jackheade - 1 Jackheade - 1 Jackheade - 1 Golden Ott<br>Jackheade - 1 Jackheade -   | er<br>bloer<br>d Gull *<br>in Gull *<br>-backed Gull *<br>-backed Gull *<br>-<br>backed Gull *<br>-<br>te 2<br>Me *<br>-<br>isethroat 1, Little Ringed P<br>isethroat 2, Whitethroat 2, 1<br>*<br>G gierzwahnutrek. Her sam<br>evolking snel toenam (voor<br>oren. Verder: 1e Lunivasmit for   | 2<br>32<br>32<br>13<br>1<br>23<br>3<br>4<br>12<br>3<br>6<br>5<br>5<br>3<br>6<br>5<br>5<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>2<br>3<br>5<br>4<br>4<br>1<br>2<br>3<br>5<br>4<br>4<br>1<br>2<br>5<br>3<br>4<br>1<br>1<br>2<br>3<br>2<br>13<br>1<br>1<br>1<br>2<br>3<br>2<br>13<br>1<br>1<br>1<br>2<br>3<br>2<br>13<br>1<br>1<br>3<br>2<br>1<br>3<br>2<br>1<br>3<br>1<br>1<br>3<br>3<br>1<br>1<br>1<br>3<br>3<br>1<br>1<br>1<br>3<br>3<br>1<br>1<br>1<br>3<br>3<br>1<br>1<br>1<br>3<br>3<br>1<br>1<br>1<br>3<br>3<br>3<br>1<br>1<br>1<br>3<br>3<br>3<br>1<br>1<br>1<br>3<br>3<br>3<br>1<br>1<br>1<br>1<br>3<br>3<br>5<br>4<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1  | House Martin<br>Starling *<br>Yellow wagtal sp.<br>Blue-headd wagtal<br>drey wagtal<br>abarbagtal<br>abarbagtal<br>abarbagtal<br>abarbagtal<br>abarbagtal<br>abarbagtal<br>abarbagtal<br>abarbagtal<br>abarbagtal<br>Greenfich<br>Linnet<br>Goldfinch<br>Serin<br>Siskin<br>Red Adminel<br>Red Adminel<br>Red Adminel<br>Bumbleber sp.<br>ack-talled Godnit 2, Cuckoo<br>1, Stonechst 1, House Spa   | 22<br>1<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-           | 100<br>317<br>2<br>1<br>2<br>1<br>5<br>5<br>5<br>3<br>1<br>2<br>2<br>1<br>6<br>4<br>4, Great  | - Tesls 2020-2019<br>> Map<br>Pictures<br>- Phanolegy<br>- Craph<br>- Record counts   |
| <ul> <li>Hute Svan * - 4 Radshank</li> <li>Hute Svan * - 4 Radshank</li> <li>Sadvall 10 6 Blackhead</li> <li>Sadvall 10 6 Blackhead</li> <li>Sadvall 10 6 Blackhead</li> <li>Sponbill 6 3 Lesser Black</li> <li>Woht Heron - 1 Common Fay</li> <li>Fay Heron 2 - Stock One</li> <li>Fay Heron 2 - Stock One</li> <li>Fay Heron 2 - Stock One</li> <li>Turtle Dove</li> <li>Turtle Dove</li> <li>Turtle Dove</li> <li>Turtle Dove</li> <li>Turtle Dove</li> <li>Sadvall 4 - 3 Stock One</li> <li>Starmond A - 3 Stock</li> <li>Starmon 2 - Stock One</li> <li>Starw Heron 2 - Stock One</li> <li>Starw Heron 2 - Stock One</li> <li>Starwon 2</li></ul>   | d Guil *   | 3<br>2<br>32<br>13<br>1<br>23<br>5<br>4<br>12<br>5<br>3<br>6<br>561<br>6<br>2<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>Nightingale  | vellow wagcali 50.<br>Blue-headd wagcall<br>Grey wagcall<br>whote wagcall<br>aba wagcall so.<br>Chaffinch<br>Goldfinch<br>Serin<br>Siskin<br>Small Tortoteshell<br>Red Adminal<br>Painted Ladv<br>Bumblebee so.<br>ack-tailed Godwit 2, Cuckoo<br>1, Stonechat 1, House Spa  | : 1, Marpie<br>   | 2<br>1<br>2<br>1<br>2<br>1<br>2<br>1<br>2<br>1<br>5<br>9<br>5<br>3<br>1<br>2<br>2<br>1<br>2<br>1<br>2<br>1<br>2<br>1<br>2<br>1<br>2<br>1<br>2<br>1<br>2<br>1<br>2   | <ul> <li>Map</li> <li>Pictures</li> <li>Phonolegy</li> <li>Craph</li> <li>Record counts</li> </ul>  |
| ihelduck - 42 Greenshak<br>Sadvall 10 6 Biack-heade<br>Weenn - 1 Mediterrane<br>Jaard - 3 Greet Biack-<br>Spoonbill 6 5 Lesser Biack<br>With Heron - 1 Common Ter<br>Stex Heron - 2 - Stock Dove<br>Unite Beron - 1 Woodpieon<br>Sreat Write Egret - 1 Turtle Dove<br>Unite Beron - 1 Collared Dov<br>Uniter Beret - 1 Collared Dov<br>Uniter Beret - 1 Collared Dov<br>Uniter Boret - 1 Collared Dov<br>Uniter Boret - 1 Collared Dov<br>Uniter Boret - 1 Collared Dov<br>Uniter - 3 Jackdaw<br>Common Buzzerd 1 - Certion Crow<br>Grant Marsh Wather 1, Lesser Wei<br>Orale: 7440 Individuals, 58 (+17) species, 10:30 hour<br>Intervalues and met aan het begin en ande ste<br>Intervalues on unit species (10:30 hour<br>Intervalues on unit species) and definition of de<br>an het voorjaan Juni saai? Weinee!   | d Gull " an Gull " backed Gull " backed Gull " backed Gull n n l l l l l l l l l l l l l l l l l   | 2<br>32<br>13<br>1<br>23<br>3<br>4<br>12<br>5<br>3<br>6<br>5601<br>6<br>2<br>1<br>1<br>1<br>1<br>Nightingale   | Blue-headed wagtall<br>Grey wagtall<br>alba wagtall<br>alba wagtall so.<br>Chaffinch<br>Greenfinch<br>Linnet<br>Goldfinch<br>Siskin<br>Siskin<br>Red Adminel<br>Red Adminel<br>Painted Ledy<br>Bumblebee sp.<br>ack-tailed Godwit 2, Cuckoo<br>1, Stonechat 1, House Spa   | , 1<br>,  | 121159531222164<br>4. Great   | * Piccures<br>• Phanelegy<br>• Craph<br>* Record counts   |
| Savali 10 6 Bucchneede<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavia<br>Islavi | a duil *   | 32<br>13<br>1<br>2<br>3<br>5<br>4<br>12<br>5<br>3<br>6<br>561<br>6<br>2<br>1<br>1<br>1<br>1<br>Nghtingale  | Urey Nagoal<br>inhite Wagoal<br>alba Nagoal<br>Chaffinch<br>Ginnench<br>Ginnench<br>Goldfinch<br>Serin<br>Siskin<br>Red Adminial<br>Red Adminial<br>Red Adminial<br>Bumbleber so-<br>act-tailed Godnit 2, Cuckoo<br>1, Stonechst 1, House Spa  | 1<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-  | 2<br>1<br>3<br>9<br>3<br>3<br>1<br>2<br>2<br>1<br>6<br>4<br>4, Great  | Phanology     Scaph     Record counts   |
| Infland - 3 Greet Black<br>Boonbill 6 5 Lesser Black<br>Hight Heron - 1 Common Ter<br>Tary Heron 2 - Stock Dove<br>Unple Heron - 1 Woodgipeon<br>Creat White Egret - 1 Turtle Dove<br>Untel Egret - 1 Curtle Dove<br>Untel Egret - 1 Curtle Dove<br>Untel Egret - 3 Jacklaw<br>Gommon Buzzard - 2 Hubby *<br>Searrowhank - 1 Golden Ork<br>Hanit Harrier * 3 Jacklaw<br>Common Buzzard 1 - Carrion Cron<br>Kingel Plover - 8 Sand Martin<br>Present: Puchard 3, Tuffed Duck 1, Partridge 1, Gowlah<br>It 2 <sup>®</sup> , Marsh Warbler 1, Lesser Wh<br>Stalls / Add Individuals, 59 (+17) species, 10/30 hour<br>common Fuzzard 1 - Lesser Warbler 1, Lesser Wa<br>Intercaleure normage en violant regelemating on de<br>an het voorjaan Juni sasi? Weinee!   | backed Gull *  | 1<br>23<br>5<br>4<br>12<br>5<br>3<br>6561<br>6<br>2<br>1<br>1<br>1<br>1<br>Nghtingale  | alba vagtali so.<br>Chaffinch<br>Linnet<br>Goldfinch<br>Siskin<br>Siskin<br>Siski Thotobreshell<br>Red Adminal<br>Painted Ladv<br>Bumblebre so.<br>ack-tailed Bodivit 2, Cuckoo<br>1, Stonechat 1, House Spa   | , 1. Magpie<br>rrow 2 <sup>8</sup> , Dv   | 1<br>9<br>3<br>1<br>2<br>2<br>1<br>6<br>4<br>4, Great   | Chaph     Pecord counts   |
| joponbill 6 5 Lesser Black<br>wight Heron - 1 Common Ter<br>Tery Heron - 2 - Stock Deve<br>Tery Heron - 1 Woodolpeon<br>Sreat White Egret - 1 Turtle Deve<br>Universe Buzzerd - 2 Hobby *<br>Darrowhank - 1 Golden Orb<br>Hobby *<br>Darrowhank - 1 Golden Orb<br>Hobby *<br>Barrowhank - 1 Golden Orb<br>Hobby *<br>Golden Orb<br>Guede River - 8 Sand Martin<br>hresent: Pochard 3, Tufted Duck 1, Partridue 1, Gosha<br>ft 2*, Marsh Warbler 1, Icterine Warbler 1, Lesser Wo<br>fortals: 7440 Individuals, 58 (+17) species, 10:30 hou<br>ormanets: Fraue dag met aan het begin en ande ste<br>Intervalewen oms regelmatig om de<br>an het voorjaan Juni saai? Weinee!   | -backed Gull -<br>n -<br>e 1<br>e 2<br>se 2<br>se 2<br>se 2<br>se 4<br>int 1, Coot 1, Little Ringed P<br>itethroat 1, Whitethroat 2, 1<br>v<br>k gjerzvalnutrek. Het aan<br>evolking snel toenam (voor<br>oren. Verder 1e kunivaam   | 23<br>3<br>4<br>12<br>5<br>3<br>6561<br>6<br>2<br>1<br>1<br>1<br>Nightingale   | Chaffinch<br>Greenfinch<br>Linne:<br>Goldfinch<br>Siskin<br>Red Adminal<br>Painted Lady<br>Bumblebee sp.<br>ack-tailed Godwit 2, Cuckoo<br>1, Stonechat 1, House Spa   | , Magpie<br>mov 2*, Do  | 5<br>9<br>5<br>3<br>1<br>2<br>2<br>1<br>6<br>4<br>4, Great  | * Record counts   |
| there were an ender the second s  | Ne 1<br>e 2<br>Ne * -<br>Ne * -<br>Ni 1, Coot 1, Little Ringed P<br>Ni 1, Coot 1, Whitethroat 2, N<br>s<br>Ke gierzwaluutrek. Het aan<br>evolking snel toenam (voor<br>oren. Verder 1e kunivaam  | 4<br>12<br>3<br>6361<br>6<br>2<br>1<br>1<br>1<br>Nightingale   | Greinnich<br>Linne<br>Goldfinch<br>Sistin<br>Sistin<br>Sinall Tottobeshell<br>Red Adminal<br>Palmod Lody<br>Bumblebee sp.<br>ack-tailed Godmit 2, Cuckou<br>1, Stonechat 1, House Spa  | , Magpie<br>mov 2*, Do  | 5<br>3<br>1<br>2<br>2<br>1<br>6<br>4<br>4, Great  | 1   |
| Undie Heron  Vande Heron  Woodgibeon  Little Egret  I Cuttle Egret  Conversant  Conversan  | e 2<br>e 2<br>Me*<br>vk 1. Coot 1. Little Ringed P<br>isethroat 1. Whitethroat 2. 1<br>X<br>Ke gierzvalustrek. Het aan<br>evolking snel toenam (voor<br>oren. Verder zie kunivaam  | 12<br>5<br>3<br>6561<br>6<br>2<br>1<br>1<br>1<br>1<br>Nightingale  | Goldhach<br>Sierin<br>Siskin<br>Small Tortobeshell<br>Red Admiral<br>Painted Ledy<br>Bumbleber sp.<br>ack-tailed Godwit 2, Cuckoo<br>1, Stonechat 1, House Spa   | , 1, Magpie<br>rrow 2 <sup>8</sup> , Do   | 3<br>1<br>2<br>2<br>1<br>6<br>4<br>4, Great   | 1   |
| Arat White Egret - 1 Turtie Dove<br>Life Egnet - 1 Collared Dov<br>Commant - 4 Swift<br>Source Suzard - 2 Hobby *<br>Saarrowhank - 1 Golden Orb<br>Saarrowhank - 1 Golden Orb<br>Garlow Tow<br>Ingel Plover - 8 Sand Martin<br>hresent: Pochard 3, Tufted Duck 1, Partridue 1, Gosha<br>nt 2*, Marsh Warbler 3, Icterine Warbler 1, Lesser Wh<br>Sorale: 7440 Individuals, 58 (+17) species, 10:30 hou<br>ormanets: Prava dag met aan het begin en ande ete<br>Interoalowen omas que vilopan ons regelematig om de<br>an het voorjaan Juni saai? Weinee!   | nk 1, Coot 1, Litzle Rimged P<br>nk 1, Coot 1, Litzle Rimged P<br>istehroat 1, Whitethroat 2, 1<br>v<br>ke gierzwahnutrek. Het aan<br>evolking snel toenam (voor<br>oren. Verder 1e kuninaam   | 3<br>6561<br>6<br>2<br>1<br>1<br>1<br>Nightingale  | Serin<br>Siskin<br>Real Tottolaeshell<br>Real Admiral<br>Painted Lady<br>Bumblebee sp.<br>ack-tailed Godmit 2, Cuckoo<br>1, Stonechat 1, House Spa   | , 1, Magpie<br>mow 2 <sup>8</sup> , Do  | 1<br>2<br>1<br>6<br>4<br>4, Great   | 1   |
| Contorents - 4 Swift<br>Contores Buzzard - 2 Hobby *<br>DerrorWank - 1 Golden Oris<br>Barrowhank - 1 Golden Oris<br>Hand Martine * 3 Jackdew<br>Common Buzzard 1 - Carrion Crow<br>Inged Plover * 8 Sand Martin<br>It 2*, Marzh Warbler 1, Isterine Warbler 1, Lesser Wi<br>Datas: 7440 Individuals, 59 (+17) species, 10:20 hour<br>ommanets: Prava dog met ash for thogin en ende sta<br>unifercord (3,748 op 1 juni 1964). Man name toen de b<br>Intervaleure onder gen witholen seelmestig om de<br>an het voorjaan Juni asai? Weinee!   | vie *<br>/<br>/<br>// Coot 1, Little Ringed P<br>//<br>// itethroat 2, /<br>/<br>/<br>/<br>/<br>/<br>/<br>/<br>/<br>/<br>/<br>/<br>/<br>/<br>/<br>/<br>/<br>/<br>/   | 6561<br>6<br>2<br>1<br>1<br>1<br>Nightingale   | Small Tortoixeshell<br>Red Admiral<br>Painted Lady<br>Bumblebee sp.<br>adk-tailed Godmit 2, Cuckoo<br>1, Stonechat 1, House Spa  | , .   | 2<br>1<br>6<br>4<br>4, Great  |   |
| forer Buzzard - 2 Mubby *<br>Serrovhank - 1 Golden Orik<br>Harah Hanter * - 3 Jackdew<br>Common Buzzard 1 - Cerrion Cron<br>Kinged Plover - 8 Sand Martin<br>Hesenit Pochard 3, Tufed Duck 1, Partitides 1, Gosha<br>16 **, Marah Worlde 1, Stenting Warbler 1, Lesser Wi<br>Istalis: 7440 Individuale, 59 (+17) species, 10:30 hour<br>ommants: Fraaie dag met aan het begin en einde ste<br>nifrecord (3,248 op 1 juni 1994). Met name toen de b<br>Istraale voorjaan Juni saal? Welnee!   | yle *  | 6<br>2<br>1<br>1<br>1<br>Nover 1, Bl   | Red Admiral<br>Painted Lady<br>Bumblebee sp.<br>ack-tailed Godwit 2, Cuckou<br>1, Stonechat 1, House Spa   | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-                 | 1<br>6<br>4   |   |
| partormank - 1 Gotteen Ork<br>Tash Hanire - 3 Jackdaw<br>Caminon Buzzard 1 - Carrion Crow<br>Ingee Plover - 8 Sand Martin<br>Ingee Plover - 8 Sand Martin<br>It 2", Marsh Warbler J, Icterine Warbler J, Lesser Wh<br>Ostals: 7440 Individuals, 59 (+17) species, 10:30 hou<br>omments: Fraue dag met aan het heigin en einde ste<br>unifecord (J,348 op 1 juni 1994), Met name toen de b<br>en het voorjaan Juni saai? Weinee!  | we<br>wk 1, Coot 1, Little Ringed 8<br>litethroat 1, Whitethroat 2, 1<br>rs<br>ke gierzwalsutrek. Het aan<br>evolking snel toenam (voor<br>oren. Verder: le kunivaarne   | 2<br>1<br>1<br>Nover 1, Bl   | ack-tailed Godwit 2, Cuckou<br>1, Stonechat 1, House Spa   | 1, Magpie<br>mov 2 <sup>8</sup> , Du  | 4<br>4<br>4, Great  |   |
| Common Buzzard 1 Carrion Chow<br>Kinged Plover 8 Sand Martin<br>Viegenti Pochard 3, Tufted Duck 1, Partridge 1, Gosha<br>(* 2 <sup>*</sup> , Marah Warbler 1, Isterine Warbler 1, Lesser Wi<br>Istals: 7440 Individuals, 58 (+17) species. 101:30 Aou<br>onments: France dag met abn dr bagin en ande me<br>unifercord (3,348 og 1 juni 1564). Man name toen de b<br>intercaleven ondere en vilopen nois revelmetig om de<br>an het voorjaan Juni saai? Weinee!  | vk 1, Cout 1, Little Ringed P<br>itethroat 1, Whitethroat 2, P<br>rs<br>Ke gierzwaluutrek. Het aan<br>evolking snel toenam (voor<br>oren. Verders 1e juniwaarno  | 1<br>1<br>Nover 1, Bl  | ack-tailed Godwit 2, Cuckoo<br>1, Stonechat 1, House Spa   | 1, Magpie<br>rrow 2 <sup>8</sup> , Du   | 4. Great  |   |
| Kinged Plover - 8 Sand Martin<br>Present: Pochard 3: Tufed Duck 1, Partingle 1, Goshe<br>(15 <sup>2</sup> ), Marsh Warbler 1, Stering Warbler 1, Lesser Wi<br>fotals: 7440 individuals, 58 (+17) species, 10:30 hour<br>ommants: Fraaie dag met aan het hagin en einde ste<br>unifecord (3,245 op 1 juni 1994). Met name toen de b<br>fercaaleure ondeag en vilogen ons regelmatig om de<br>en het voorjaan Juni saal? Weinee!   | -<br>wk 1, Coot 1, Little Ringed A<br>itethroat 1, Whitethroat 2, 7<br>re<br>re<br>evolicing snel toenam (voor<br>oren. Verder: 1e Junimearn   | 1<br>Plover 1, Bl<br>Nightingale   | ack-tailed Godwit 2, Cuckoo<br>1, Stonechat 1, House Spa   | 1, Magpie<br>rrow 2*, Du  | 4, Great  |   |
| <i>(</i> , , , , , , , , , , , , , , , , , , ,   |  | tal Gierzwa<br>r het regen<br>eming Grot   | luwen betreft een verdubbe<br>front uit) en tijdens de eerst<br>æ Zilverreiger en Grote Man  | eling van be<br>te regen kw<br>telmeeuw,  | et oude<br>vamen de<br>6e Kwak  | ×   |
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Figure 4. Daily result sheet of a single watchpoint via Trektellen.org or via a plugin included in the website of an organisation.

mine the species. The number of calls and the number of birds are submitted. In 2019 14,472 (mostly hourly) lists were submitted to Trektellen from 111 "listening stations".

### **Output features**

The most important feature and the most visited pages of the website are the daily result sheets of individual sites (Figure 4). On days with good migration the page of a single migration hotspot may be visited thousands of times. The result sheet shows the totals per species for the selected date. For most sites, depending on the settings chosen by the coordinator of the selected site, it is possible to dig into details like age, sex and plumage, open the details to see the hourly counts, find links to photos, watch the season/ year totals, etc. Plugins are available for organisations to embed the results and/or year totals live into their own websites.

Although there is no strong coordination, the standardization in the data is quite high. Most of the sites count all migrating species and if they only count a selection of species (e.g. raptors and storks) this is recorded. Because the dataset is large it is possible to visualize patterns within these three monitoring types in a variety of ways. The website has a lot of "visualisation tools" available to play with the data. In all these tools

it is possible to filter on species, site, country and period (like time of the year, or between two specific dates). There are three main types of output. Table lists are used to display data for example to find the highest counts for a species / sites / country ('record counts', Figure 5) or earliest or latest date for a species in a year (phenology). It is also possible to output maps where it is possible to filter by dates, species and country (figure 6). While lists and maps make it easy to dig deepor into the data, graphs give more information

er into the data, graphs give more information about the timing of migration. Users can choose two options to generate graphs; the default option is hourly averages, giving the mean number of birds counted per observation hour. It is also possible to choose to show totals of birds counted, but this option is less useful for comparing data because the effort is not the same at each site or in each year.

Species have different migration strategies; some are mainly seen in spring migration at given sites, others mainly during autumn: these differences can be visualised through the system. For instance, the three main movement periods for the European Starling *Sturnus vulgaris* are visible in The Netherlands (Figure 7). Trektellen also enables the comparison of phenology between sites. For example, Chaffinch *Fringilla coelebs* and Bramblings *Fringilla montifringilla* migrate on average about two weeks earlier at Falsterbo, the

| Count                    | ry All countries 🔻                      | Sex                    | all    | <b>.</b> |  |
|--------------------------|---|------------------------|--------|----------|--|
| Migration site All sites |   | Age                    | all    | •        |  |
| Speci                    | es Spoonbill                            | Plumag                 | ge all | ۲        |  |
| Year                     | all years 🔻                             | Presen                 | t 🔲    |          |  |
| Period all months 🔻      |   | Favour                 | ites 📃 |          |  |
| Sho                      | w overview                              |                        |        |          |  |
|                          |   |                        |        |          |  |
| #                        | Migration site                          | Totals Date            |        |          |  |
| 1.                       | 📰 Besh Barmag                           | 1440 30 September 2018 |        |          |  |
| 2.                       | 🔤 Besh Barmag                           | 923 24 September 2018  |        |          |  |
| з.                       | Jigue de Malo - Dunkerque (Nord, 59)    | 844 27 September 2016  |        |          |  |
| 4.                       | 📲 Graaf Visart (Brugge)                 | 841 19 September 2015  |        |          |  |
| 5.                       | 🔚 Castro Urdiales                       | 760 22 September 2014  |        |          |  |
| 6.                       | 📧 Besh Barmag                           | 760 22 September 2016  |        |          |  |
| 7.                       | 🚍 De Vulkaan (Den Haag)                 | 704 26 September 2016  |        |          |  |
| 8.                       | 💶 Cabo Roche                            | 701 28 September 2018  |        |          |  |
| 9.                       | II Digue de Malo - Dunkerque (Nord, 59) | 636 13 September 2018  |        |          |  |
| 10.                      | Fonteintjes                             | 603 9 September 2008   |        |          |  |

# Record counts

Figure 5. An example of the highest counts for Spoonbill *Platalea leucorodia* in the Trektellen database https://www. trektellen.org/species/records/0/0/34



Figure 6. Map with hourly averages for Balearic Shearwater *Puffinus mauretanicus* in western Europe for the years 2015–2019 https://www.trektellen.org/maps/species/-3/-1/454/20150101/20191231/1/0



Starling — average number per hour / standard week 1990–2019 (h=547,313:00 n=96,859,620

Figure 7. Migration pattern of European Starling *Sturnus vulgaris* over The Netherlands based on migration counts in 1990–2019 https://www.trektellen.org/species/graph/1/-1/397/0? jaar=2019,2018,2017,2016,2015,2014,2013,2012,201 1,2010,2009,2008,2007,2006,2005,2004,2003,2002,2001,2000,1999,1998,1997,1996,1995,1994,1993,1992,1991,1990

Chaffinch/Brambling TOTAL Sweden Falsterbo Fågelstation, Nabben 2007–2018 (h=10,266:52 n=12,117,375)



Figure 8. Timing of migrating Chaffinck/Brambling *Fringilla coelebs/montifringilla* in Falsterbo Sweden and The Hague The Netherlands (autumn 2007–2018). Median dates are 3 October and 17 October, respectively. https://www.trektellen.org/species/graph\_combo/18/1/2355/28/1923/1923/-2?jaar=2018,2017,2016,2015,2014,2013,2012,2011,2010,2009,2008,2 007&t=dag



Figure 9. Hourly averages per year for Great White Egret *Ardea alba* during spring migration in The Netherlands in 1990–2019. https://www.trektellen.org/species/trend/1/-1/28/-1/0/1990/2019/

most southern point of Sweden, compared to "De Vulkaan" in the North Sea-dunes near The Hague, The Netherlands (Figure 8).

For sites with a longer period of data, the season/year totals (or average number per hour) can give an idea of the annual variation or long-term changes in abundance for a species. The graph of migrating Great White Egret *Ardea alba* in The Netherlands in spring shows that this beautiful species is now migrating over The Netherlands in hundreds (Figure 9).

### Monitoring

It is great to have a lot of data in a database, but can it be used for monitoring? Raptor migration counts are a well-known source for monitoring (populations). In Europe and Asia there are several projects studying raptors in bottlenecks (e.g. Vansteelant et al. 2019) and in North America the numbers are monitored with the Raptor Population Index Project (http://rpi-project.org/technical\_publications.php). For other species migration counts can also be used, for example to show the long-term changes in the timing of migration (van Turnhout et al. 2009). By combining data from both ringing stations and migration counts the selection of species that can be studied can be expanded further.

In the Netherlands, Sovon and Statistics Netherlands recently started to use Trektellen data from a selected set of seawatch sites to calculate trends for the waterbird monitoring, both for the whole country and for coastal Natura 2000 areas. For some species the data is combined with data from other surveys, but for 173 species (Red-throated



Figure 10. Trend for Arctic Skua *Stercorarius parasiticus* in the Netherlands — Source: NEM (Sovon, CBS, Trektellen). Photo: Arctic Skua (28-07-2017, Katwijk-Savoy, the Netherlands, René van Rossum)

*Gavia stellata* and Black-throated Diver *Gavia arctica*, shearwaters, skuas, some seaducks, and some terns) the seawatch data from Trektellen is the only source for calculating trends for these species during the season (July-June) and for an additional four species the data is combined with aerial surveys (Hornman et al. 2020). In figure 10 an example is given for the Arctic Skua *Stercorarius parasiticus* (www.sovon.nl/soort/5690).

### **Outlook and Acknowledgements**

Desirable future developments include better protocols, and a greater focus on recording optional details like exact age/sex/plumage and flight direction. In addition we would like to work on giving Trektellen a more official status, by getting more organisations involved officially. We see no role for Trektellen itself in doing scientific analyses, but we hope that with continued increasing and broader coverage of data in the future, large-scale analyses of Trektellen data can be conducted by researchers and that our work can be a small part in the monitoring and conservation of nature. We want to thank all volunteer counters who use Trektellen.org and add thousands of counts from all over Europe and elsewhere. Special thanks goes to the people like Adri Clements, Clive McKay, Guus van Duin and many others who help in developing and testing new features, checking data, etc. Furthermore we would like to thank the country organizers: Koen Leysen and Rudi Dujardin (Belgium), Nicolas Selosse (France), Kees Koffijberg (Germany), Annika Forsten (Northern-Europe), Xulio Valeiras (Spain, Portugal), Clive McKay (United Kingdom, Ireland), Tom Reed (USA) and Simon Gillings (nocturnal flight call monitoring).

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