Wilds Birds Regulation Unit

Report on a survey of the influx of Golden Plover and Song Thrush over the Maltese Islands, made between October 2020 and January 2021

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1. Introduction

1.1 Preamble

On 20th December 2019, the then Ministry for the Environment, Sustainable Development and Climate Change (hereafter 'MESDC')[1] issued a call for tenders (reference: MESDC Tender 445/2019), titled "*Tender for an independent scientific study on the influx or passage of migratory Common Quail and Turtle Dove in Malta during autumn 2020 and the influx or passage of migratory finches, Golden Plover and Song Thrush in Malta during the 2020 autumn/winter season*". The Terms of Reference (ToR) specified in the tender document are as follows:

2. Contract Objectives and Expected Results

2.1 Overall Objectives

The overall objective of this contract is:

- *To provide an independent study on the influx or passage of the migratory Turtle Dove* Streptopelia turtur *and Common Quail* Coturnix coturnix *during the Autumn period, between the 1st of September 2020 to the 31st October 2020, inclusive of both dates; and*
- *To provide an independent study on the influx or passage during the Autumn/Winter 2020, between the 15th of October 2020 till the 15th January 2021, inclusive of both dates, of the following species:*
  *Common Linnet (*Linaria cannabina*),*
  *Common Chaffinch (*Fringilla coelebs*),*
  *European Serin (*Serinus serinus*),*
  *European Goldfinch (*Carduelis carduelis*),*
  *European Greenfinch (*Chloris chloris*),*
  *Hawfinch (*Coccothraustes coccothraustes*),*
  *Eurasian Siskin (*Spinus spinus*),*
  *Golden Plover (*Pluvialis apricaria*), and*
  *Song Thrush (*Turdus philomelos*)*

2.2 Specific Objectives

The objectives of this contract are as follows:

- *To survey and scientifically monitor the daily influx of Turtle Dove, Common Quail, seven species of finches, Golden Plover and Song Thrush on the respective dates/periods specified above;*
- *To estimate the overall presence (influx) of these eleven species per day and for the whole study period for each respective species as specified above, subject to scientifically justified assumptions; and*
- *To correlate migration data gathered through the present survey with bag data for the relevant species, should any live-capturing derogations be applied during the 2020 autumn season.*

[1] Tender MESDC 445/2019 was issued by the then Ministry for the Environment, Sustainable Development and Climate Change on behalf of the Wild Birds Regulation Unit (WBRU); the WBRU now falls within the Ministry for Gozo.

2.3 Results to be Achieved by the Consultant

1. *Daily datasheets with raw counts for seven (7) finch species: (Common Linnet* Linaria cannabina*, Common Chaffinch* Fringilla coelebs*, European Serin* Serinus serinus*, European Goldfinch* Carduelis carduelis*, European Greenfinch* Chloris chloris*, Hawfinch* Coccothraustes coccothraustes*, Eurasian Siskin* Spinus spinus
2. *Daily datasheets with raw counts for Golden Plover* Pluvialis apricaria *and Song Thrush* Turdus philomelos*;*
3. *Daily datasheets with raw counts for the Turtle Dove* Streptopelia turtur *and Quail* Coturnix coturnix*; and*
4. *Submission of three (3) monitoring reports for Autumn/Winter 2020: one report comprising the monitoring of the influx of seven species of finches, a separate report comprising the monitoring of the influx of Golden Plover and Song Thrush and another separate report comprising of the monitoring of Turtle Dove and Common Quail. Each of these reports must include:*
   a) *List of monitoring stations which recorded high/low counts;*
   b) *Dates which showed high/low peaks in the migration of each of the bird species;*
   c) *A daily estimate of the influx of each of the bird species for the whole of the Maltese Islands;*
   d) *The estimated total influx for these species for the whole of the study period, subject to scientifically justified assumptions;*
   e) *A comparative analysis of the results obtained during the past studies; and*
   f) *A comparative assessment of the results obtained with the bag data extracted from telephonic reports for 2020, which data shall be provided by the Wild Birds Regulation Unit at the end of each monitoring period, (for Golden Plover, Song Thrush and Finches reports, this would only apply in case relevant derogations permitting live-capturing are applied in 2020).*

3. Assumptions and Risks

3.1 Assumptions Underlying the Project Intervention

For the purposes of this bird migration study, it will be assumed that the contractor shall use the daily counts obtained from the monitoring stations to extrapolate the approximate estimate of the total influx of each of the bird species: Common Linnet Linaria cannabina*, Common Chaffinch* Fringilla coelebs*, European Serin* Serinus serinus*, European Goldfinch* Carduelis carduelis*, European Greenfinch* Chloris chloris*, Hawfinch* Coccothraustes coccothraustes*, Eurasian Siskin* Spinus spinus*, Golden Plover* Pluvialis apricaria*, Song Thrush* Turdus philomelos*, Turtle Dove* Streptopelia turtur *and Common Quail* Coturnix coturnix *over the Maltese Islands.*

Moreover, it shall also be assumed that the passage of birds at different localities is extremely variable and may be subject to local topographic, anthropogenic, climatic and other conditions which are to be taken into account in the appropriate extrapolation methods that shall be used to estimate the total influx of the species concerned.

3.2 Risks

Execution of the bird migration study is dependent on an adequate enrolment of the ornithologists/ field assistants who shall be manning the monitoring stations (at least 21 in number). It shall be the responsibility of the contractor to ensure that the active monitoring

stations are manned by a sufficient number of ornithologists and/or field assistants. The number of active stations on any given day shall be six (6) sites manned by at least two ornithologists and/or field assistants and each site has to be surveyed every 4 days. The numbers and location of the monitoring stations, as well as the level of personnel deployed in each station should be consistent with the corresponding parameters deployed in past studies of this nature in Malta which can be accessed on http://environment.gov.mt/en/Pages/WBRU/Reports-and-Statistics.aspx.

The consultants shall propose strategies to address the identified risks. These proposals shall be included in the tenderer's technical offer.

The Contracting Authority reserves the right to cancel award of the tender at its discretion. The publication of this tender shall in no way be construed or perceived as obliging the Government or any other relevant authority to take any decision in connection with any derogation under the European Union Birds Directive or any other law or regulation

4 Scope of the Work

4.1 General

Project Description

The monitoring of the influx or passage of nine bird species (Common Linnet Linaria cannabina*, Common Chaffinch* Fringilla coelebs*, European Serin* Serinus serinus*, European Goldfinch* Carduelis carduelis*, European Greenfinch* Chloris chloris*, Hawfinch* Coccothraustes coccothraustes*, Eurasian Siskin* Spinus spinus*, Golden Plover* Pluvialis apricaria*, Song Thrush* Turdus philomelos*) shall take place during the period between the 15th October 2020 and the 15th January 2021 both dates included. The Contractor shall mobilise all staff and equipment for this study by the 24th of September 2020, in preparation for the execution of Autumn/Winter 2020 migration study.*

The monitoring of the influx or passage of the Turtle Dove Streptopelia turtur *and Common Quail* Coturnix coturnix *at each station shall take place between the 1st of September 2020 till the 31st of October 2020, both dates included, for at least two hours in the morning (prior to 12:00hrs) for Common Quail and for seven hours starting from 7:00hrs in the case of Turtle Dove. The consultant shall mobilise all staff and equipment for this study by the 17th of August 2020, in preparation for the execution of the Autumn 2020 bird migration study. The bird monitoring phase shall commence on the 1st of September 2020.*

The bird migration studies should comprise the on-field surveying and scientific monitoring of the daily influx of migration of all seven (7) finch species, Golden Plover, Song Thrush, Turtle Dove and Common Quail. This would provide an independent verification of the level of presence of the species in Autumn/Winter and the timing of their migration. This shall be achieved by generating a "Migration Count," that is a count of migrant birds of each species in question in the stipulated time span when monitoring is undertaken.

The collection of scientific data to elucidate general population trends for these species is beyond the scope of this bird migration study. The Contractor must submit the daily datasheets with raw counts to the Contracting Authority at the end of each week. The draft monitoring reports and analysis for the Finches and Golden Plover and Song Thrush reports are to be submitted by the 22th of January 2021.The draft monitoring report for Turtle Dove and Quail is

to be submitted within five (5) working days from the study phase, that is, by the 6th November 2020.

Once the draft Autumn 2020 study reports have been certified for quality assurance by the Contracting Authority, the final monitoring reports are to be submitted for quality assurance within five (5) working days from such review.

Geographical Area to be covered

The three inhabited islands of the Maltese archipelago, namely Malta, Gozo and Comino.

Target Groups

As appropriate.

4.2 Specific Activities

The bird migration studies shall monitor the influx of migratory specimens of Common Linnet Linaria cannabina*, Common Chaffinch* Fringilla coelebs*, European Serin* Serinus serinus*, European Goldfinch* Carduelis carduelis*, European Greenfinch* Chloris chloris*, Hawfinch* Coccothraustes coccothraustes*, Eurasian Siskin* Spinus spinus*, Golden Plover* Pluvialis apricaria*, Song Thrush* Turdus philomelos*, Turtle Dove* Streptopelia turtur *and Common Quail* Coturnix coturnix *bearing in mind any methodological and physical limitations in the monitoring of these species, such as ability to identify or differentiate species of finches on the basis of their call rather than appearance and as identified in the European Union Management Plan for the Common Quail.*

A field protocol of standard operating procedures, which will be used in the same manner from day to day should be designed by the commissioned experts on the basis of best practice procedures. There might be a need to take into consideration however, the flexibility of the techniques used to meet the constraints imposed by local geographical conditions

A network of monitoring stations will need to be set up throughout the three inhabited islands of the Maltese archipelago for the study periods. Such a network would need to comprise of 21 monitoring stations. The number of active stations on any given day shall be six (6) sites manned by at least two ornithologists and/or field assistants. Each site has to be surveyed every 4 days. Monitoring in Malta, Gozo and Comino shall be carried out on a daily basis, however this requirement shall be waived with respect to Comino on those days when access to the Island would not be possible due to adverse weather conditions. The ornithologists and/or field assistants shall be persons with relevant knowledge in bird identification and shall have the capacity to identify all of the eleven (11) bird species visually as well as capable of recognizing the flight calls of finches.

For Golden Plover, Song Thrush and Finches monitoring study, daily monitoring at each station shall be conducted from 09:00hrs to 14:00hrs during the first ten days of the study (15th October-24th October) and from 08:00hrs to 13:00hrs during the 25th October-15th January study period to factor in the Daylight Saving Time, which ends on 24th October.

For Turtle Dove and Common Quail monitoring study, daily monitoring at each station shall be conducted from at least two hours in the morning (prior to 12:00hrs) for Common Quail and

for seven hours starting from 7:00hrs in the case of Turtle Dove at each station during the study period ie. 1st September 2020 till the 31st October 2020, both dates included.

For each day during the bird monitoring phase, at least six (6) monitoring stations must be fully manned. The exact number, location and area of the monitoring stations will be determined in consultation with scientific experts listed by contractor who are commissioned to undertake this bird migration study. Such details should be included in the methodology submitted in Section 4 Technical Offer (Organization and Methodology) by the Contractor. Given that the survey is aimed at quantifying the influx or passage of migrating birds, all monitoring stations shall be placed in strategic locations depending on the species being surveyed and the expected geographical occurrence of the species depending on the overall timing of the migration and prevailing weather conditions. The location of the monitoring stations shall be selected with care and shall not include areas where the settlement or sighting of the birds under study cannot in practice occur.

The Project coordinator should be able to co-ordinate a team of scientists and scientific experts and conduct environmental monitoring, nature-related and/or ornithological studies. The role of the scientists accompanying the Project coordinator should also include the ability to conduct environmental monitoring, nature-related and/or ornithological studies.

Each monitoring station should include or encompass a defined 'count area' that has features that are compatible with the chosen count procedures. Moreover, no matter the type of method, the experts should also define the total daily 'count period', as well as the standard daily time periods during which the various component activities of bird counting procedures occur.

Surveys should focus on observations made, and should be coordinated by the Project co-ordinator or/and scientist/s, so as to enable an appropriate scientific determination with ecological statistics and/or models leading to population estimates (possibly through the extrapolation of results, with standard errors being indicated) and should cover, at least, the three main inhabited islands of the Maltese archipelago.

The migration count can include birds counted at a site, observed flying past a fixed point in diurnal migration or alighting onto the ground or trees. For monitoring small landbirds, particular attention should be drawn to birds observed at short-term stopover sites immediately following a migratory flight. There are several options for producing a useful migration count of small landbirds; these options include: visible migration count; area search or route census counts; incidental observations; and daily estimated totals. The commissioned experts should define in the final monitoring report what they will consider as a migration count and what standardised methods will be used.

Nonetheless, in view that Finches, Golden Plover and Song Thrush have a preference for migrating during particular times of day, observations should focus on such peak times. In this respect the monitoring is to be carried out from 09:00hrs to 14:00hrs during the first ten days of the study (15th October–24th October) and from 08:00hrs to 13:00hrs during the 25st October–15th January study period to factor in the Daylight Saving Time, which ends on 24th October.

In view that the Common Quail has a preference for cover and may be more difficult to observe or be detected, the surveys for this species should focus on area searches. These may include, the use of dogs to flush the birds out and/or through the use of line transects (a method where

observers traverse the monitoring area in close parallel lines to search the area). Surveys for the Common Quail should be carried out for at least two hours in the morning (prior to 12:00hrs) at each of the monitoring stations in operation.

The surveys of the Turtle Dove, on the other hand, should focus mainly on observations (which should include both specimens observed in flight as well as those alighting within the study site). The monitoring of this species needs to be carried out during the times of maximum activity/ major influx of the Turtle Dove and for a minimum of seven hours starting from 7:00hrs at each of the monitoring stations in operation.

It is imperative that the observers, or persons deployed by the consultant to man the stations and/or conduct counts or observations for the purpose of this study shall not be directly or indirectly involved with the practice of live-capturing or hunting.

Standardisation of counting methods can make a major contribution to removing extraneous variation derived from variable observer effort and sampling procedures. Nevertheless, migration counts will still be subject to uncontrollable variation from weather, observer differences, and unavoidable changes in the level of effort. Such problems should be addressed by the use of appropriate analytical procedures.

Daily datasheets with raw counts need to be drawn for each of the monitoring stations in use, such that the prevalent meteorological conditions, namely wind direction and speed, the degree of cloud cover; the habitat type; bird counts; the times and locations; and the names of the field assistants, are all recorded.

The count data collected for a pre-defined area and the count period at each study site shall be used to establish the average counts (per day) recorded in a typical monitoring station for each of the eleven (11) bird species. The calculations for such counts also need to include the standard deviation errors. Such mean counts shall then be extrapolated so as to cover the total area where the species may settle / which serves as short-term stopover sites, in order to estimate the total number of birds migrating daily over the Maltese Islands.

The appropriate methodology for extrapolation shall be determined by the scientific experts taking into account the possibility of repeat counting of observed birds; the patchiness of each species' distribution and frequency depending on available appropriate habitat; the seasonal geographical variation in the frequency of sightings dependent on the expected migration flow direction and any assumptions taken for such calculations need to be clearly stated in the monitoring report.

Relevant seasonal, local topographic (e.g. configuration of the coast), climatic and anthropogenic factors (such as degree of local urbanization) shall be duly taken into account in the extrapolation methodology, subject to scientifically justified assumptions.

The methodology shall not involve trapping or any taking of any bird, whether alive or dead.

The field study for Golden Plover, Song Thrush and Finches shall cover 88 full days during the Autumn/Winter migration period, between the 15th October 2020 and the 15th January 2021. The field study for the Turtle Dove and Quail shall cover 61 full days between the 1stSeptember and 31st October 2020. The collection of scientific data to elucidate population trends for each bird species is beyond the scope of this bird migration study. The consultant must submit the daily datasheets with raw counts to the Contracting Authority at the end of each week of each of the bird monitoring periods. The Autumn/Winter 2020 Finches, Golden Plover and Song

Thrush Migration monitoring reports and analysis is to be submitted by the 22nd January 2021. Once such draft reports have been certified for quality assurance by the Contracting Authority, the Finches Migration 2020 monitoring report and Golden Plover and Song Thrush Migration 2020 monitoring report are to be submitted within 5 working days from such a review. The draft monitoring report and analysis for Turtle Dove and Quail Autumn 2020 study is to be submitted by the 6th of November 2020. Once such draft report has been certified for quality assurance by the Contracting Authority, the final Autumn 2020 monitoring report is to be submitted within 5 working days from such a review.

These activities will result in:

1. Daily datasheets with raw counts for each of the above mentioned bird species.
2. Three monitoring reports for each study period, including comparative analysis.

4.3 Project Management

Responsible Body

The overall responsibility of the implementation of this contract lies with the Contracting Authority. An official will be appointed to oversee the implementation of the contract.

Management Structure

The Head of the Wild Birds Regulation Unit within the Ministry for the Environment, Sustainable Development and Climate Change is the official responsible for this contract. The Head may delegate various tasks to other officials within the Wild Birds Regulation Unit and may appoint an official to act as a project manager and to monitor the progress of this project.

Facilities to be provided by the Contracting Authority and/or other parties

None

5. Logistics and Timing

5.1 Location

The Republic of Malta. The monitoring stations shall be set up at appropriate locations within the three inhabited Maltese Islands, namely in Malta, Gozo and Comino.

The contractor, moreover, is expected to compile reports, prepare scientific analysis, and prepare the setup of the administrative framework from his own premises. The contractor should be available during office hours via e-mail and telephone.

5.2 Commencement Date & Period of Execution

The intended commencement date for the monitoring phase for Turtle Dove and Quail study is from the 1st September 2020 and the study of the Golden Plover, Song Thrush and Finches is the 15th October 2020. Article 19.1 of the Special Conditions will determine the actual commencement date and period of execution.

6. Requirements

6.1 Personnel

The Service Provider/s must be a natural person, or a legal entity providing the below Key Experts:

A list of the key experts and other staff proposed for the execution of the contract as per Form marked Key Experts to be submitted online through the prescribed tender response format (tender structure).

Key Expert 1

A Project co-ordinator who must be:
In possession of a Ph.D. or equivalent or other academic qualification at MQRIC Level 8 related to natural sciences

Key Expert 2

A Scientist who must be:
In possession of a Masters degree or equivalent or other academic qualification at MQRIC level 7 in natural sciences

The above key expertise can be provided by a single person, provided that he/she has the required qualifications as stipulated above.

Other experts

CVs for experts other than the key experts are not examined prior to the signature of the contract.

The Consultant shall select and hire other experts as required according to the profiles identified in the Organisation & Methodology and these Terms of Reference.

All experts must be independent and free from conflicts of interest in the responsibilities accorded to them.

The selection procedures used by the Contractor to select these other experts shall be transparent, and shall be based on pre-defined criteria, including professional qualifications, language skills and work experience. The findings of the selection panel shall be recorded. The selection of experts shall be subject to approval by the Contracting Authority.

Support Staff and Backstopping

- *The bird migration study is to be supported by ornithologists or field assistants with relevant experience in bird identification.*
- *Other support staff should be capable in carrying out statistical analysis, report writing and/or other relevant administration work.*

6.2 Accommodation

Office accommodation of a reasonable standard and of approximately 10 square metres for each expert working on the contract is to be provided by the Consultant.

6.3 Facilities to be provided by the Consultant

The Consultant shall ensure that experts are adequately supported and equipped. In particular it shall ensure that there is sufficient administrative, secretarial and interpreting provision to enable experts to concentrate on their primary responsibilities. It must also transfer funds as necessary to support its activities under the contract and to ensure that its employees are paid regularly and in a timely fashion.

The contractor shall provide the equipment, software and hardware needed for carrying out surveys, data gathering, storage, analysis and evaluation.

If the Consultant is a consortium, the arrangements should allow for the maximum flexibility in project implementation. Arrangements offering each consortium partner a fixed percentage of the work to be undertaken under the contract should be avoided.

6.4 Equipment

No equipment is to be purchased on behalf of the Contracting Authority/beneficiary country as part of this service contract or transferred to the Contracting Authority/beneficiary country at the end of this contract. Any equipment related to this contract which is to be acquired by the beneficiary country must be purchased by means of a separate supply tender procedure.

The contractor shall be responsible for establishing his own sources for goods, equipment, materials and software to perform the necessary activities and tasks, which may include:

- *Field Monitoring equipment, as appropriate e.g. binoculars, compass (to measure wind direction), radar equipment etc.*
- *Research equipment*

7. Reports

7.1 Reporting Requirements

Daily data sheets with raw counts need to be drawn for each of the monitoring stations in use, such that the prevalent meteorological conditions, namely wind direction and speed, the degree of cloud cover, the habitat type, bird counts, the times and locations, the names of the field assistants all need to be recorded.

Following the survey/study period a detailed analysis shall be carried out on the data collated which are to be presented in Three separate reports (one concerning Turtle Dove and Common Quail, one concerning seven finch species and a separate report concerning Golden Plover and Song Thrush migration). Such reports are to indicate:

- *the raw counts for the species covered by the corresponding migration report*
- *sampling methodology used*
- *the time schedule for the monitoring taken place*
- *the locations where monitoring was carried out and the estimated area of each site of observation*
- *the peak and low counts for each of the species under study*
- *the locations/ monitoring stations which had peak/low counts*

- *an extrapolation indicating the total influx of each of the relevant species migrating over the Maltese Islands for each day*
- *an estimated total influx of each of the relevant bird species for the whole study period*
- *assumptions taken for such estimates*
- *For Turtle Dove and Quail, comparison of the results with hunting bag data for this period*
- *For Golden Plover, Song Thrush and seven finch species comparison of the results with live-capturing bag data for the species concerned for the current period (this would only apply in case relevant derogations permitting live-capturing are applied in 2020)*

These reports should only concern information/data on the influx of the migratory birds and should not include personal opinions of the Contractor.

The Contractor must submit the daily datasheets with raw counts to the Contracting Authority at the end of each week during the bird monitoring phase. The draft Autumn 2020 report and analysis for Turtle Dove and Quail is to be submitted by the 6th November 2020. The draft Autumn/Winter 2020 Migration monitoring Finch report and the Golden Plover and Song Thrush Migration monitoring report analysis are to be submitted by the 22nd January 2021.

Draft reports are to be submitted to the Contracting Authority for quality assurance certification. The Contracting Authority reserves the right to request the necessary modifications to bring the reports in line for issuance of quality assurance certification. In this regard, the Contractor is bound to submit his final version for quality assurance certification to the Contracting Authority, five (5) working daysafter the Contracting Authority reviews the report.

All reports and other forms of written communication must be presented in an editable format using commonly available software. All reports must be approved by the Contracting Authority before these can be considered finalised. All reports will be property of the Contracting Authority and it will have sole copyright.

7.2 Submission & approval of progress reports

The daily data sheets with raw counts, a hard copy and a soft copy of each of the monitoring reports referred to above must be submitted to the Project Manager identified in the contract. The progress reports must be written in English. The Project Manager is responsible for approving the progress reports.

8 Monitoring and Evaluation

8.1 Definition of Indicators

Results	*Objectively verifiable indicators*	*Sources of verifications*
Daily datasheets with raw counts of Common Linnet Linaria cannabina*, Common Chaffinch* Fringilla coelebs*, European Serin* Serinus serinus*, European Goldfinch*	*The original raw datasheets which are to be completed on site during the monitoring process to be submitted by the end of each*	*The original datasheets submitted to the Contracting Authority.*

Carduelis carduelis, *European Greenfinch* Chloris chloris, *Hawfinch* Coccothraustes coccothraustes, *Eurasian Siskin* Spinus spinus, *Golden Plover* Pluvialis apricaria, *and Song Thrush* Turdus philomelos, *Turtle Dove* Streptopelia turtur *and Common Quail* Coturnix coturnix	*week of the monitoring phase.*	
Daily datasheets with raw counts of Turtle Dove Streptopelia turtur *and Common Quail* Coturnix coturnix	*The original raw datasheets which are to be completed on site during the monitoring process to be submitted by the end of each week of the monitoring phase.*	*The original datasheets submitted to the Contracting Authority.*
Autumn/Winter 2020 Finches migration monitoring report which presents clear analyses of the monitoring carried out.	*The draft monitoring report shall be submitted by the 22nd of January 2021.* *The monitoring report will be finalised by the consultant and approved by the Contracting Authority within five working days of the final submitted report.*	*The actual monitoring report presented by the contractor.*
Turtle Dove and Quail Autumn 2020 season monitoring report which presents a clear analyses of the monitoring carried out as well as analysis and comparison with results of past studies	*The draft monitoring report shall be completed within the 6th November 2020.* *The monitoring report will be finalised by the consultant and approved by the Contracting Authority within five working days of the final submitted report.*	*The actual monitoring report presented by the contractor.*

Ecoserv Ltd (hereafter 'Ecoserv') submitted a response to the tender and was subsequently notified that the company's bid was successful. The present submission constitutes Ecoserv's report of the independent scientific study on the influx of Golden Plover (*Pluvialis apricaria*) and Song Thrush (*Turdus philomelos*) in Malta, undertaken by the company during the period 15 October 2020 to 15 January 2021, which overlaps with the 2020 autumn/winter live-capturing season (01 November 2020 to 10 January 2021 for Golden Plover[2]; 20 October to 31 December 2020 for Song Thrush), and is based on the ToR stated above. A report on the study of the migratory influx of Turtle Dove *Streptopelia*

[2] Although the statutory closing date of the season for Golden Plover was 10 January 2021, the national bag limit was reached on 04 January 2021 and the season was therefore closed on this date.

turtur and Common Quail *Coturnix coturnix* that forms part of the present tender was submitted in 2020 (Ecoserv, 2020d), while another report on the study of the migratory influx of finches Common Linnet *Linaria cannabina*, Common Chaffinch *Fringilla coelebs*, European Serin *Serinus serinus*, European Goldfinch *Carduelis carduelis*, European Greenfinch *Chloris chloris*, Hawfinch *Coccothraustes coccothraustes* and Eurasian Siskin *Spinus spinus* that also forms part of the present tender has been submitted separately but in parallel with the present submission (Ecoserv, 2021).

An overview of the migratory behaviour and records for Golden Plover (*Pluvialis apricaria*) and Song Thrush (*Turdus philomelos*) around the Maltese Islands has already been presented in Ecoserv (2016a) and will not be repeated here. Except for the bird migration monitoring studies conducted in the autumn of 2015, 2016, 2017, 2018 and 2019 (see Ecoserv, 2016a; 2017a; 2018a; 2019a; 2020a), no similar studies on Golden Plover and Song Thrush have been previously undertaken locally. However, records of the number of individuals of these two species caught by live-capturers between 2002 and 2019 are available in the *Carnet de Chasse*/Game Reporting Data reports for the respective years (reports for 2010–2019 accessible from the Wild Birds Regulation Unit (WBRU) website: https://mgoz.gov.mt/en/Pages/WBRU/Reports-and-Statistics.aspx), while the records of Golden Plover and Song Thrush catches made during the 2012–2019 Autumn live-capturing derogations are available from the website of the Wild Birds Regulation Unit (https://mgoz.gov.mt/en/Pages/WBRU/Reports%20and%20Statistics/Autumn-Live-Capturing-Derogations%E2%80%8B-.aspx).

2. Methodology

Field procedure

The survey design used by Ecoserv during the present autumn/winter 2020 survey was aimed at assessing the migratory influx of Golden Plover and Song Thrush, which entails trend analysis based on data from monitoring carried out regularly over a sufficiently long period comprising subsequent years, and using a similar methodology to that used previously by Ecoserv to monitor the migratory influx of Golden Plover and Song Thrush (Ecoserv, 2016a; 2017a; 2018a; 2019a; 2020a) and other migratory bird species (Ecoserv, 2011; 2012; 2013; 2014a; 2014b; 2015b; 2015c; 2016b; 2016c; 2017b; 2017c; 2017d; 2018b; 2018c; 2018d; 2019b; 2019c; 2019d; 2020b, 2020c; 2020d). During the survey, two individuals - a field assistant capable of identifying Golden Plover and Song Thrush and an observer who was responsible for recording of data in the field - were stationed at a total of 21 sites (= count stations) distributed over Malta, Comino and Gozo. Prior to enrolment for the survey, the field assistants would have been assessed by Ecoserv's environmental scientists and ecologists to ensure that they are capable of identifying the bird species concerned. The observers were given briefings by Ecoserv's consultants on identification of Golden Plover and Song Thrush, and received further training in the field on same by the field assistants. Throughout the survey, Ecoserv's environmental scientists and ecologists ensured close monitoring of the activities of the field personnel to ensure that collection of data proceeded as per designated protocol by carrying out field visits (most of which were 'surprise visits') on a regular basis.

The survey was undertaken over a period of 93 days, between 15 October 2020 and 15 January 2021. During the survey, counts of individuals of the two species (Golden Plover *Pluvialis apricaria* and Song Thrush *Turdus philomelos*) were made at each of 6 different sites on each day during the monitoring period. Each group of 6 sites was surveyed once every 4 days, such that a total of 21 sites were surveyed over each period of 4 days, as agreed with the Contracting Authority. The study site at

Comino was included in the 6 sites surveyed on any one day, such that every attempt was made to survey this site on a daily basis. However, when weather conditions precluded count surveys at this site due to unavailability of sea transport services, the surveys were undertaken at an alternative site instead. The sampling sites are represented by the grid cell reference numbers listed in Table 1, while their locations are shown in Figure 1.

Table 1
List of grid locations where monitoring of influx of migratory birds was carried out.

Location	Day 1	Day 2	Day 3	Day 4
Gozo	3690	3292	2888	3286
Comino	4085	4085	4085	4085
Malta	3881	4079	4077	4073
Malta	4070	4268	4666	5064
Malta	5663	6067	6069	5872
Malta	5277	4878	4480	4283

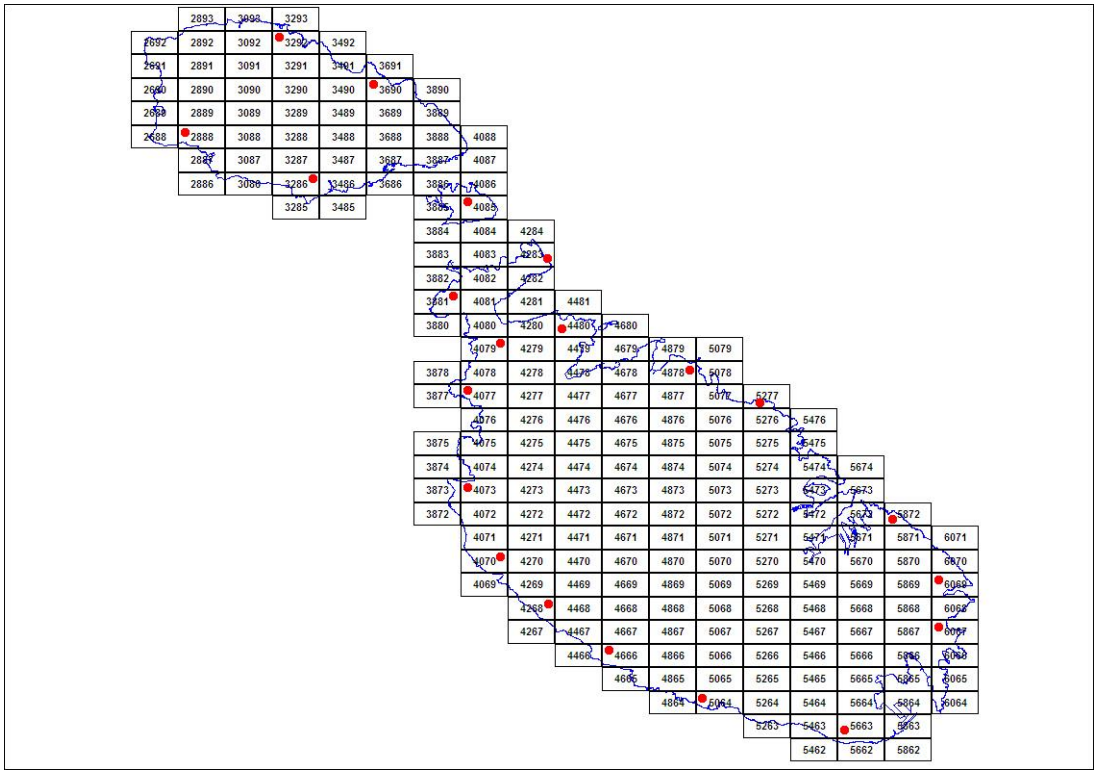

Figure 1. Map of the Maltese Islands showing the localities (grid cells indicated by the red filled circle) where the bird counts were made; see also Table 1.

Since the survey was mainly aimed at quantifying the influx of migrating individuals, field sites were sited at strategic locations in coastal areas. For each species, the number of individuals observed flying within each study site was recorded, while the count area was estimated as the area within the observer's field of view when observing horizontally (c. 250m on each side of the observer) and vertically upwards (as far as the birds were detected by sight). Golden Plover and Song Thrush are small birds that are difficult to identify when they are flying at a distance, even if binoculars are used. Nonetheless, every effort was made to identify the species as accurately as possible; to aid the observers detect the birds, field personnel used a pair of binoculars (magnification: 8 x 21). The different species were identified on the basis of their flight pattern and call. When the field personnel had doubt as to the specific identity of a species, a '?' was placed next to the record on the field data sheet to indicate the uncertainty. Afterwards, during data analysis (see below), comparison was made of records marked with a '?' from a particular site with records from other sites for the same day as corroboration procedure. Uncertain records were allotted to the species which the field personnel determined as most probable with respect to species identity and which showed agreement with appreciable records from other sites on the same day for that species.

Monitoring of Golden Plover and Song Thrush was made between 09:00 and 14:00 during the first ten days of the study (i.e. up to the date when the daylight saving hour was removed) and between 08:00 and 13:00 during the rest of the study period. The count data collected for the pre-defined area and count period at each study site was used to establish the mean number of birds recorded for each day of the survey.

At each study site, the observers also recorded the prevalent weather conditions, namely wind direction and strength, and degree of cloud cover. This information is available on the raw data sheets, copies of which have been submitted to the Wild Birds Regulation Unit. Although it would be interesting to explore potential relationships between weather conditions and migratory influx of the bird species surveyed, this would entail in-depth statistical analyses, while assessment of the influence of local climatic factors on the migratory influx of birds was beyond the scope of the present study. Nevertheless, the weather data collected during the present survey is useful as it will be available for such potential study.

Data analysis

Using the recorded raw data for each of the two bird species, estimates were made of the mean daily count and total count for the study period (15 October 2020 to 15 January 2021). Values of standard deviation for the respective mean daily counts were also estimated; standard deviation is a measure of variability among counts recorded from the different sites; that is, a low standard deviation implies that very similar counts were recorded at all six sites surveyed during a particular day, whereas dissimilar values would lead to a high standard deviation. Standard deviation is influenced by sample size (i.e. number of study sites); it tends to increase with a decreased sample size.

An estimate of total influx of the respective bird species was made using the daily counts. Extrapolations were then made to obtain the total number of individuals of each species that migrated over the Maltese Islands on a particular date. However, such an estimate must be treated with utmost caution, given that: (a) migration of Golden Plover and Song Thrush is not necessarily restricted to that time of the year covered by the present study; (b) a relatively small number of sites used; (c) the counts were not made daily at each site; and (d) bird counts were made while the live-capturing season for Golden Plover and Song Thrush was open, hence individuals may have been caught before the field personnel could record them. Being small birds, Golden Plover and Song Thrush are easy to miss and present difficulty to identify if they pass beyond a certain distance from the observer, and especially if

they do not call while in flight. Furthermore, passage of birds at different localities is extremely variable, with potential large differences in birds passing at two different localities, even if these are separated by a very small distance.

As already stated, another notable limiting factor was that on any day of the field survey, recording of data was stopped in the early afternoon and was resumed the following morning, hence potentially missing birds that arrive during that time of the day not covered by the present survey, as these would not have been recorded by the field observers. Golden Plover and Song Thrush are known to also migrate between dusk and dawn; hence individuals migrating during this time would not be detected during the survey. One should also mention that Song Thrush migration starts before the survey period, given that they start migrating from mid-September onwards, whereas the autumn/winter migration of Golden Plover extends into late January; hence such birds would not have been included in the present survey. On the other hand, the estimates given in the present report will be useful when making comparisons of data collected from the present study period (autumn/winter 2020) and that collected from future studies held in autumn in subsequent years, assuming that a similar survey design is adopted, to assess whether the trend in influx is increasing or decreasing with time. Since the coastal length surveyed at each site during the present survey is approximately 0.5 km, the mean daily count represents the mean influx of the respective species per 0.5 km coastline. The estimated daily influx was obtained by extrapolating the mean daily values obtained (per 0.5 km) to the total coastline length for the Maltese Islands, which have a perimeter of 271.22 km (Mallia *et al*, 2002)[3]; that is, the estimated daily influx equals the mean daily count multiplied by an extrapolation factor of 271.22/0.5. Values of estimated daily influx were then summed to obtain an estimate of the total influx of the two bird species (Golden Plover and Song Thrush).

3. Results

Ecoserv's laboratory report reference for the present survey is **010-21**. The sample reference codes for the bird count data are **B-847-20** to **B-888-20**.

Where indicated in the following results, a mean count value of '0' recorded for a bird species on a particular day during the survey period, which would also have been extrapolated to a total influx value of zero for that specific date, is highly unlikely to correspond to actual total absence of migration of the particular species over the Maltese Islands, and should be attributed to an artefact of sampling, resulting from the small sample size.

Golden Plover

Raw daily counts for Golden Plover recorded from the 21 sites during the present study varied between 0 and a maximum of 10 (see Appendix I), while the mean daily counts ranged between 0 and 3.33 (Table 2). Most of the counts for this species were recorded between early November and early January, with a period of higher counts between mid-November and mid-December. The total counts, i.e. the total number of Golden Plover individuals recorded from a given grid location (= study site) during the whole study period (93 days), varied appreciably between the different sites: at the lower end, no individuals were recorded throughout the survey period from the site at grid locations 5064, while at the higher end, 60 Golden Plover individuals were recorded from the site at grid location 4085 (which was surveyed daily), and 34 individuals were recorded from the site at grid location 4073.

[3] Note, however, that this estimate includes the perimeter of minor islets and rocks.

Values of mean daily counts and total counts of Golden Plover recorded during the period 15 October 2020 to 15 January 2021 from the present survey are summarised in Table 2. Values of standard deviation associated with the mean daily counts are also provided in Table 2. Counts of Golden Plover recorded from the present survey, along with those made during the autumn 2015, 2016, 2017, 2018 and 2019 surveys, are shown graphically in Figure 2. Overall, count values for Golden Plover from the present (autumn/winter 2020) survey show a similar trend to those recorded in the previous autumn surveys, with higher count values recorded during the period mid-November to early January.

An estimate of total influx of Golden Plover over the Maltese Islands is given in Table 2. Based on the mean daily counts (Table 2), extrapolation translates to an estimated daily influx ranging between 0 and 1,808 individuals, with a total influx over the survey period (15 October 2020 – 15 January 2021; i.e. 93 days) of 26,579 individuals; see Table 2.

Mean count values for Golden Plover recorded from each of the 21 sites are indicated on the map shown in Figure 3. The highest mean count was recorded from Fomm ir-Riħ (Grid 4073) located in western Malta, while relatively high counts were also recorded from other sites located in northern Malta, Comino and Gozo, as well as from San Tumas (Grid 6067) in southeastern Malta. Comparatively lower counts for this species were recorded from other study sites located in southern Malta.

Table 2

Values of mean (± SD) daily count and daily total count recorded from the six study sites during the present survey, together with total influx of migratory Golden Plover.

Date	Mean daily count	Standard deviation	Total daily count	Estimated daily influx
15-Oct-20	0.00	± 0.00	0	0
16-Oct-20	0.00	± 0.00	0	0
17-Oct-20	0.00	± 0.00	0	0
18-Oct-20	0.00	± 0.00	0	0
19-Oct-20	0.00	± 0.00	0	0
20-Oct-20	0.00	± 0.00	0	0
21-Oct-20	0.00	± 0.00	0	0
22-Oct-20	0.00	± 0.00	0	0
23-Oct-20	0.00	± 0.00	0	0
24-Oct-20	0.00	± 0.00	0	0
25-Oct-20	0.00	± 0.00	0	0
26-Oct-20	0.00	± 0.00	0	0
27-Oct-20	0.17	± 0.41	1	90
28-Oct-20	0.00	± 0.00	0	0
29-Oct-20	0.00	± 0.00	0	0
30-Oct-20	0.00	± 0.00	0	0
31-Oct-20	0.00	± 0.00	0	0
01-Nov-20	0.00	± 0.00	0	0
02-Nov-20	0.00	± 0.00	0	0
03-Nov-20	0.00	± 0.00	0	0
04-Nov-20	0.00	± 0.00	0	0
05-Nov-20	0.17	± 0.41	1	90
06-Nov-20	0.33	± 0.82	2	181
07-Nov-20	0.00	± 0.00	0	0
08-Nov-20	0.67	± 1.21	4	362
09-Nov-20	1.00	± 1.26	6	542
10-Nov-20	0.67	± 0.82	4	362

Date	Mean daily count	Standard deviation	Total daily count	Estimated daily influx
11-Nov-20	0.00	± 0.00	0	0
12-Nov-20	0.17	± 0.41	1	90
13-Nov-20	1.00	± 1.26	6	542
14-Nov-20	0.67	± 0.82	4	362
15-Nov-20	0.67	± 1.63	4	362
16-Nov-20	0.17	± 0.41	1	90
17-Nov-20	0.67	± 1.63	4	362
18-Nov-20	0.00	± 0.00	0	0
19-Nov-20	0.17	± 0.41	1	90
20-Nov-20	1.50	± 1.87	9	814
21-Nov-20	1.17	± 2.40	7	633
22-Nov-20	0.83	± 1.33	5	452
23-Nov-20	1.17	± 0.98	7	633
24-Nov-20	0.50	± 0.84	3	271
25-Nov-20	2.33	± 2.94	14	1266
26-Nov-20	0.83	± 1.33	5	452
27-Nov-20	0.50	± 0.84	3	271
28-Nov-20	0.00	± 0.00	0	0
29-Nov-20	0.50	± 0.55	3	271
30-Nov-20	1.67	± 2.34	10	904
01-Dec-20	1.50	± 3.67	9	814
02-Dec-20	3.33	± 3.44	20	1808
03-Dec-20	3.33	± 3.56	20	1808
04-Dec-20	0.50	± 0.84	3	271
05-Dec-20	1.17	± 1.60	7	633
06-Dec-20	1.50	± 1.87	9	814
07-Dec-20	2.00	± 2.19	12	1085
08-Dec-20	1.33	± 1.03	8	723
09-Dec-20	0.67	± 1.03	4	362
10-Dec-20	0.67	± 1.03	4	362
11-Dec-20	0.33	± 0.82	2	181
12-Dec-20	0.33	± 0.82	2	181
13-Dec-20	0.50	± 0.84	3	271
14-Dec-20	0.00	± 0.00	0	0
15-Dec-20	0.00	± 0.00	0	0
16-Dec-20	0.67	± 1.03	4	362
17-Dec-20	0.67	± 1.21	4	362
18-Dec-20	0.83	± 1.33	5	452
19-Dec-20	0.00	± 0.00	0	0
20-Dec-20	0.67	± 1.21	4	362
21-Dec-20	0.67	± 1.03	4	362
22-Dec-20	0.17	± 0.41	1	90
23-Dec-20	0.00	± 0.00	0	0
24-Dec-20	0.17	± 0.41	1	90
25-Dec-20	0.83	± 2.04	5	452
26-Dec-20	0.17	± 0.41	1	90
27-Dec-20	0.83	± 2.04	5	452
28-Dec-20	0.83	± 1.33	5	452
29-Dec-20	0.00	± 0.00	0	0
30-Dec-20	0.33	± 0.52	2	181
31-Dec-20	1.00	± 0.89	6	542
01-Jan-21	0.33	± 0.82	2	181

Date	Mean daily count	Standard deviation	Total daily count	Estimated daily influx
02-Jan-21	0.50	± 1.22	3	271
03-Jan-21	0.50	± 0.84	3	271
04-Jan-21	0.33	± 0.82	2	181
05-Jan-21	0.17	± 0.41	1	90
06-Jan-21	0.00	± 0.00	0	0
07-Jan-21	0.33	± 0.82	2	181
08-Jan-21	0.00	± 0.00	0	0
09-Jan-21	0.33	± 0.82	2	181
10-Jan-21	0.00	± 0.00	0	0
11-Jan-21	0.00	± 0.00	0	0
12-Jan-21	1.83	± 3.25	11	994
13-Jan-21	0.00	± 0.00	0	0
14-Jan-21	1.17	± 2.86	7	633
15-Jan-21	1.00	± 1.26	6	542
Total Count / Estimated Influx			**294**	**26,579**

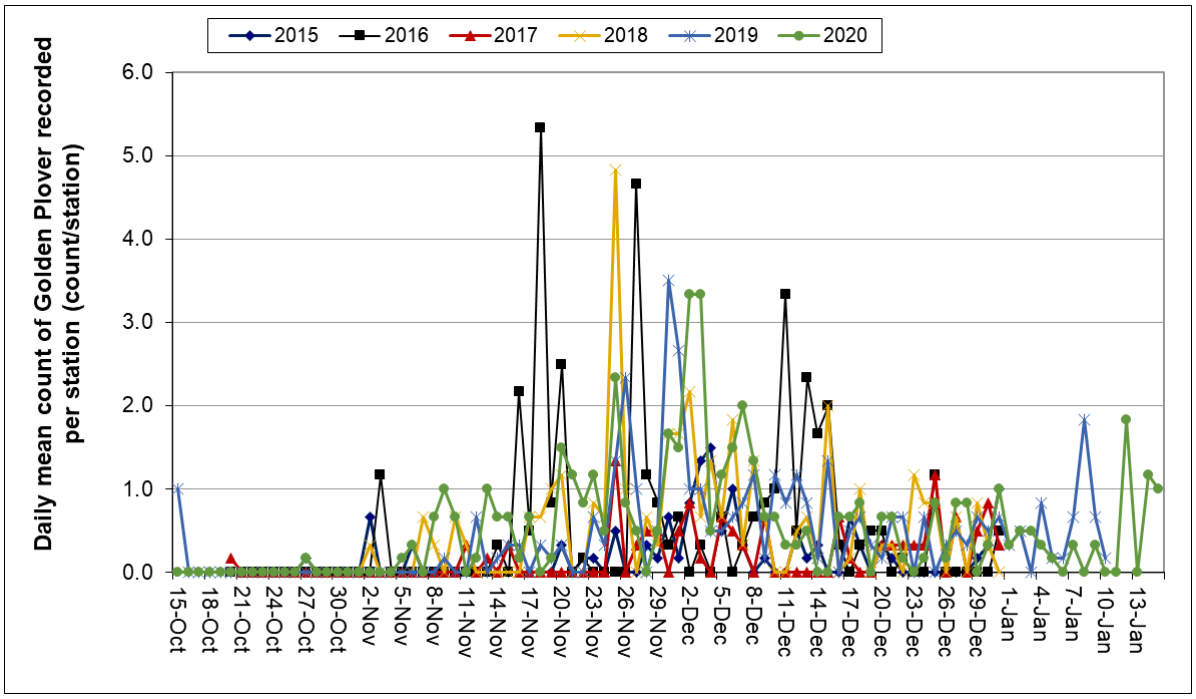

Figure 2. Daily mean counts of Golden Plover per station (= site) recorded between 15 October 2020 and 15 January 2021 during the present (2020) survey, between 15 October 2019 and 10 January 2020 during the 2019 survey, and between 20 October and 31 December during previous (2015, 2016, 2017, 2018) surveys.

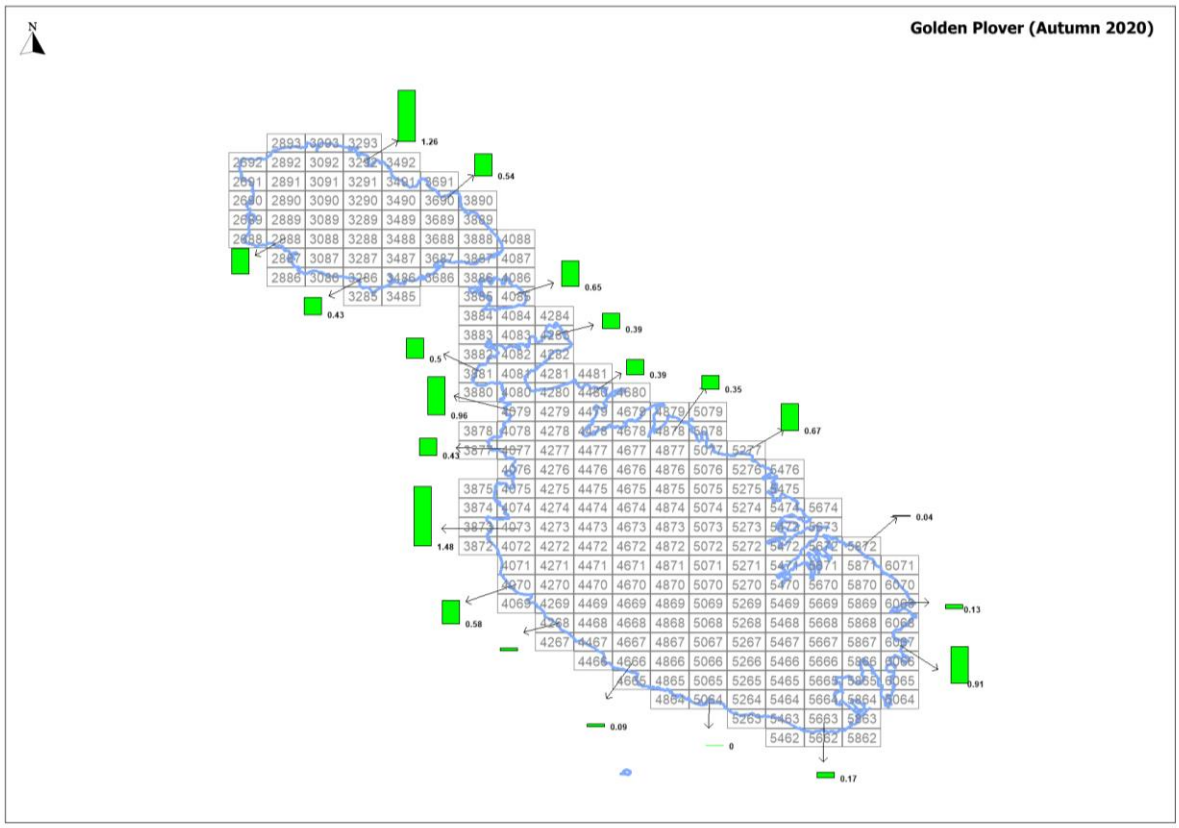

Figure 3. Map of the Maltese Islands showing the standard grid and respective codes, including ones used in the present study. The green bars indicate mean counts of Golden Plover recorded from study sites in the respective cells during the present survey.

Song Thrush

Raw daily counts for Song Thrush recorded from the 21 sites during the present study varied between 0 and a maximum of 26 (see Appendix I), while the mean daily counts ranged between 0 and 7.17 (Table 3). Comparatively higher counts were recorded between late October and mid-November. The total count, i.e. the total number of Song Thrush individuals recorded from a given grid location (= study site) during the whole study period (93 days), varied appreciably between the different sites: at the lower end no individuals were recorded throughout the survey period from the sites at grid locations 6067 and 5064, while at the higher end 85 Song Thrush individuals were recorded from the site at grid location 4085, which was surveyed daily, and 47 individuals were recorded from the site at grid location 4666.

Values of mean daily counts and total counts of Song Thrush recorded during the period 15 October 2020 to 15 January 2021 from the present survey are summarised in Table 3. Values of standard deviation associated with the mean daily counts are also provided in Table 3. Counts of Song Thrush recorded from the present survey, along with those made during the autumn 2015, 2016, 2017, 2018 and 2019 surveys, are shown graphically in Figure 4. Overall, count values for Song Thrush from the present (autumn/winter 2020) survey show a similar trend to those recorded in the previous autumn surveys, with higher count values recorded during the period late October to mid-November (Figure 4).

Table 3

Values of mean (± SD) daily count and daily total count recorded from the six study sites during the present survey, together with total influx of migratory Song Thrush.

Date	Mean daily count	Standard deviation	Total daily count	Estimated daily influx
15-Oct-20	0.00	± 0.00	0	0
16-Oct-20	0.33	± 0.82	2	181
17-Oct-20	0.00	± 0.00	0	0
18-Oct-20	0.00	± 0.00	0	0
19-Oct-20	2.50	± 3.51	15	1356
20-Oct-20	3.00	± 3.03	18	1627
21-Oct-20	5.50	± 7.84	33	2983
22-Oct-20	1.33	± 1.51	8	723
23-Oct-20	1.00	± 1.55	6	542
24-Oct-20	3.33	± 3.44	20	1808
25-Oct-20	1.83	± 1.94	11	994
26-Oct-20	0.33	± 0.82	2	181
27-Oct-20	0.67	± 1.63	4	362
28-Oct-20	0.17	± 0.41	1	90
29-Oct-20	0.67	± 1.21	4	362
30-Oct-20	1.50	± 1.38	9	814
31-Oct-20	7.17	± 10.09	43	3887
01-Nov-20	2.67	± 3.08	16	1447
02-Nov-20	2.83	± 3.71	17	1537
03-Nov-20	2.33	± 2.07	14	1266
04-Nov-20	0.83	± 1.33	5	452
05-Nov-20	1.33	± 2.34	8	723
06-Nov-20	1.83	± 1.83	11	994
07-Nov-20	2.33	± 2.66	14	1266
08-Nov-20	2.00	± 1.10	12	1085
09-Nov-20	1.00	± 1.67	6	542
10-Nov-20	0.50	± 0.84	3	271
11-Nov-20	1.17	± 1.17	7	633
12-Nov-20	1.00	± 0.89	6	542
13-Nov-20	0.50	± 0.84	3	271
14-Nov-20	0.67	± 0.82	4	362
15-Nov-20	1.00	± 1.26	6	542
16-Nov-20	0.33	± 0.52	2	181
17-Nov-20	0.00	± 0.00	0	0
18-Nov-20	0.50	± 0.55	3	271
19-Nov-20	0.00	± 0.00	0	0
20-Nov-20	0.17	± 0.41	1	90
21-Nov-20	0.17	± 0.41	1	90
22-Nov-20	1.17	± 0.98	7	633
23-Nov-20	0.50	± 0.84	3	271
24-Nov-20	0.17	± 0.41	1	90
25-Nov-20	0.50	± 0.84	3	271
26-Nov-20	0.50	± 0.55	3	271
27-Nov-20	0.00	± 0.00	0	0
28-Nov-20	0.50	± 0.84	3	271
29-Nov-20	0.17	± 0.41	1	90
30-Nov-20	0.50	± 0.84	3	271
01-Dec-20	0.00	± 0.00	0	0

Date	Mean daily count	Standard deviation	Total daily count	Estimated daily influx
02-Dec-20	0.00	± 0.00	0	0
03-Dec-20	0.00	± 0.00	0	0
04-Dec-20	0.33	± 0.82	2	181
05-Dec-20	0.00	± 0.00	0	0
06-Dec-20	0.33	± 0.82	2	181
07-Dec-20	0.00	± 0.00	0	0
08-Dec-20	0.33	± 0.82	2	181
09-Dec-20	0.00	± 0.00	0	0
10-Dec-20	0.00	± 0.00	0	0
11-Dec-20	0.00	± 0.00	0	0
12-Dec-20	0.67	± 1.03	4	362
13-Dec-20	0.00	± 0.00	0	0
14-Dec-20	0.00	± 0.00	0	0
15-Dec-20	0.17	± 0.41	1	90
16-Dec-20	0.17	± 0.41	1	90
17-Dec-20	0.00	± 0.00	0	0
18-Dec-20	0.00	± 0.00	0	0
19-Dec-20	0.17	± 0.41	1	90
20-Dec-20	0.67	± 1.03	4	362
21-Dec-20	0.00	± 0.00	0	0
22-Dec-20	0.00	± 0.00	0	0
23-Dec-20	0.33	± 0.82	2	181
24-Dec-20	0.50	± 1.22	3	271
25-Dec-20	0.50	± 1.22	3	271
26-Dec-20	0.17	± 0.41	1	90
27-Dec-20	0.67	± 1.03	4	362
28-Dec-20	0.00	± 0.00	0	0
29-Dec-20	0.00	± 0.00	0	0
30-Dec-20	0.00	± 0.00	0	0
31-Dec-20	0.33	± 0.82	2	181
01-Jan-21	0.17	± 0.41	1	90
02-Jan-21	0.50	± 1.22	3	271
03-Jan-21	0.17	± 0.41	1	90
04-Jan-21	0.17	± 0.41	1	90
05-Jan-21	0.00	± 0.00	0	0
06-Jan-21	0.00	± 0.00	0	0
07-Jan-21	0.00	± 0.00	0	0
08-Jan-21	0.00	± 0.00	0	0
09-Jan-21	0.00	± 0.00	0	0
10-Jan-21	0.83	± 1.33	5	452
11-Jan-21	0.00	± 0.00	0	0
12-Jan-21	0.00	± 0.00	0	0
13-Jan-21	0.00	± 0.00	0	0
14-Jan-21	0.00	± 0.00	0	0
15-Jan-21	0.00	± 0.00	0	0
Total Count / Estimated Influx			**382**	**34,529**

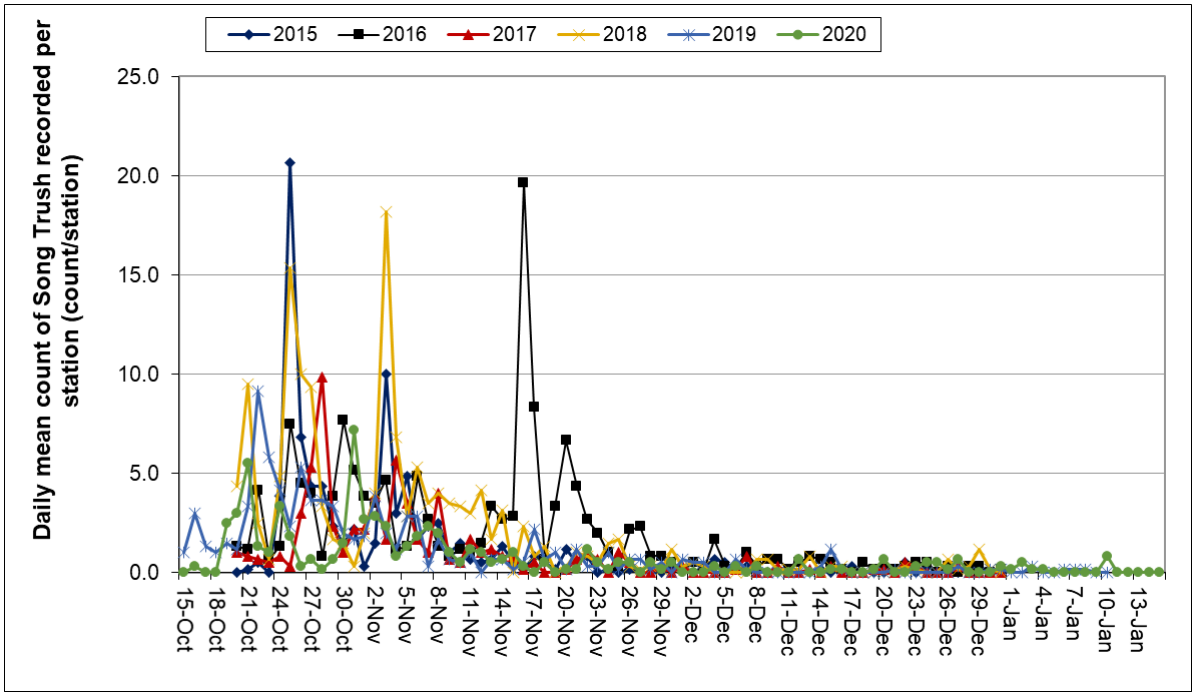

Figure 4. **Daily mean counts of Song Thrush per station (= site) recorded between 15 October 2020 and 15 January 2021 during the present (2020) survey, between 15 October 2019 and 10 January 2020 during the 2019 survey, and between 20 October and 31 December during previous (2015, 2016, 2017, 2018) surveys.**

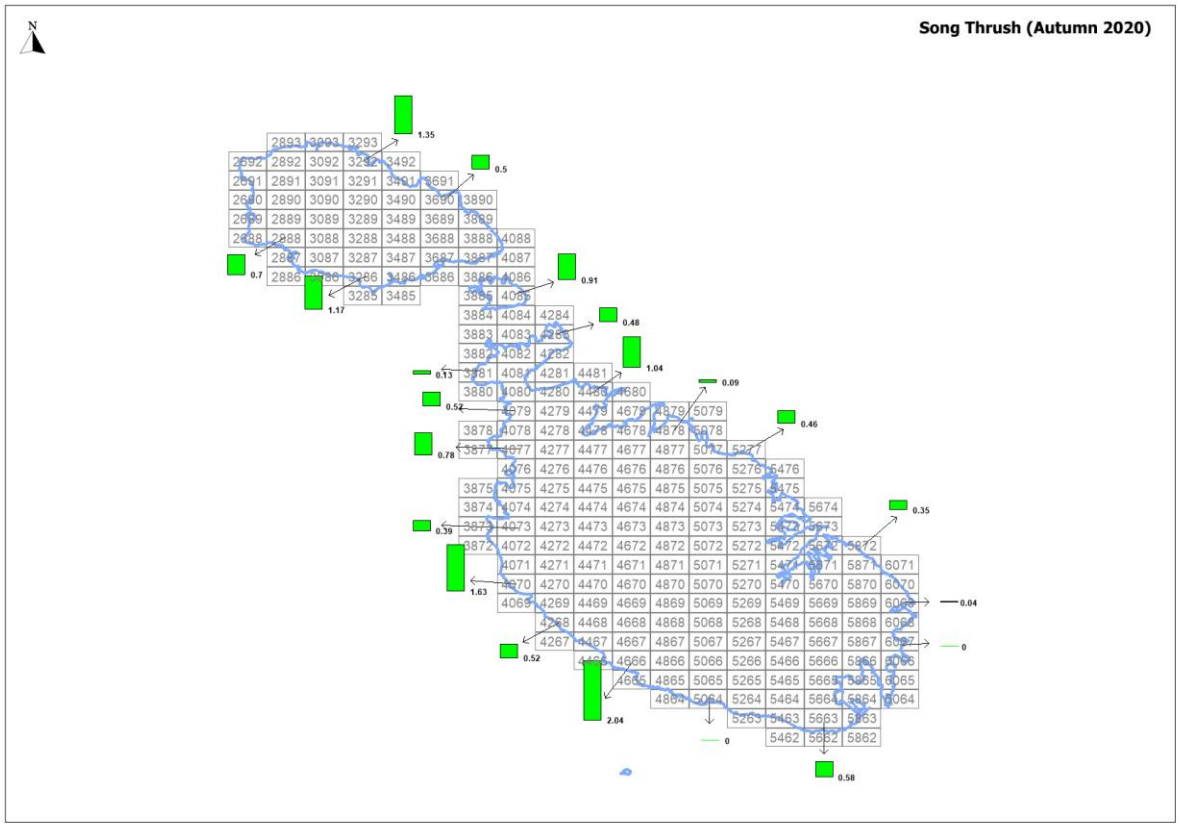

Figure 5. **Map of the Maltese Islands showing the standard grid and respective codes, including ones used in the present study. The green bars indicate mean counts of Song Thrush recorded from study sites in the respective cells during the present survey.**

An estimate of total influx of Song Thrush over the Maltese Islands is given in Table 3. Based on the mean daily counts (Table 3), extrapolation translates to an estimated daily influx ranging between 0 and 3,887 individuals, with a total influx over the survey period (15 October 2020 – 15 January 2021; i.e. 93 days) of 34,529 individuals; see Table 3.

Mean count values for Song Thrush recorded from each of the 21 sites are indicated on the map shown in Figure 5. The highest mean count was recorded from Fawwara (Grid 4666) in western Malta, while comparatively high mean counts were also recorded from other sites located on the northern coast of Malta, from Comino and from Ta Ċenċ (Grid 3268) and Marsalforn (Grid 3292) in Gozo. The lowest counts for this species were recorded from study sites in the southern coasts of Malta.

4. Comparison with bag data

A comparative analysis of the results obtained during the present study with bag data provided by the Wild Birds Regulation Unit (WBRU) was undertaken. It should be stated from the outset that the two sets of data were collected for different purposes, using very different methodologies, and therefore the magnitudes of the values are not directly comparable. However, the temporal trends can be expected to follow similar patterns, that is, periods when higher mean daily counts were recorded during the present survey should broadly correspond to dates when higher numbers of birds were captured (and reported in the bag data) in the same year. Whether the influx of the bird species follows the same temporal trend from year to year can only be confirmed through a longitudinal study of influx of the different bird species over a period of several years.

The data set provided by the WBRU for this comparison comprises the daily bag count of the two bird species (as reported by live-capturers through a telephonic game reporting system) for the period 01 November 2020 to 04 January 2021 in the case of Golden Plover and for the period 20 October 2020 to 31 December 2020 in the case of Song Thrush.

Graphical representations of the mean daily counts made during the present (2020) survey and the daily bag counts for the same time period (15 October – 15 January) in 2020 (WBRU unpublished data) for each of the two bird species were prepared to compare temporal trends among the two different data sets. In a graphical plot showing daily counts, a high variation in counts from day to day may overshadow temporal trends over the two-month period. To aid visual interpretation, a second set of analyses was undertaken by computing a moving average using a rolling 5-day period for the time series count data. This has the effect of smoothening out the day to day fluctuations and hence making longer-term trends in mean daily counts or daily bag counts more apparent, thus facilitating visual interpretation of temporal trends. Note that the analyses based on a moving average do not replace those based on the raw daily counts. Rather, the graphical representations showing a 5-day moving average should be seen in conjunction with those based on daily counts, which are also presented.

Golden Plover

The daily bag counts indicating the number of Golden Plover caught during the 2020 live-capturing season and the mean daily counts of the same species made during the present (2020) survey are shown in Figure 6, while Figure 7 presents the 5-day moving average computed from these data. As already noted, the magnitude of the bag counts and those of the mean counts made in the 2020 survey are not directly comparable; consequently the two sets of values are on different scales. Therefore, in Figures 6–7, two separate y-axes are used: the bag count data are plotted on the left-side y-axis, whereas the counts from the 2020 survey are plotted on the right-side y-axis.

Overall, the highest daily counts made during the 2020 survey occurred between mid-November and early January, with a peak on 02 and 03 December. Bag counts in 2020 were nil throughout October when the season was not open, low in early November and increased between mid-November and late December, with a peak on 02 December. Thus, the general trend observed in the bag counts for 2020 and the daily counts recorded during the 2020 survey is of higher counts starting in mid-November and continuing until early January, with a peak at the beginning of December.

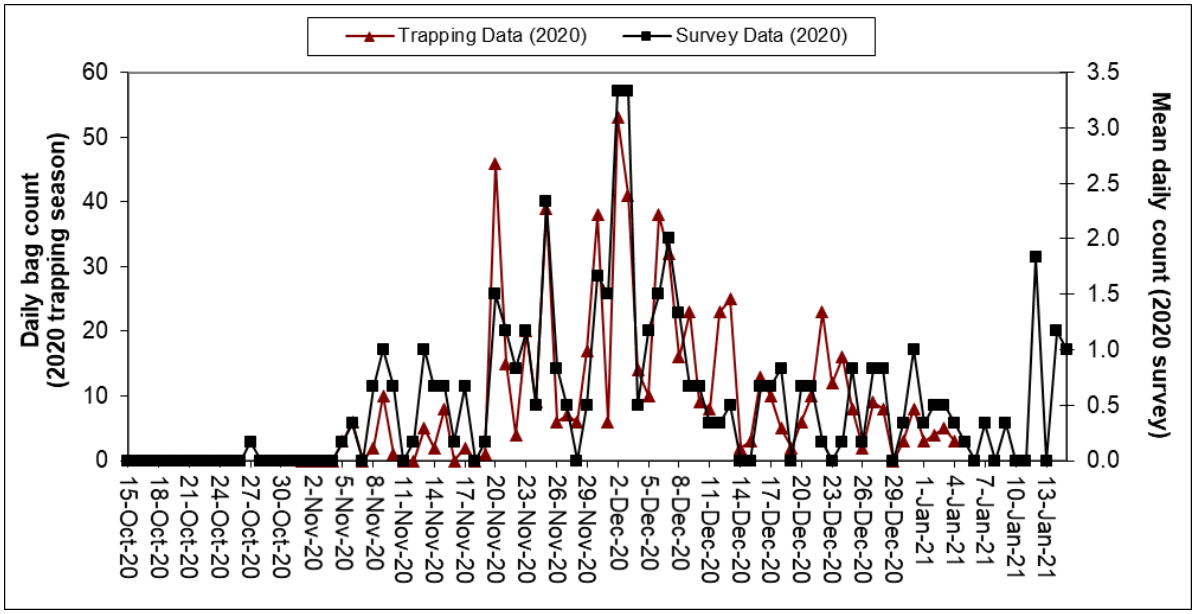

Figure 6. Daily bag count of Golden Plover for the period 01 November 2020 to 04 January 2021 (red line; values on left-side y-axis), together with the mean daily counts recorded during the present 2020 migration survey (black line; values on right-side y-axis) for the period 15 October 2020 to 15 January 2021.

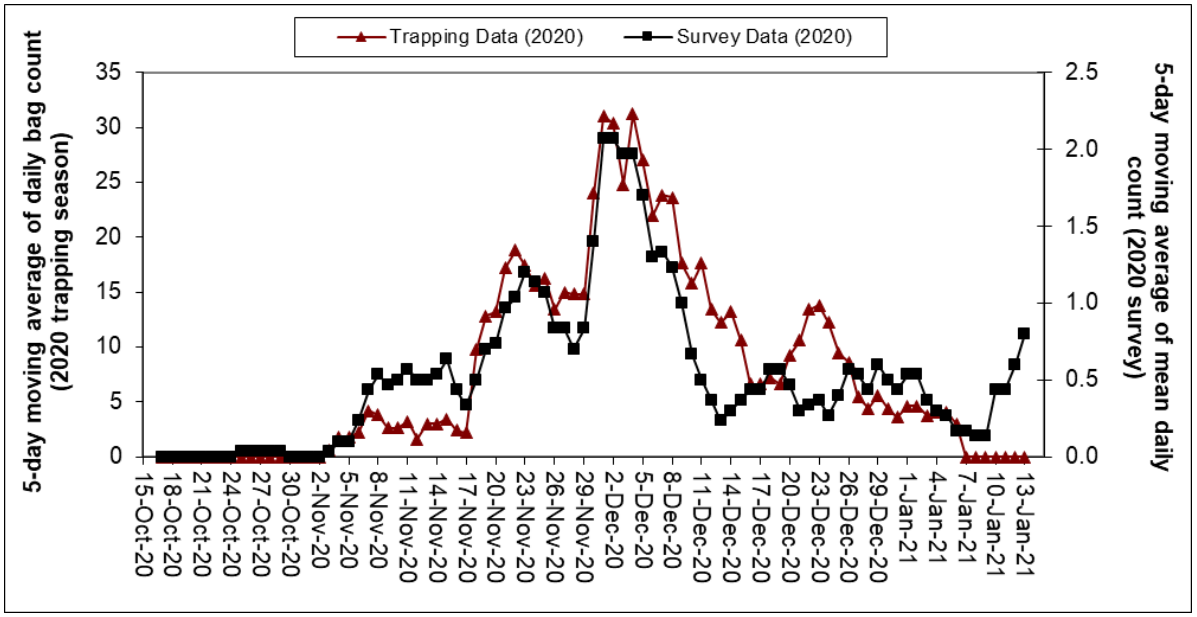

Figure 7. Moving average based on a 5-day rolling time period of the daily bag counts of Golden Plover for the period 01 November 2020 to 04 January 2021 (red line; values on left-side y-axis), together with the mean daily counts recorded during the 2020 migration survey (black line; values on right-side y-axis) for the period 15 October 2020 to 15 January 2021.

Song Thrush

The daily bag counts indicating the number of Song Thrush caught during the 2020 live-capturing season and the mean daily counts of the same species made during the present (2020) survey are shown in Figure 8, while Figure 9 presents the 5-day moving average computed from these data. As already noted, the magnitude of the bag counts and those of the mean counts made in the 2020 survey are not directly comparable, consequently the two sets of values are on different scales. Therefore, in Figures 8–9, two separate y-axes are used: the bag count data are plotted on the left-side y-axis, whereas the counts from the 2020 survey are plotted on the right-side y-axis.

Overall, the highest daily counts made during the present 2020 survey occurred between mid-October and mid-November, with counts declining thereafter; most days in December and January were characterised by low or zero counts. The highest bag counts in 2020 also occurred between mid-October and mid-November, with lower bag counts reported thereafter until the end of December. Thus, the general trend observed in the bag counts for 2020 and the daily counts recorded during the 2020 survey is of higher counts in the earlier part of the live-capturing season, up to around mid-November.

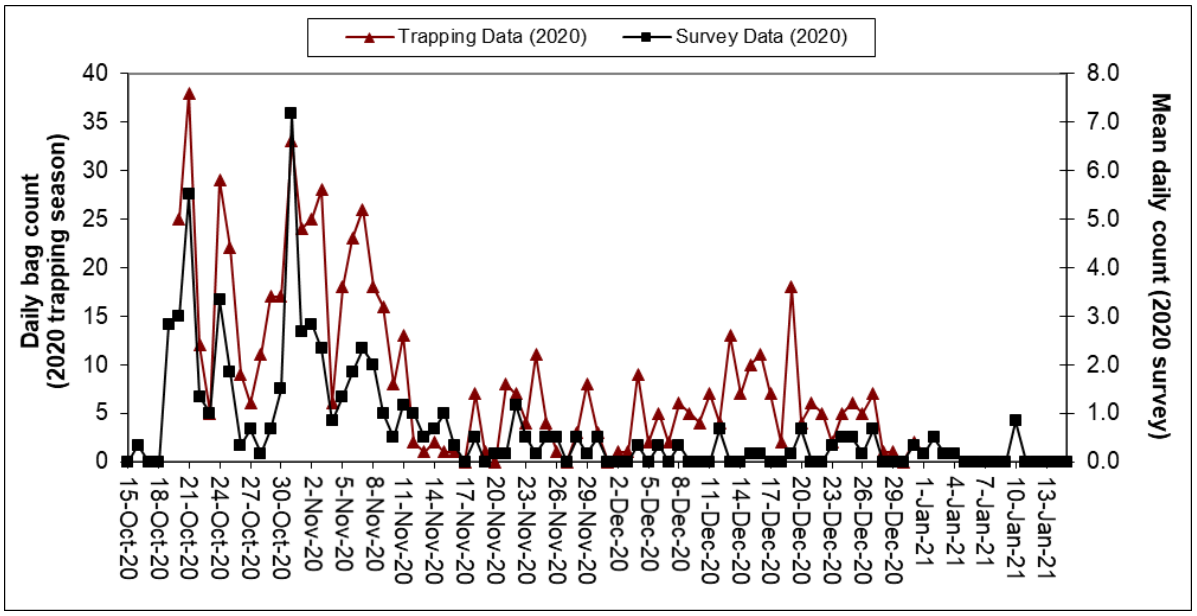

Figure 8. Daily bag count of Song Thrush for the period 20 October 2020 to 31 December 2020 (red line; values on left-side y-axis), together with the mean daily counts recorded during the present 2020 migration survey (black line; values on right-side y-axis) for the period 15 October 2020 to 15 January 2021.

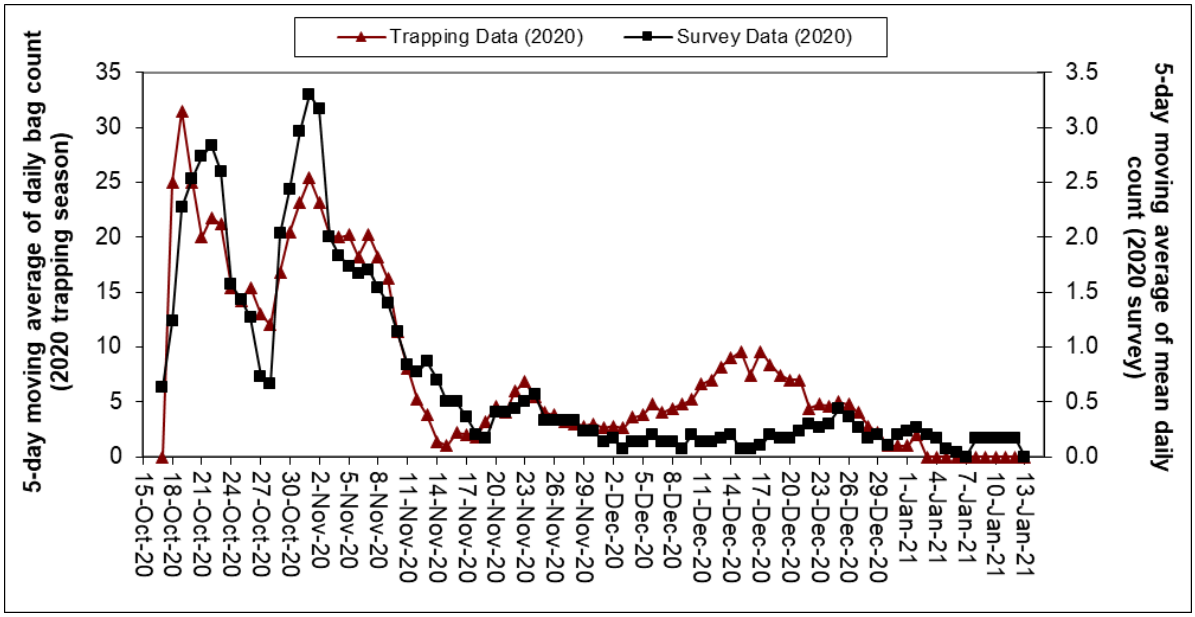

Figure 9. Moving average based on a 5-day rolling time period of the daily bag counts of Song Thrush for the period 20 October 2020 to 31 December 2020 (red line; values on left-side y-axis), together with the mean daily counts recorded during the present 2020 migration survey (black line; values on right-side y-axis) for the period 15 October 2020 to 15 January 2021.

5. Appraisal

The present survey provides data on mean daily counts of Golden Plover (*Pluvialis apricaria*) and Song Thrush (*Turdus philomelos*) recorded during the study period held between 15 October 2020 and 15 January 2021, together with estimates of the migratory influx of the two species. Government had established the autumn/winter live-capturing season for these species (01 November 2020 to 04 January 2021 for Golden Plover; 20 October to 31 December 2020 for Song Thrush), which overlapped with the period of the present study.

The mean daily counts from the present survey indicate that higher counts for Golden Plover were recorded between mid-November to early January, while for Song Thrush higher counts were recorded between mid-October and mid-November. The higher values recorded on certain dates indicate a general trend of migratory influx during mid-November to early January for Golden Plover, and during mid-October to mid-November for Song Thrush. The raw counts for the two species varied appreciably among the different stations. Such variation is to be expected in studies such as the present, given that birds may have a strong influx at one site and a potentially much lower one at a different site, even if the two sites are separated by a very small distance of even a few hundred metres. Considerations of habitat and land cover apply only to a degree, since migratory birds also fly over urban and other built-up areas. Another noteworthy consideration is that some birds may also pass overhead, maintaining high altitude and avoid alighting on land. The usefulness of the values provided in the present report therefore lies primarily in providing data for future comparison, rather than using the counts *per se*, which in any study of this type should be considered as a rough estimate.

The total influx of individuals for the present survey period (15 October 2020 – 15 January 2021) was estimated at 26,579 for Golden Plover and 34,529 for Song Thrush. When comparing the present results with those from the autumn 2015, 2016, 2017 and 2018 surveys (Ecoserv, 2016a, 2017a, 2018a, 2019a, 2020a), the following overall observations are noted[4]:

- The migratory influx of Golden Plover recorded from the present autumn/winter 2020 survey is higher than that recorded during all previous surveys. The total influx of this species recorded in autumn 2016, 2018, 2019 and 2020 (present survey) is around three to four times higher than that recorded during the autumn 2015 and 2017 surveys; this can be attributed to migratory peaks recorded during the 2016, 2018, 2019 and 2020 (present) surveys, since no such peaks for Golden Plover were recorded in the 2015 and 2017 surveys.
- In the case of Song Thrush, the migratory influx recorded from the present autumn/winter 2020 survey is lower than that recorded during all previous surveys, but very similar to that recorded during the autumn 2017 survey. The influx recorded during the autumn 2016 and 2018 surveys is about twice as high as that recorded during the autumn 2015, 2017, 2019 and 2020 (present) surveys. This can also be attributed to the presence of more migratory peaks during autumn 2016 and 2018.
- When comparing data from the present 2020 survey with those from previous surveys within the context of the specific period during which a higher influx of the two species was recorded, no discernible differences are evident since overall higher counts for the respective species were recorded during the same period in all four years.

It is reiterated that estimates of total influx should be treated with utmost caution, given the relatively small number of field sites used in the survey, that counts were not made daily at each site, and since the extrapolation procedure used is likely to result in a rough estimate. Influx of birds at different localities is extremely variable, with potential large differences in number of birds passing at two different localities, even if these are separated by a very small distance, as indicated above. Furthermore, the total length of coastline surveyed per day (3 km) amounts to less than 1.5% of the total coastline. Other limitations are (i) bird migration starts in September, and therefore birds that would have migrated before the start of the present study (i.e. before 15 October 2020) would not have been recorded; and (ii) counts were recorded over a five hour survey period, hence any individuals migrating at other times of the day were not included, leading to a potential underestimate of the total influx if significant migratory influx occurred outside the survey time on any day. Nevertheless, the stated estimate is useful when making comparison between different years, assuming data from surveys based on a similar design are available, to assess whether influx of any of the two bird species is increasing or decreasing with time.

The design of the present survey included counts made over a 93-day period between 15 October 2020 and 15 January 2021, which covers the period when peak autumn migration of Golden Plover and Song Thrush normally occurs.

Robust and rigorous assessment of migratory influx requires trend analysis based on data from monitoring carried out regularly over a sufficiently long period comprising subsequent years, and using the same methodology. For each year, the data should ideally be collected over the whole migratory season and using a larger sampling effort, for example by making counts daily at all of a minimum 21 sites. However, it should be noted that such higher sampling effort will entail very high costs, which may render the study prohibitively expensive, while it would be very difficult to carry out a survey involving daily counts at a large number of sites, given the large number of field personnel that would be required.

[4] It should also be noted that the present survey extended over a period of 93 days, which is longer than the 88-day period in 2019 and the 73-day period used in all other previous surveys.

Nevertheless, the data from the present study provides a useful indication of the autumn influx of the two bird species, provided that results are interpreted in the context of the limitations indicated above.

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APPENDIX I - Raw counts

Table A. Daily counts of Golden Plover recorded per site.

Ecoserv Sample Reference Code	B-847-20	B-848-20	B-849-20	B-850-20	B-851-20	B-852-20	B-853-20	B-854-20	B-855-20	B-856-20	B-857-20
Grid Location	**4085**	**3292**	**4079**	**4268**	**6067**	**4878**	**2888**	**4077**	**4666**	**6069**	**4480**
15-Oct-20	0										
16-Oct-20	0	0	0	0	0	0					
17-Oct-20	0						0	0	0	0	0
18-Oct-20	0										
19-Oct-20	0										
20-Oct-20	0	0	0	0	0	0					
21-Oct-20	0						0	0	0	0	0
22-Oct-20	0										
23-Oct-20	0										
24-Oct-20	0	0	0	0	0	0					
25-Oct-20	0						0	0	0	0	0
26-Oct-20	0										
27-Oct-20	0										
28-Oct-20	0	0	0	0	0	0					
29-Oct-20	0						0	0	0	0	0
30-Oct-20	0										
31-Oct-20	0										
01-Nov-20	0	0	0	0	0	0					
02-Nov-20	0						0	0	0	0	0
03-Nov-20	0										
04-Nov-20	0										
05-Nov-20	1	0	0	0	0	0					
06-Nov-20	2						0	0	0	0	0
07-Nov-20	0										
08-Nov-20	3										
09-Nov-20	0	2	3	0	1	0					
10-Nov-20	2						1	0	0	0	1

Ecoserv Sample Reference Code	B-847-20	B-848-20	B-849-20	B-850-20	B-851-20	B-852-20	B-853-20	B-854-20	B-855-20	B-856-20	B-857-20
11-Nov-20	0										
12-Nov-20	0										
13-Nov-20	0	3	2	0	1	0					
14-Nov-20	2						1	0	0	0	1
15-Nov-20	0										
16-Nov-20	0										
17-Nov-20	0	4	0	0	0	0					
18-Nov-20	0						0	0	0	0	0
19-Nov-20	0										
20-Nov-20	2										
21-Nov-20	0	6	0	0	0	1					
22-Nov-20	2						3	0	0	0	0
23-Nov-20	2										
24-Nov-20	0										
25-Nov-20	1	5	7	0	0	1					
26-Nov-20	0						0	3	0	0	2
27-Nov-20	2										
28-Nov-20	0										
29-Nov-20	0	1	1	0	0	1					
30-Nov-20	6						2	0	2	0	0
01-Dec-20	0										
02-Dec-20	0										
03-Dec-20	3	6	0	0	9	2					
04-Dec-20	2						1	0	0	0	0
05-Dec-20	2										
06-Dec-20	0										
07-Dec-20	6	0	2	0	2	2					
08-Dec-20	2						2	2	0	2	0
09-Dec-20	0										
10-Dec-20	2										
11-Dec-20	0	2	0	0	0	0					
12-Dec-20	0						2	0	0	0	0

Ecoserv Sample Reference Code	B-847-20	B-848-20	B-849-20	B-850-20	B-851-20	B-852-20	B-853-20	B-854-20	B-855-20	B-856-20	B-857-20
13-Dec-20	0										
14-Dec-20	0										
15-Dec-20	0	0	0	0	0	0					
16-Dec-20	0						2	0	0	0	2
17-Dec-20	1										
18-Dec-20	3										
19-Dec-20	0	0	0	0	0	0					
20-Dec-20	0						0	3	0	0	1
21-Dec-20	0										
22-Dec-20	0										
23-Dec-20	0	0	0	0	0	0					
24-Dec-20	0						0	0	0	1	0
25-Dec-20	0										
26-Dec-20	1										
27-Dec-20	0	0	5	0	0	0					
28-Dec-20	3						0	2	0	0	0
29-Dec-20	0										
30-Dec-20	0										
31-Dec-20	1	0	2	2	0	1					
01-Jan-21	2						0	0	0	0	0
02-Jan-21	0										
03-Jan-21	0										
04-Jan-21	2	0	0	0	0	0					
05-Jan-21	0						1	0	0	0	0
06-Jan-21	0										
07-Jan-21	0										
08-Jan-21	0	0	0	0	0	0					
09-Jan-21	0						0	0	0	0	2
10-Jan-21	0										
11-Jan-21	0										
12-Jan-21	3	0	0	0	8	0					
13-Jan-21	0						0	0	0	0	0

Ecoserv Sample Reference Code	B-847-20	B-848-20	B-849-20	B-850-20	B-851-20	B-852-20	B-853-20	B-854-20	B-855-20	B-856-20	B-857-20
14-Jan-21	0										
15-Jan-21	2										

Table A continued. Daily counts of Golden Plover recorded per site.

Ecoserv Sample Reference Code	B-858-20	B-859-20	B-860-20	B-861-20	B-862-20	B-863-20	B-864-20	B-865-20	B-866-20	B-867-20
Grid Location	**3268**	**4073**	**5064**	**5872**	**4283**	**3690**	**3881**	**4070**	**5663**	**5277**
15-Oct-20						0	0	0	0	0
16-Oct-20										
17-Oct-20										
18-Oct-20	0	0	0	0	0					
19-Oct-20						0	0	0	0	0
20-Oct-20										
21-Oct-20										
22-Oct-20	0	0	0	0	0					
23-Oct-20						0	0	0	0	0
24-Oct-20										
25-Oct-20										
26-Oct-20	0	0	0	0	0					
27-Oct-20						0	0	1	0	0
28-Oct-20										
29-Oct-20										
30-Oct-20	0	0	0	0	0					
31-Oct-20						0	0	0	0	0
01-Nov-20										
02-Nov-20										
03-Nov-20	0	0	0	0	0					
04-Nov-20						0	0	0	0	0
05-Nov-20										

Ecoserv Sample Reference Code	B-858-20	B-859-20	B-860-20	B-861-20	B-862-20	B-863-20	B-864-20	B-865-20	B-866-20	B-867-20
06-Nov-20										
07-Nov-20	0	0	0	0	0					
08-Nov-20						0	0	1	0	0
09-Nov-20										
10-Nov-20										
11-Nov-20	0	0	0	0	0					
12-Nov-20						1	0	0	0	0
13-Nov-20										
14-Nov-20										
15-Nov-20	0	4	0	0	0					
16-Nov-20						0	0	1	0	0
17-Nov-20										
18-Nov-20										
19-Nov-20	0	0	0	0	1					
20-Nov-20						5	0	1	0	1
21-Nov-20										
22-Nov-20										
23-Nov-20	0	2	0	1	2					
24-Nov-20						0	1	0	0	2
25-Nov-20										
26-Nov-20										
27-Nov-20	1	0	0	0	0					
28-Nov-20						0	0	0	0	0
29-Nov-20										
30-Nov-20										
01-Dec-20	9	0	0	0	0					
02-Dec-20						2	10	3	3	2
03-Dec-20										
04-Dec-20										
05-Dec-20	0	4	0	0	1					
06-Dec-20						1	1	2	0	5
07-Dec-20										

Ecoserv Sample Reference Code	B-858-20	B-859-20	B-860-20	B-861-20	B-862-20	B-863-20	B-864-20	B-865-20	B-866-20	B-867-20
08-Dec-20										
09-Dec-20	0	2	0	0	2					
10-Dec-20						2	0	0	0	0
11-Dec-20										
12-Dec-20										
13-Dec-20	0	2	0	0	1					
14-Dec-20						0	0	0	0	0
15-Dec-20										
16-Dec-20										
17-Dec-20	0	3	0	0	0					
18-Dec-20						0	0	0	0	2
19-Dec-20										
20-Dec-20										
21-Dec-20	0	2	0	0	2					
22-Dec-20						0	0	1	0	0
23-Dec-20										
24-Dec-20										
25-Dec-20	0	5	0	0	0					
26-Dec-20						0	0	0	0	0
27-Dec-20										
28-Dec-20										
29-Dec-20	0	0	0	0	0					
30-Dec-20						1	0	0	1	0
31-Dec-20										
01-Jan-21										
02-Jan-21	0	3	0	0	0					
03-Jan-21						0	0	1	0	2
04-Jan-21										
05-Jan-21										
06-Jan-21	0	0	0	0	0					
07-Jan-21						0	0	0	0	2
08-Jan-21										

Ecoserv Sample Reference Code	B-858-20	B-859-20	B-860-20	B-861-20	B-862-20	B-863-20	B-864-20	B-865-20	B-866-20	B-867-20
09-Jan-21										
10-Jan-21	0	0	0	0	0					
11-Jan-21						0	0	0	0	0
12-Jan-21										
13-Jan-21										
14-Jan-21	0	7	0	0	0					
15-Jan-21						1	0	3	0	0

Table B. Daily counts of Song Thrush recorded per site.

Ecoserv Sample Reference Code	B-868-20	B-869-20	B-870-20	B-871-20	B-872-20	B-873-20	B-874-20	B-875-20	B-876-20	B-877-20	B-878-20
Grid Location	**4085**	**3292**	**4079**	**4268**	**6067**	**4878**	**2888**	**4077**	**4666**	**6069**	**4480**
15-Oct-20	0										
16-Oct-20	0	0	2	0	0	0					
17-Oct-20	0						0	0	0	0	0
18-Oct-20	0										
19-Oct-20	7										
20-Oct-20	8	5	1	3	0	1					
21-Oct-20	0						5	8	20	0	0
22-Oct-20	1										
23-Oct-20	0										
24-Oct-20	9	5	2	4	0	0					
25-Oct-20	1						3	0	5	0	2
26-Oct-20	0										
27-Oct-20	0										
28-Oct-20	0	0	0	1	0	0					
29-Oct-20	0						0	0	3	1	0
30-Oct-20	2										
31-Oct-20	11										

Ecoserv Sample Reference Code	B-868-20	B-869-20	B-870-20	B-871-20	B-872-20	B-873-20	B-874-20	B-875-20	B-876-20	B-877-20	B-878-20
01-Nov-20	8	4	3	0	0	1					
02-Nov-20	0						0	2	8	0	7
03-Nov-20	4										
04-Nov-20	0										
05-Nov-20	0	6	1	1	0	0					
06-Nov-20	0						2	2	2	0	5
07-Nov-20	4										
08-Nov-20	2										
09-Nov-20	0	4	2	0	0	0					
10-Nov-20	0						0	2	1	0	0
11-Nov-20	0										
12-Nov-20	1										
13-Nov-20	0	2	0	1	0	0					
14-Nov-20	1						2	1	0	0	0
15-Nov-20	3										
16-Nov-20	0										
17-Nov-20	0	0	0	0	0	0					
18-Nov-20	0						0	1	1	0	1
19-Nov-20	0										
20-Nov-20	0										
21-Nov-20	0	0	1	0	0	0					
22-Nov-20	2						2	0	1	0	2
23-Nov-20	2										
24-Nov-20	1										
25-Nov-20	1	2	0	0	0	0					
26-Nov-20	0						0	1	1	0	1
27-Nov-20	0										
28-Nov-20	0										
29-Nov-20	0	1	0	0	0	0					
30-Nov-20	0						0	1	2	0	0
01-Dec-20	0										
02-Dec-20	0										

Ecoserv Sample Reference Code	B-868-20	B-869-20	B-870-20	B-871-20	B-872-20	B-873-20	B-874-20	B-875-20	B-876-20	B-877-20	B-878-20
03-Dec-20	0	0	0	0	0	0					
04-Dec-20	2						0	0	0	0	0
05-Dec-20	0										
06-Dec-20	0										
07-Dec-20	0	0	0	0	0	0					
08-Dec-20	0						0	0	0	0	2
09-Dec-20	0										
10-Dec-20	0										
11-Dec-20	0	0	0	0	0	0					
12-Dec-20	0						0	0	2	0	2
13-Dec-20	0										
14-Dec-20	0										
15-Dec-20	1	0	0	0	0	0					
16-Dec-20	0						0	0	1	0	0
17-Dec-20	0										
18-Dec-20	0										
19-Dec-20	0	1	0	0	0	0					
20-Dec-20	0						2	0	0	0	2
21-Dec-20	0										
22-Dec-20	0										
23-Dec-20	2	0	0	0	0	0					
24-Dec-20	3						0	0	0	0	0
25-Dec-20	0										
26-Dec-20	0										
27-Dec-20	2	0	0	2	0	0					
28-Dec-20	0						0	0	0	0	0
29-Dec-20	0										
30-Dec-20	0										
31-Dec-20	2	0	0	0	0	0					
01-Jan-21	1						0	0	0	0	0
02-Jan-21	0										
03-Jan-21	1										

Ecoserv Sample Reference Code	B-868-20	B-869-20	B-870-20	B-871-20	B-872-20	B-873-20	B-874-20	B-875-20	B-876-20	B-877-20	B-878-20
04-Jan-21	0	1	0	0	0	0					
05-Jan-21	0						0	0	0	0	0
06-Jan-21	0										
07-Jan-21	0										
08-Jan-21	0	0	0	0	0	0					
09-Jan-21	0						0	0	0	0	0
10-Jan-21	3										
11-Jan-21	0										
12-Jan-21	0	0	0	0	0	0					
13-Jan-21	0						0	0	0	0	0
14-Jan-21	0										
15-Jan-21	0										

Table B continued. Daily counts of Song Thrush recorded per site.

Ecoserv Sample Reference Code	B-879-20	B-880-20	B-881-20	B-882-20	B-883-20	B-884-20	B-885-20	B-886-20	B-887-20	B-888-20
Grid Location	**3268**	**4073**	**5064**	**5872**	**4283**	**3690**	**3881**	**4070**	**5663**	**5277**
15-Oct-20						0	0	0	0	0
16-Oct-20										
17-Oct-20										
18-Oct-20	0	0	0	0	0					
19-Oct-20						0	1	0	7	0
20-Oct-20										
21-Oct-20										
22-Oct-20	4	2	0	1	0					
23-Oct-20						1	1	0	0	4
24-Oct-20										
25-Oct-20										
26-Oct-20	2	0	0	0	0					

Ecoserv Sample Reference Code	B-879-20	B-880-20	B-881-20	B-882-20	B-883-20	B-884-20	B-885-20	B-886-20	B-887-20	B-888-20
27-Oct-20						0	0	4	0	0
28-Oct-20										
29-Oct-20										
30-Oct-20	3	0	0	3	1					
31-Oct-20						2	0	26	4	0
01-Nov-20										
02-Nov-20										
03-Nov-20	5	3	0	0	2					
04-Nov-20						0	0	3	0	2
05-Nov-20										
06-Nov-20										
07-Nov-20	4	0	0	0	6					
08-Nov-20						3	0	3	2	2
09-Nov-20										
10-Nov-20										
11-Nov-20	1	2	0	3	1					
12-Nov-20						2	1	2	0	0
13-Nov-20										
14-Nov-20										
15-Nov-20	2	0	0	0	1					
16-Nov-20						0	0	1	0	1
17-Nov-20										
18-Nov-20										
19-Nov-20	0	0	0	0	0					
20-Nov-20						0	0	0	1	0
21-Nov-20										
22-Nov-20										
23-Nov-20	0	0	0	1	0					
24-Nov-20						0	0	0	0	0
25-Nov-20										
26-Nov-20										
27-Nov-20	0	0	0	0	0					

Ecoserv Sample Reference Code	B-879-20	B-880-20	B-881-20	B-882-20	B-883-20	B-884-20	B-885-20	B-886-20	B-887-20	B-888-20
28-Nov-20						2	0	0	0	1
29-Nov-20										
30-Nov-20										
01-Dec-20	0	0	0	0	0					
02-Dec-20						0	0	0	0	0
03-Dec-20										
04-Dec-20										
05-Dec-20	0	0	0	0	0					
06-Dec-20						2	0	0	0	0
07-Dec-20										
08-Dec-20										
09-Dec-20	0	0	0	0	0					
10-Dec-20						0	0	0	0	0
11-Dec-20										
12-Dec-20										
13-Dec-20	0	0	0	0	0					
14-Dec-20						0	0	0	0	0
15-Dec-20										
16-Dec-20										
17-Dec-20	0	0	0	0	0					
18-Dec-20						0	0	0	0	0
19-Dec-20										
20-Dec-20										
21-Dec-20	0	0	0	0	0					
22-Dec-20						0	0	0	0	0
23-Dec-20										
24-Dec-20										
25-Dec-20	3	0	0	0	0					
26-Dec-20						0	0	0	0	1
27-Dec-20										
28-Dec-20										
29-Dec-20	0	0	0	0	0					

Ecoserv Sample Reference Code	B-879-20	B-880-20	B-881-20	B-882-20	B-883-20	B-884-20	B-885-20	B-886-20	B-887-20	B-888-20
30-Dec-20						0	0	0	0	0
31-Dec-20										
01-Jan-21										
02-Jan-21	3	0	0	0	0					
03-Jan-21						0	0	0	0	0
04-Jan-21										
05-Jan-21										
06-Jan-21	0	0	0	0	0					
07-Jan-21						0	0	0	0	0
08-Jan-21										
09-Jan-21										
10-Jan-21	0	2	0	0	0					
11-Jan-21						0	0	0	0	0
12-Jan-21										
13-Jan-21										
14-Jan-21	0	0	0	0	0					
15-Jan-21						0	0	0	0	0