Satellite Tagging of Song Thrushes (*Turdus philomelos*) and Golden Plovers (*Pluvialis apricaria*): Results from the 2022–2025 Research Period and Proposed Renewal

Figure A. Satellite-tagged Song Thrush prior to release.

Figure B. Two first-year Golden Plovers (male above, satellite-tagged) flying away after release.

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Executive Summary

This report presents the findings of a satellite-tracking study on Song Thrushes and Golden Plovers, conducted at the request of the European Commission to determine the breeding grounds of these birds. The analysis also revealed their wintering grounds, migratory routes, and stopover sites during their pre-nuptial (spring) migration.

The project utilized 60 satellite tags—30 for each species—deployed over multiple phases between February 2022 and February 2025. Song Thrushes were captured by licensed bird-ringers using mist-nets and fitted with non-solar tags, while Golden Plovers were captured by licensed live-capturers using clap-nets and fitted with solar-powered tags. A strategic decision was made in later phases to program less intensive GPS schedules to maximize data collection during the crucial breeding season. Nine Song Thrush tags and a Golden Plover tag were decommissioned due to battery failure. Two Golden Plover tags were retrieved following deployment and were re-used.

The study successfully concluded the Song Thrush component, with 21 of the 30 procured tags deployed. All Song Thrushes satellite-tagged during post-nuptial migration wintered in Malta. Data from seven specimens provided conclusive evidence of their breeding locations in Romania (n=2), Bulgaria (n=2), Slovakia (n=1), Hungary (n=1), and Ukraine (n=1). This confirms that 85.7% of the tracked Song Thrushes bred within the territory of the European Union. This component also confirmed that these birds follow a distinct SW–NE pre-nuptial migration route.

For the Golden Plover, 17 of 32 deployed tags yielded comprehensive data. Specimens were found to winter exclusively in Tunisia before migrating north. The study provided valuable new data, with 17 specimens breeding in Sweden (n=3), Finland (n=3), Norway (n=4), and Russia (n=7). Overall, 35.3% of the tracked Golden Plovers bred within the territory of the European Union.

Based on the findings, the final Golden Plover tag will be deployed in a concluding study phase from November 2025 to January 2026. The strategic approach of a modified GPS schedule, implemented in the final phases, proved highly effective in maximizing data on breeding grounds and will be continued for the final deployment. This report serves as the final submission on the Song Thrush component. A final report on the Golden Plover study will be presented to the Committee once the last tag ceases transmission prior to formal communication to the European Commission and publication of a final consolidated report on the website of the Wild Birds Regulation Unit.

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1. Introduction

This report details the findings of a satellite-tracking study on the Song Thrush (*Turdus philomelos*) and the Golden Plover (*Pluvialis apricaria*). The project, conducted under an Article 9(1)(b) research derogation and overseen by the Wild Birds Regulation Unit, was initiated at the request of the European Commission during a bilateral meeting on 26 November 2019. The primary objective was to improve the knowledge base on Malta's reference populations of these two species, specifically by determining the geographical locations of their breeding grounds using satellite tracking.

The study utilized 60 satellite tags, with 30 allocated to each species. The tags for Golden Plovers were solar-powered for long-term data collection, while the non-solar Song Thrush tags had a lifespan of approximately one year. Both sets of tags were programmed with specific schedules to optimize data collection. The project tracked the movements of specimens that were tagged over a number of phases from February 2022 to February 2025, providing valuable insights into migration patterns, wintering locations, and breeding grounds.

This report summarizes the findings from the project's inception in 2022 to its current phase, detailing the deployment efforts, data collection methodology, and key results from tracking both species.

2. Objective of the research

This study's objective is to enhance scientific understanding of Malta's reference populations of the Golden Plover (*Pluvialis apricaria*) and the Song Thrush (*Turdus Philomelos*) through the use of satellite tracking technology. This project, conducted under an Article 9(1)(b) research derogation from the general prohibitions of the Birds Directive, was initiated in response to a request from the European Commission during a bilateral meeting in November 2019. The key aim is to determine the geographical locations of the breeding grounds of the tagged individuals. As an added value, this project will also analyse temporal migration patterns during pre-nuptial and post-nuptial periods, throughout the lifespan of the tags. The analysis will investigate whether there are noticeable shifts in wintering and breeding locations or if the birds exhibit high site fidelity.

3. Procurement of Satellite Tags

On 27 August 2020, the Wild Birds Regulation Unit (WBRU) obtained the necessary approvals from the Ministry for Finance to procure sixty satellite tags. Thirty tags were allocated for Golden Plovers (*Pluvialis apricaria*) and thirty for Song Thrushes (*Turdus philomelos*). The procurement included the associated PinPoint Reader/Programme/Charger (Lotek UK Ltd) and monthly data charges from CLS - Collecte Localisation Satellites, Argos. All related costs, totaling €90,409 (excluding VAT) for the tags and reader, plus monthly data charges (€15/active tag + €4/day, capped at €63/month/active tag, excluding VAT), were borne by the Wild Birds Regulation Unit. Teflon harness material, as recommended by Lotek UK Ltd, was also procured for the tags.

The satellite tags for each species had distinct specifications. Tags for the Golden Plover (Figures 1 and 2) weighed 6.04g (7.21g with harness and breast-loop crimp) and were powered by a solar-charged battery. The tags for the Song Thrush (Figures 3 and 4) were not solar-powered and weighed 2.46g (3.3g with harness and breast-loop crimp). The lifespan of the Song Thrush tags was approximately one year from deployment/activation, depending on the programmed schedule.

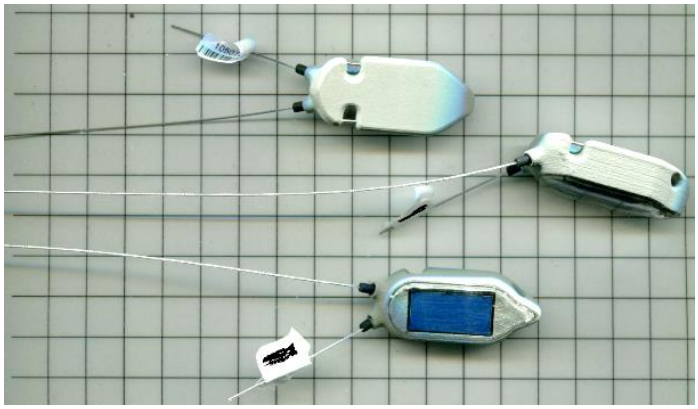


Figure 1. Satellite tags for Golden Plovers. PP-ARG-SOL-40 (not to scale). Source: Lotek UK Ltd.

Figure 2. Weight (7.21g) of a Golden Plover satellite tag (PP-ARG-SOL-40) including harness and breast-loop crimp. Source: WBRU (2022).

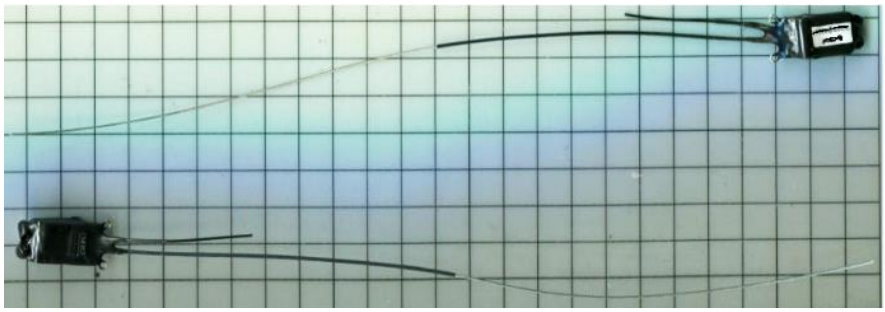


Figure 3. Satellite tags for Song Thrushes. PP-ARG-40 light (not to scale). Source: Lotek UK Ltd.

Figure 4. Weight (3.33g) of a Song Thrush satellite tag (PP-ARG-40 light) including harness and breast-loop crimp. Source: WBRU (2022).

4. Methodology

Song Thrushes were captured using mist-nets by BirdLife Malta's licensed bird-ringers (Figure A). Golden Plovers were captured using clap-nets with a mesh size of 60mm × 60mm by individuals holding a valid general live-capturing licence and a special satellite-tagging licence. The Golden Plover satellite-tagging licence was issued pursuant to an Article 9(1)(b) research derogation for each phase of the project, a notice of which was published in the Government Gazette (refer to Section 5 for details).

In all data tables, dates are presented in the Day-Month-Year (DMY) format, indicated by dd/mm/yyyy in column headers.

Prior to deployment, a specific schedule was programmed and saved onto each satellite tag using the DLC Interface and the PinPoint Host Application. The DLC Interface was also utilized to charge the tags. The software provides three distinct scheduling rules, which can be applied individually or in combination to meet the needs of the study (PinPoint Host Application User Manual, Lotek, August 2019).

Daily Cycle Rule: This rule configures a daily schedule between two specified dates (Rule Period). For each day, GPS fixes are taken at a defined Fix Interval over a specified time period (Start Time to End Time). The total number of fixes is determined by the duration of the period and the set interval.

Discrete Rule: This rule sets a daily schedule of individual fixes between two dates. Fixes are scheduled to occur at one or more specific times (Daily Fix Times).

Rollover Rule: This rule establishes a continuous schedule between two dates. Unlike the Daily Cycle Rule, the schedule does not reset daily but rolls over according to the Repetition Fix Interval. A fix is taken at the Start Date/Time, and subsequent fixes occur at the specified Fix Interval until the End Date/Time. The interval can be set from one minute to 1,000 days.

The ability to combine multiple rules (Discrete, Daily Cycle, or Rollover) allowed for a flexible approach to data collection. For instance, the Song Thrush tags, with their approximate one-year battery lifespan, were programmed to take fixes on a specific day each month using a Rollover rule while simultaneously taking several fixes during the critical breeding season using a Daily Cycle rule.

Tag Activation and Deployment

Once a schedule was programmed and saved, tags could be stored as inactive or activated immediately. A tag is considered deployed after it has been activated and fitted onto a specimen for release. To maximize efficiency, the Golden Plover and Song Thrush tags were programmed with different schedules to reflect their respective battery lifespans. Following deployment, GPS locations are transmitted with every third successful fix.

To avoid unnecessary data charges, which begin immediately upon activation, tags were activated just before being fitted to a bird. However, this posed a logistical challenge, as activation required specific software and access to the DLC interface. This was further complicated by the fact that multiple activated PinPoint Argos tags, which all operate on the same frequency, could not be placed within close proximity (~1m) of each other. According to Lotek UK Ltd, the strong Argos signal could damage the electronics of other activated tags nearby.

5. Regulatory Approvals and Project Phases

The Ornis Committee, during its meeting on 29 July 2020[1], unanimously approved the application of an Article 9(1)(b) derogation for the study of Golden Plover and Song Thrush migration routes via satellite tracking. This approval was conditional on the submission and approval of the proposed methodology. This in-principle decision was subsequently published as Government Notice No. 1415/2020 on 1 December 2020[2].

The Committee officially approved the proposed methodology on 29 March 2021[3]. This initial approval was limited to the pre-nuptial migration period from 1 February to 31 March 2022. While the Federation for Hunting and Conservation (FKNK) and Kaċċaturi San Ubertu (KSU) had offered their assistance, the Committee agreed that site selection and participant lists should be left to the discretion of the Wild Birds Regulation Unit (WBRU).

Project Renewal Phases:

- **Phase 2:** The renewal application for the period 20 October 2022 to 31 March 2023 was deferred from the 5 October 2022 meeting to 16 November 2022[4]. Following approval, the project was renewed with a validity period commencing from the publication of Government Notice No. 1618/2022 on 29 November 2022[5] until 31 March 2023.

- **Phase 3:** Recommended by the Ornis Committee on 2 August 2023[6], this phase covered the period from 20 October 2023 to 31 March 2024. This was formally published as Government Notice No. 1110/2023 on 11 August 2023[7].

- **Phase 4 (Current Reporting Period):** The project's fourth phase was recommended by the Ornis Committee on 5 September 2024[8] for the period 20 October 2024 to 31 March 2025. This was subsequently published as Government Notice No. 1277/2024 on 1 October 2024[9].

[1] Minutes of the Ornis Committee meeting held on 29 July 2020. Available at: https://wbru.gov.mt/wp-content/uploads/2024/03/oMinTweNinJul20.pdf

[2] Government Notice No. 1415/2020, published in the Government Gazette No. 20,530 on 1 December 2020. Available at: https://www.gov.mt/en/Government/DOI/Government%20Gazette/Documents/2020/12/Government%20Gazette%20-%201st%20December.pdf

[3] Minutes of the Ornis Committee meeting held on 29 March 2021. Available at: https://wbru.gov.mt/wp-content/uploads/2024/03/oMinTweNinMar21.pdf

[4] Minutes of the Ornis Committee meetings held on 5 October 2022 and 16 November 2022. Available at: https://wbru.gov.mt/wp-content/uploads/2024/03/oMinutesOctNov22.pdf

[5] Government Notice No. 1618/2022, published in the Government Gazette No. 20,967 on 29 November 2022. Available at: https://www.gov.mt/en/Government/DOI/Government%20Gazette/Documents/2022/11/Gaz%20Government%20Gazette%20-%2029th%20November.pdf

[6] Minutes of the Ornis Committee meeting held on 02 August 2023. Available at: https://wbru.gov.mt/wp-content/uploads/2024/03/oMinSecAug23.pdf

[7] Government Notice No. 1110/2023, published in the Government Gazette No. 21,099 on 11 August 2023. Available at: https://www.gov.mt/en/Government/DOI/Government%20Gazette/Documents/2023/08/Government%20Gazette%20-%2011th%20August.pdf

[8] Minutes of the Ornis Committee meeting held on 05 September 2024. Available at: https://wbru.gov.mt/wp-content/uploads/2025/04/Ornis-Meeting-Minutes-05.09.24.pdf

[9] Government Notice No. 1277/2024, published in the Government Gazette No. 21,321 on 01 October 2024. Available at: https://www.gov.mt/en/Government/DOI/Government%20Gazette/Documents/2024/10/Government%20Gazette%20-%201st%20October.pdf

6. Outcome of research period February 2022 – February 2025

Song Thrush

Initial Tag Deployment and Decommissioning
A total of three tags were deployed during the initial research period (Phase 1, February–March 2022). Seven tags were decommissioned in 2022 due to battery failure (Figure 5).

Phase 2 Deployment and Tag Failures
During Phase 2 of the project (November 2022–March 2023), 11 additional tags were deployed. Tags **208603** and **208608** were decommissioned on September 11 and October 17, 2023, respectively, due to battery failure, as shown in Figure 6.

Figure 5. Seven Song Thrush tags were decommissioned in 2022 (note damage to black potting due to battery expansion). Not to scale.

Figure 6. Tags 208603 and 208608 were decommissioned in 2023 due to battery failure/expansion. Not to scale.

Phase 3 Deployment Strategy
For the final phase of the project (Phase 3), deployment was strategically limited to late February and March 2024 to maximize the number of GPS fixes during the breeding season. This decision was based on three key factors:

- The tags had a limited shelf life of one year, regardless of their deployment date.
- The tags, which were procured in 2020, required a prolonged charging period to maintain their function, which reduced the probability of them being in good working condition.
- Data from Phase 2 showed a need for a larger sample size on the breeding grounds. The majority of fixes from that phase were recorded during the wintering period, which led to inconclusive data on breeding locations due to tag battery failure after the birds migrated to mainland Europe.

The Song Thrush tags deployed during Phase 3 were programmed with a schedule designed to capture the start of post-nuptial migration, their migration route and breeding grounds. This schedule included daily GPS fixes from March 29–31, 2024, and May 15–17, 2024, along with a fix every 12 days from April 2, 2024, until battery depletion (Figure **7**).

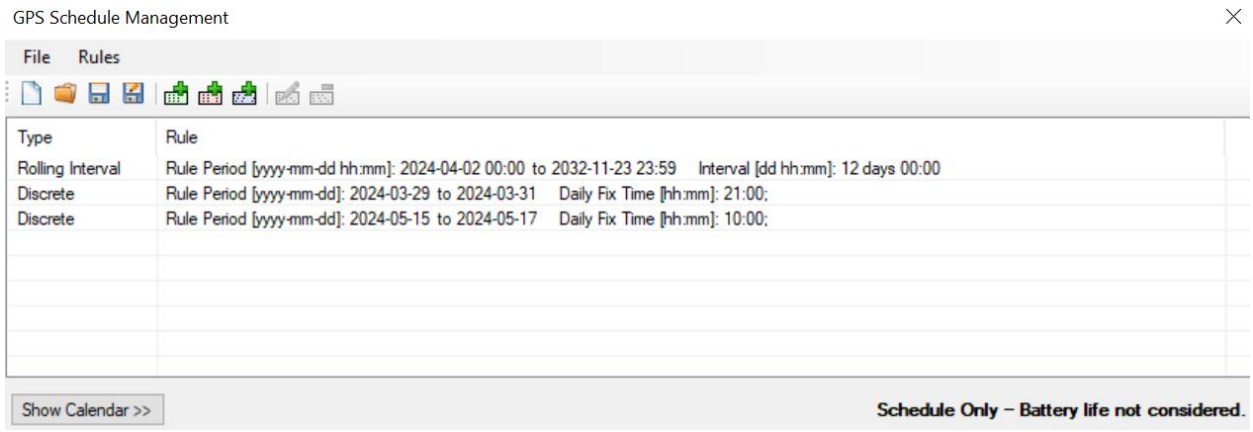


Figure 7. Song Thrush GPS schedule during phase 3 (2024).

Based on this schedule, the estimated battery life ranged from 190 to 281 GPS days, with a mean of 242 days (Figure 8). The timing was set with the assumption that birds would depart from their wintering grounds in Malta during the pre-nuptial period (late March to early April), consistent with previous tagging phases.

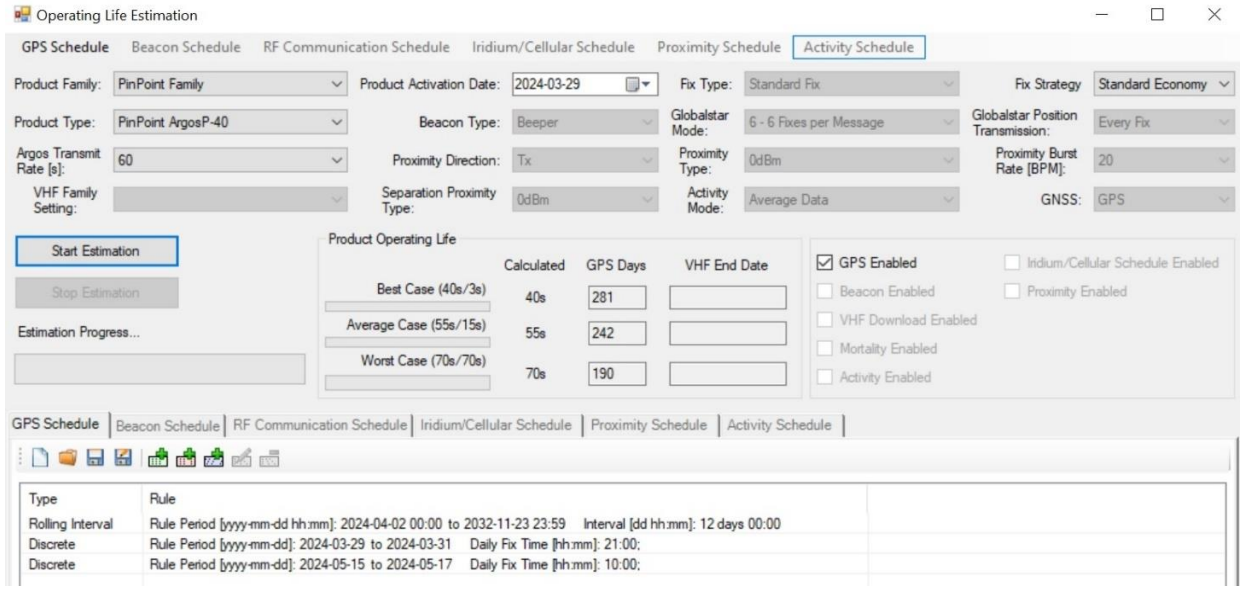


Figure 8. Estimated operating life of Song Thrush tags.

During Phase 3, all seven remaining tags were deployed. The Song Thrushes were captured over several days using mist nets set up within the Buskett Bird Sanctuary. Table 1 lists the corresponding tag details and deployment dates for all Song Thrushes fitted with a satellite tag since the project's inception in February 2022.

***Table 1**. Deployment of Song Thrush tags during 2022–2024 (PP-ARG-40 light, weight 3.33g with 35cm harness and breast-loop crimp.*

Date (dd/mm/yyyy)	**Location**	**Ring No.**	**Specimen's Weight (g)** (without satellite tag)	**Tag-to-weight ratio (%)**	**Tag No.**
04/02/2022	Buskett	CC4804	73.0	4.56	**208582**
04/02/2022	Buskett	CC4756	63.0	5.29	**208583**
01/03/2022	Girgenti	CC4805	67.8	4.91	**208586**
06/12/2022	Buskett	CC4772	62.3	5.35	**208590**
08/12/2022	Manikata	CC5303	64.4	5.17	**208589**
09/12/2022	Girgenti	CC4808	65.6	5.08	**208594**

Date (dd/mm/yyyy)	**Location**	**Ring No.**	**Specimen's Weight (g)** (without satellite tag)	**Tag-to-weight ratio (%)**	**Tag No.**
09/12/2022	Żebbiegħ	CC5605	66.4 (re-trapped on 18 March 2023 weighing 81.2g, including tag)	5.02	**208593**
12/12/2022	Buskett	CC4773	67.0	4.97	**208595**
12/12/2022	Buskett	CC4774	68.2	4.88	**208592**
04/01/2023	Buskett	CC4776	72.9	4.57	**208597**
16/01/2023	Buskett	CC4777	72.2	4.61	**208596**
23/01/2023	Buskett	CC4358	68.5	4.86	**208578**
28/02/2023	Simar	CC3563	76.3	4.36	**208585**
10/03/2023	Wied Ħarq Ħamiem	CC5355	75.4	4.42	**208584**
28/02/2024	Buskett	CC4815	78.2	4.26	**208598**
29/02/2024	Buskett	CC4816	68.4	4.89	**208602**
29/02/2024	Buskett	CC4817	68.0	4.90	**208605**
29/02/2024	Buskett	CC4818	70.7	4.71	**208609**
03/03/2024	Buskett	CC4819	66.1	5.04	**208604**
03/03/2024	Buskett	CC4820	67.3	4.95	**208600**
03/03/2024	Buskett	CC4821	79.0	4.22	**208599**

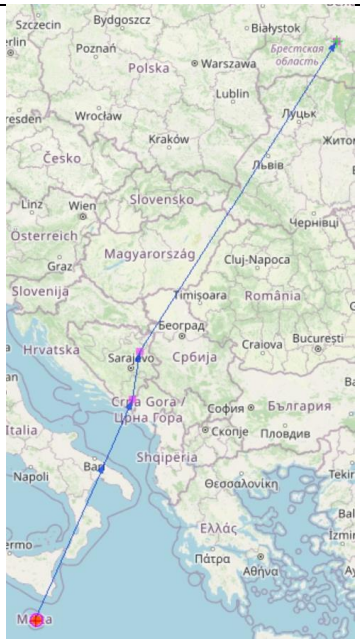
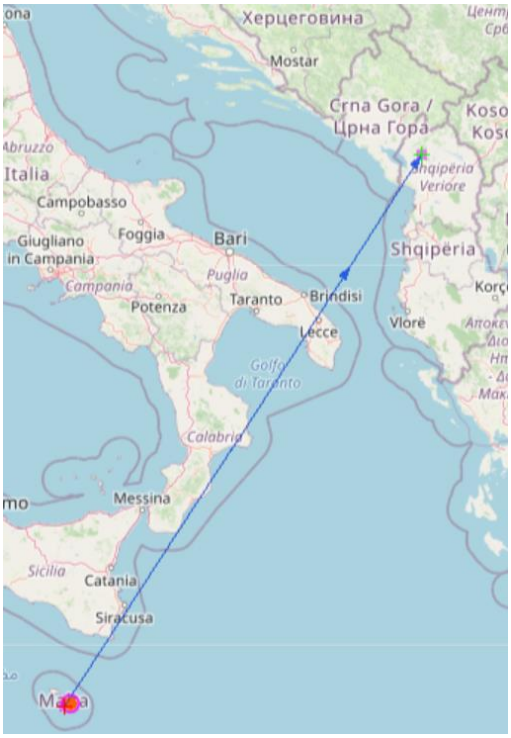
Song Thrush Geolocations

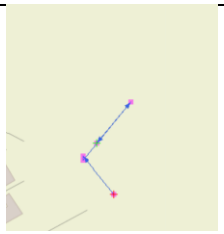
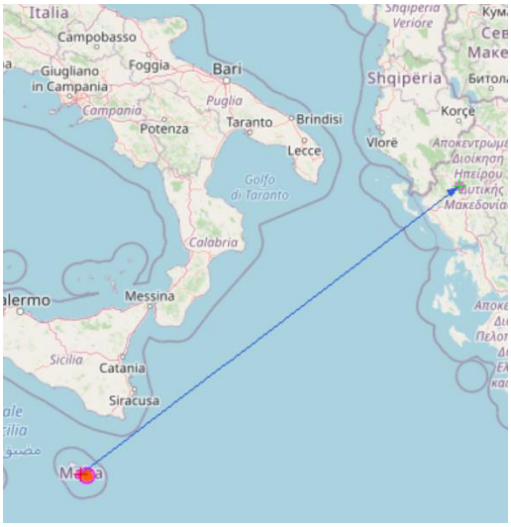
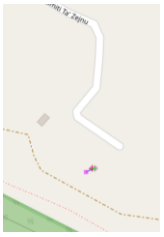
The GPS fixes for the satellite-tagged Song Thrushes are detailed in Table 2. A composite map illustrating the complete migration routes of all tagged individuals is presented in Figure 9.

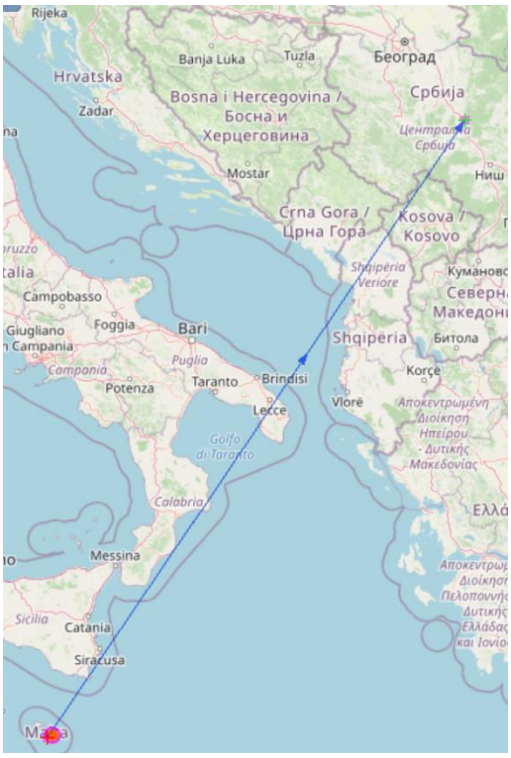
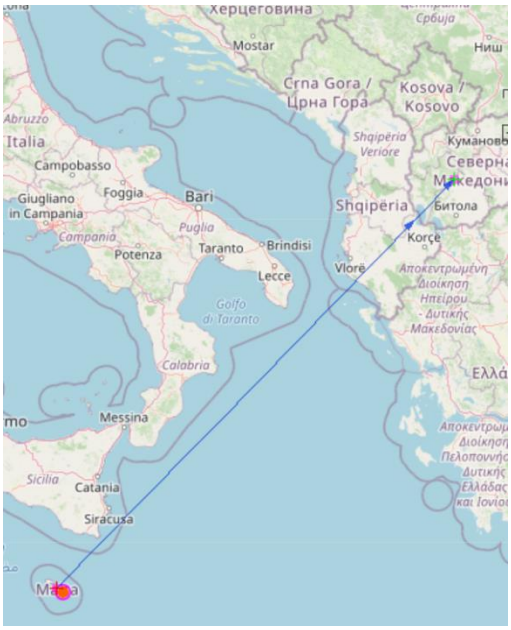
Table 2. GPS tracking data for Song Thrushes, detailing migratory routes, wintering and breeding locations.

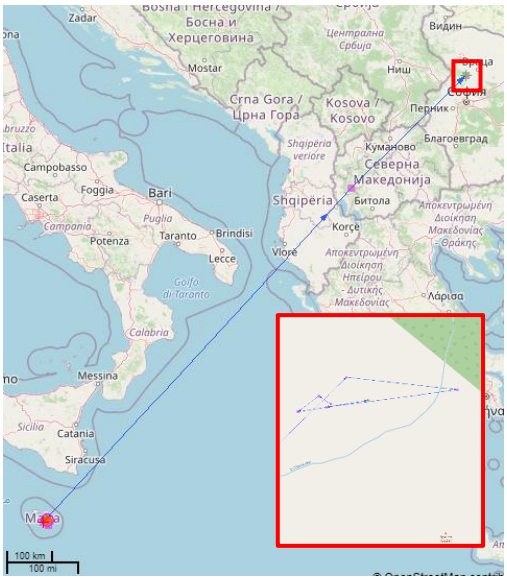
A note about the formatting: Deployment locations and dates are in italics; the last recorded location and date of transmission are in bold. Inset maps show the location of the satellite-tagged individuals during the breeding season.

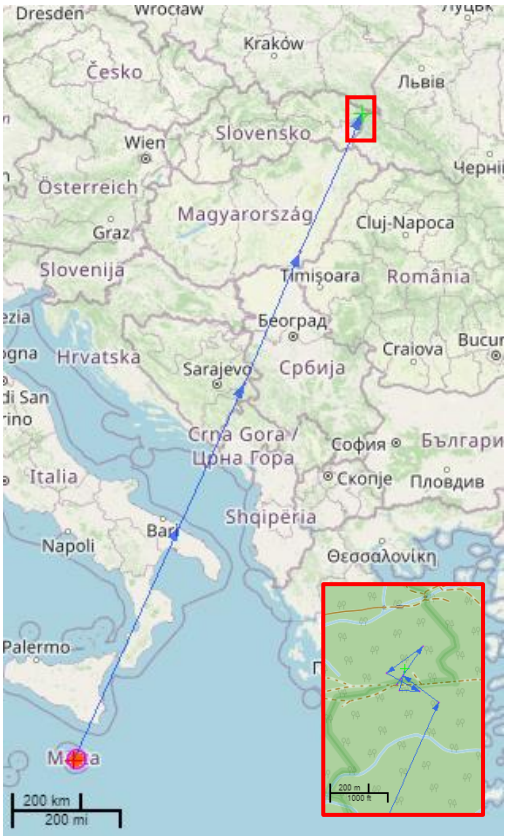
Species	**Ring No.**	**Tag No.**	**Location of GPS fixes**	**Date** (dd/mm/yyyy)	**Map**
Turdus philomelos	CC4804	**208582**	*Buskett, Malta*	*04/02/2022*	
			Buskett, Malta	08/02/2022	
			Buskett, Malta	15/02/2022	
			Buskett, Malta	22/02/2022	
			Planina, Serbia	29/03/2022	
			Ileanda, Romania	05/04/2022	
			Ileanda, Romania	12/04/2022	
			Ileanda, Romania	26/04/2022	
			Ileanda, Romania	03/05/2022	
			Ileanda, Romania	10/05/2022	
			Ileanda, Romania	17/05/2022	
			Ileanda, Romania	**14/06/2022**	

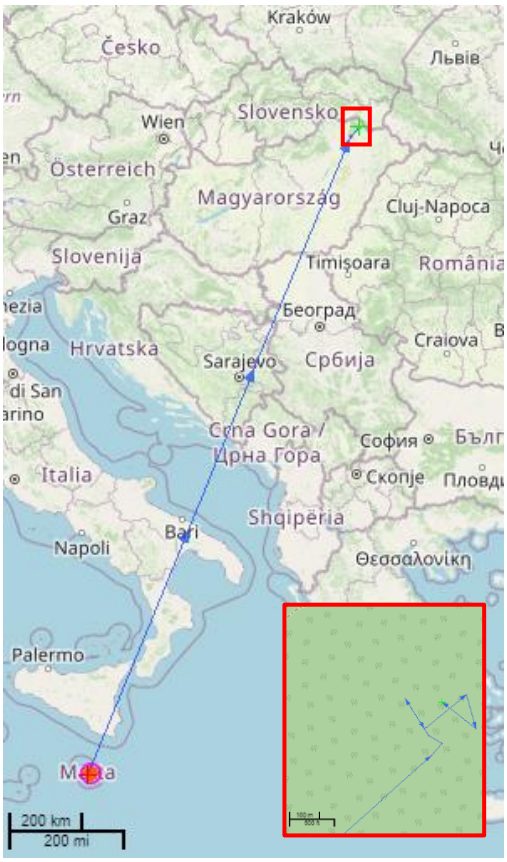
Species	Ring No.	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Turdus philomelos	CC4756	**208583**	*Buskett, Malta*	*04/02/2022*	
			Girgenti, Malta	08/02/2022	
			Girgenti, Malta	15/02/2022	
			Girgenti, Malta	22/02/2022	
			Buskett, Malta	22/03/2022	
			Baljci, Bosnia and Herzegovina	12/04/2022	
			Brgule, Bosnia and Herzegovina	19/04/2022	
			Kletsk District, Belarus	**26/04/2022**	
Turdus philomelos	CC4805	**208586**	*Girgenti, Malta*	*01/03/2022*	
			Girgenti, Malta	08/03/2022	
			Girgenti, Malta	15/03/2022	
			Girgenti, Malta	**22/03/2022**	
Turdus philomelos	CC4772	**208590**	*Buskett, Malta*	*06/12/2022*	
			Buskett, Malta	26/12/2022	
			Buskett, Malta	05/01/2023	
			Buskett, Malta	16/01/2023	
			Buskett, Malta	18/03/2023	
			Likaj, Albania	**06/04/2023**	
Turdus philomelos	CC5303	**208589**	*Manikata, Malta*	*08/12/2022*	No GPS data

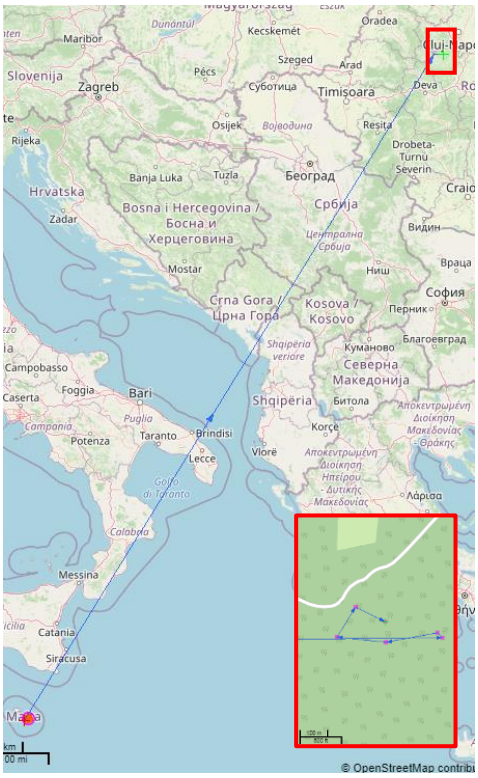
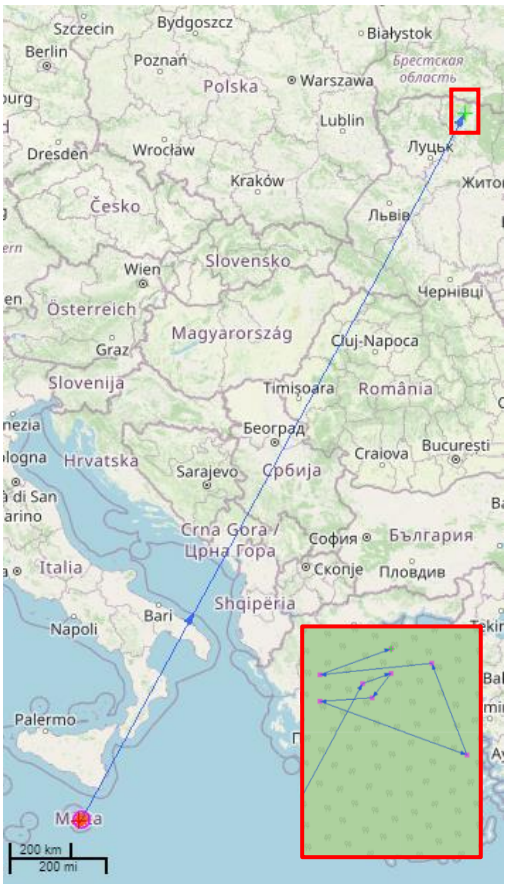
Species	Ring No.	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Turdus philomelos	CC4808	**208594**	*Girgenti, Malta* Girgenti, Malta Girgenti, Malta Girgenti, Malta Girgenti, Malta **Girgenti, Malta**	*09/12/2022* 26/12/2022 05/01/2023 16/01/2023 05/02/2023 **25/02/2023**	
Turdus philomelos	CC5605	**208593**	*Żebbiegħ, Malta* Mġarr, Malta Mġarr, Malta Mġarr, Malta Mġarr, Malta **Perama, Greece**	*09/12/2022* 26/12/2022 05/01/2023 16/01/2023 18/03/2023 **07/04/2023**	
Turdus philomelos	CC4773	**208595**	*Buskett, Malta*	*12/12/2022*	No GPS data
Turdus philomelos	CC4774	**208592**	*Buskett, Malta* Buskett, Malta Buskett, Malta **Buskett, Malta**	*12/12/2022* 26/12/2022 05/01/2023 **16/01/2023**	
Turdus philomelos	CC4776	**208597**	*Buskett, Malta* Buskett, Malta Buskett, Malta **Buskett, Malta**	*04/01/2023* 05/01/2023 16/01/2023 **04/02/2023**	
Turdus philomelos	CC4777	**208596**	*Buskett, Malta* Buskett, Malta Buskett, Malta Buskett, Malta Buskett, Malta Buskett, Malta **Buskett, Malta**	*16/01/2023* 04/02/2023 05/02/2023 25/02/2023 06/03/2023 18/03/2023 **06/04/2023**	

Species	Ring No.	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Turdus philomelos	CC4358	**208578**	*Buskett, Malta* Buskett, Malta Buskett, Malta **Bosnjane, Serbia**	*23/01/2023* 04/02/2023 05/02/2023 **07/04/2023**	
Turdus philomelos	CC3563	**208585**	*Simar, Malta* Simar, Malta Miżieb, Malta **Debreshte, North Macedonia**	*28/02/2023* 06/03/2023 18/03/2023 **06/04/2023**	
Turdus philomelos	CC5355	**208584**	*Wied Ħarq Ħamiem, Malta*	*10/03/2023*	No GPS data

Species	Ring No.	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Turdus philomelos	CC4815	**208598**	*Buskett, Malta*	*28/02/2024*	
			Buskett, Malta	29/03/2024	
			Buskett, Malta	30/03/2024	
			Buskett, Malta	31/03/2024	
			Kratovo, North Macedonia	14/04/2024	
			Chiprovtzi, Bulgaria	26/04/2024	
			Chiprovtzi, Bulgaria	08/05/2024	
			Chiprovtzi, Bulgaria	15/05/2024	
			Chiprovtzi, Bulgaria	16/05/2024	
			Chiprovtzi, Bulgaria	17/05/2024	
			Chiprovtzi, Bulgaria	20/05/2024	
			Chiprovtzi, Bulgaria	**01/06/2024**	
Turdus philomelos	CC4816	**208602**	*Buskett, Malta*	*29/02/2024*	
			Buskett, Malta	03/03/2024	
			Buskett, Malta	26/03/2024	
			Buskett, Malta	02/04/2024	
			Debarca, North Macedonia	14/04/2024	
			Svoge, Bulgaria	26/04/2024	
			Svoge, Bulgaria	08/05/2024	
			Svoge, Bulgaria	15/05/2024	
			Svoge, Bulgaria	16/05/2024	
			Svoge, Bulgaria	17/05/2024	
			Svoge, Bulgaria	20/05/2024	
			Svoge, Bulgaria	**01/06/2024**	

Species	Ring No.	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Turdus philomelos	CC4817	**208605**	*Buskett, Malta*	*29/02/2024*	
			Buskett, Malta	29/03/2024	
			Buskett, Malta	30/03/2024	
			Buskett, Malta	31/03/2024	
			Buskett, Malta	02/04/2024	
			Rogatica Municipality, Bosnia and Herzegovina	14/04/2024	
			Békéssámson, Hungary	26/04/2024	
			Topoľa, Slovakia	08/05/2024	
			Topoľa, Slovakia	15/05/2024	
			Topoľa, Slovakia	16/05/2024	
			Topoľa, Slovakia	17/05/2024	
			Topoľa, Slovakia	20/05/2024	
			Topoľa, Slovakia	01/06/2024	
			Topoľa, Slovakia	13/06/2024	
			Topoľa, Slovakia	25/06/2024	
			Topoľa, Slovakia	**07/07/2024**	
Turdus philomelos	CC4818	**208609**	*Buskett, Malta*	*29/02/2024*	No GPS data

Species	Ring No.	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Turdus philomelos	CC4819	**208604**	*Buskett, Malta*	*03/03/2024*	
			Buskett, Malta	29/03/2024	
			Buskett, Malta	30/03/2024	
			Buskett, Malta	31/03/2024	
			Buskett, Malta	02/04/2024	
			Han Pijesak, Bosnia and Herzegovina	14/04/2024	
			Tállya, Hungary	26/04/2024	
			Nagyhuta, Hungary	08/05/2024	
			Kovácsvágás, Hungary	15/05/2024	
			Kovácsvágás, Hungary	16/05/2024	
			Kovácsvágás, Hungary	17/05/2024	
			Kovácsvágás, Hungary	20/05/2024	
			Kovácsvágás, Hungary	01/06/2024	
			Kovácsvágás, Hungary	13/06/2024	
			Kovácsvágás, Hungary	25/06/2024	
			Kovácsvágás, Hungary	**07/07/2024**	

Species	Ring No.	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Turdus philomelos	CC4820	**208600**	*Buskett, Malta*	*03/03/2024*	
			Bistra, Romania	26/03/2024	
			Posaga, Romania	14/04/2024	
			Posaga, Romania	17/05/2024	
			Posaga, Romania	20/05/2024	
			Posaga, Romania	01/06/2024	
			Posaga, Romania	13/06/2024	
			Posaga, Romania	25/06/2024	
			Posaga, Romania	**07/07/2024**	
Turdus philomelos	CC4821	**208599**	*Buskett, Malta*	*03/03/2024*	
			Buskett, Malta	29/03/2024	
			Buskett, Malta	30/03/2024	
			Girgenti, Malta	02/04/2024	
			Litvytsya, Rivne Oblast, Ukraine	15/05/2024	
			Litvytsya, Rivne Oblast, Ukraine	16/05/2024	
			Litvytsya, Rivne Oblast, Ukraine	17/05/2024	
			Litvytsya, Rivne Oblast, Ukraine	20/05/2024	
			Litvytsya, Rivne Oblast, Ukraine	01/06/2024	
			Litvytsya, Rivne Oblast, Ukraine	13/06/2024	
			Litvytsya, Rivne Oblast, Ukraine	25/06/2024	
			Litvytsya, Rivne Oblast, Ukraine	**07/07/2024**	

As illustrated in Figure 9, the flightpath of satellite-tagged Song Thrushes during pre-nuptial migration is consistent with the general framework of southwesterly autumn migration and northeasterly spring migration across Europe as observed by Spina and Volponi (2008)[10].

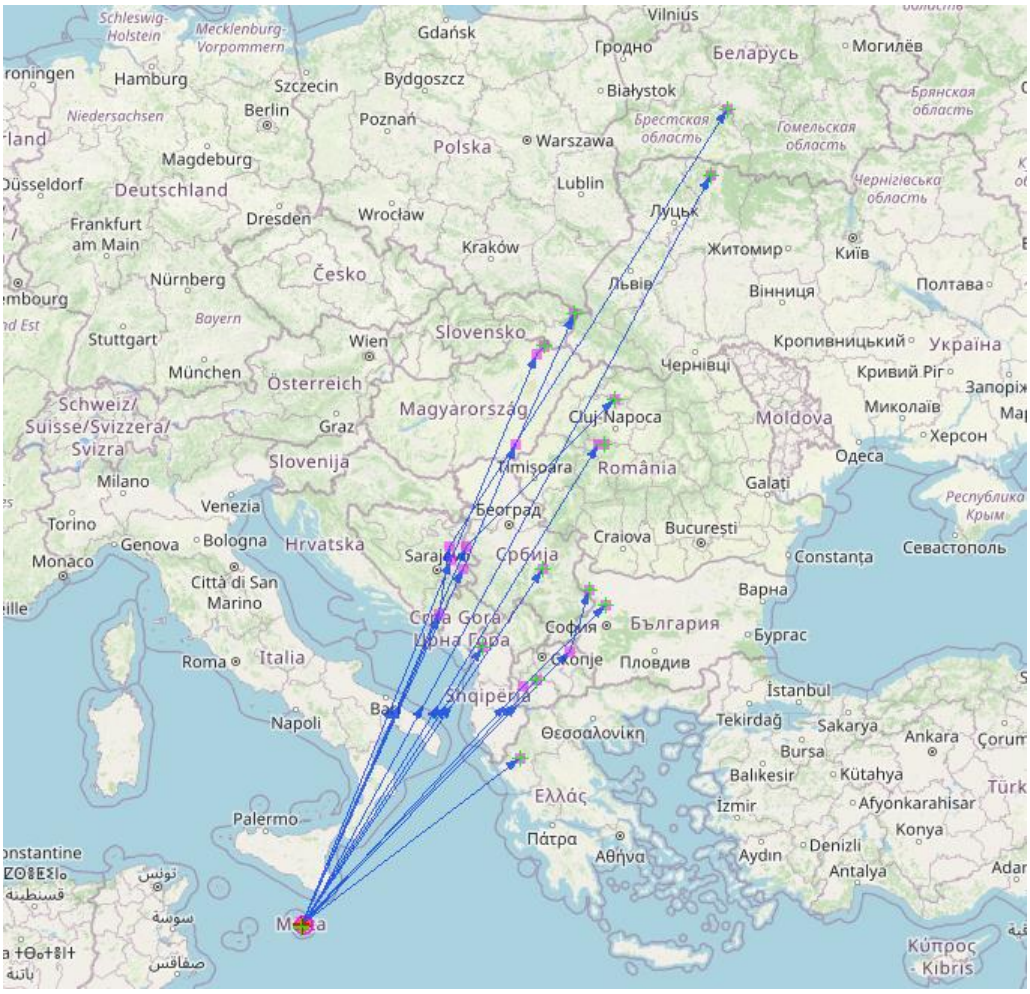


Figure 9. Composite map of Song Thrushes pre-nuptial migration, illustrating general north-eastward movement (data from 04 Feb 2022 to 07 Jul 2024). Source: movebank.org, study name "Migration of Golden Plovers and Song Thrushes", study ID 1995912295.

Update on Song Thrush Tracking Data and Data Analysis

No additional GPS fixes were registered by the tags deployed during Phase 1 (2021–2022) and Phase 2 (2022–2023) after the respective reports were compiled and presented to the Ornis Committee.

Wintering grounds (2022–2023 data)

Six of the 14 Song Thrush tags deployed between February 4, 2022, and March 10, 2023, transmitted GPS fixes from continental Europe during pre-nuptial migration, following the birds' wintering period in Malta (Table 3). The wintering location of the satellite-tagged Song Thrushes was very restricted—all specimens remained in the same area where they were captured and tagged throughout the wintering period. The remaining tags did not transmit any data.

Data from Phase 3 (2024) were excluded from this analysis because the seven specimens were tagged at the end of the wintering period and the start of post-nuptial migration.

[10] See p.12 of the Golden Plover and Song Thrush Conservation Status Report (2021 update), available at: https://mgoz.gov.mt/en/Documents/WBRU/Reports%20and%20Statistics/consStaRepMay21GpSt.pdf

***Table 3**. GPS data for Song Thrushes during their wintering period in Malta.*

Tag no.	Date tagged (dd/mm/yyyy)	Last GPS fix in Malta (dd/mm/yyyy)	First GPS fix overseas (dd/mm/yyyy)	Wintering period in Malta (days)		
				Minimum	*Maximum*	*Mean*
208582	04/02/2022	22/02/2022	29/03/2022	18	53	36
208583	04/02/2022	22/03/2022	12/04/2022	46	67	57
208590	06/12/2022	18/03/2023	06/04/2023	102	121	112
208593	09/12/2022	18/03/2023	07/04/2023	99	119	109
208578	23/01/2023	05/02/2023	07/04/2023	13	74	44
208585	28/02/2023	18/03/2023	06/04/2023	18	37	28
			Mean	**49**	**79**	**64**

Breeding grounds (2022–2024 data)

The Song Thrush fitted with Tag **208582** remained in Romania throughout the breeding season (April 5 – June 14, 2022). The specimen with Tag **208583** appeared to remain in Belarus; however, because the last confirmed data was transmitted on April 26, 2022, it could not be confirmed whether the specimen stayed in Belarus for the entire breeding season or migrated further north in May.

Deployments during Phase 2 in 2023 did not yield conclusive data on breeding grounds, as the tags' batteries failed shortly after the specimens reached continental Europe. Conversely, the Phase 3 deployments in 2024 provided comprehensive breeding ground data for six of the seven tagged specimens (Table 4). This success highlights the strategic decision to deploy the tags later in the wintering period and to program a less intensive schedule for the Phase 3 tags. This approach prioritized data collection on breeding grounds, as sufficient information on wintering locations had already been gathered in previous phases.

***Table 4**. GPS data for Song Thrushes during the breeding season.*

Tag No.	Last set of GPS fixes from overseas countries during pre-nuptial and breeding period		Number of GPS fixes	Location of GPS fixes during breeding period
	Location	**Date** (dd/mm/yyyy)		
208582	Romania	05/04/2022 – 14/06/2022	7	Romania
208583	Belarus	26/04/2022	1	*Inconclusive*
208590	Albania	06/04/2023	1	*Inconclusive*
208593	Greece	07/04/2023	1	*Inconclusive*
208578	Serbia	07/04/2023	1	*Inconclusive*
208585	North Macedonia	06/04/2023	1	*Inconclusive*
208598	Bulgaria	26/04/2024 – 01/06/2024	7	Bulgaria
208602	Bulgaria	26/04/2024 – 01/06/2024	7	Bulgaria
208605	Slovakia	08/05/2024 – 07/07/2024	9	Slovakia
208604	Hungary	26/04/2024 – 07/07/2024	10	Hungary
208600	Romania	26/03/2024 – 07/07/2024	8	Romania
208599	Ukraine	15/05/2024 – 07/07/2024	8	Ukraine

Table 5 lists the stopover sites used by satellite-tagged Song Thrushes during their northbound (pre-nuptial) migration.

Table 5. Northbound migration of satellite-tagged Song Thrushes: stopover sites.

Greece
Albania
North Macedonia
Bosnia and Herzegovina
Serbia
Hungary

Based on the project's GPS data from 05 Apr 2022 to 07 Jul 2024, seven satellite-tagged Song Thrushes spent the breeding season in five countries: Romania (n=2), Bulgaria (n=2), Slovakia (n=1), Hungary (n=1), and Ukraine (n=1), as shown in Table 4 and illustrated in Figure 10.

According to the study's data, 85.7% of the satellite-tagged Song Thrushes bred within the territory of the European Union.

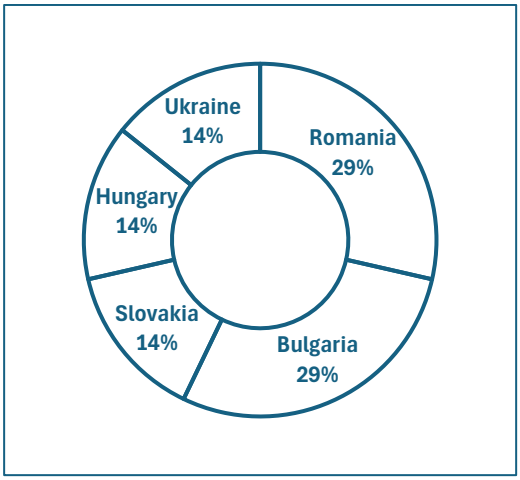


Figure 10. Proportional distribution of satellite-tagged Song Thrushes across their breeding grounds, based on the project's satellite tagging data from 05 Apr 2022 to 07 Jul 2024 (refer to Table 4).

Golden Plover

Tagging Methodology

Golden Plovers were fitted with solar-powered PP-ARG-SOL-40 tags, which, unlike the non-solar tags used for Song Thrushes, were designed for long-term deployment and a more frequent GPS schedule. During testing, a tag maintained a schedule of one GPS fix every two hours for 12 consecutive days, even in cloudy weather. After a brief standby period to recharge, the fixes resumed. A 'worst-case' battery life estimate was calculated using the non-solar tag's parameters, as Lotek's program for estimating battery life does not apply to solar models.

Tagging schedule adjustments

Following the unexpected failure of tags with an intensive GPS schedule during the latter part of the 2023 breeding season, the programming for subsequent phases was modified. It was determined that the intensive schedule likely led to battery failure because the time between transmissions was insufficient for solar recharging. The revised schedule for Phase 3 (2023–2024) was designed to extend the tags' battery life during the post-nuptial migration period and included the following:

Discrete Fixes:

- Three fixes every two hours during the first six hours.
- Two fixes on the second day.
- One daily fix for the following week.

Rolling Interval:

- A single fix every 25 days thereafter.

Tag **208629** was the only exception, with a schedule of one fix per week followed by fixes every 25 days. Despite this revised approach, all tags ceased transmission before the post-nuptial migration period.

The tags' schedule for Phase 4 (2024–2025) was also programmed with both discrete and rolling interval fixes. This schedule was designed to specifically target the migratory and breeding seasons, as detailed below and as shown in Figure 11.

Discrete Fixes:

- First fix on March 14, 2025.

- Second fix on April 2, 2025.
- Daily fixes from May 29–31, 2025.
- Daily fixes from June 28–30, 2025.
- A fix on August 18, 2025.

Rolling Interval:

- A single fix on April 26, 2025, and every 25 days thereafter.

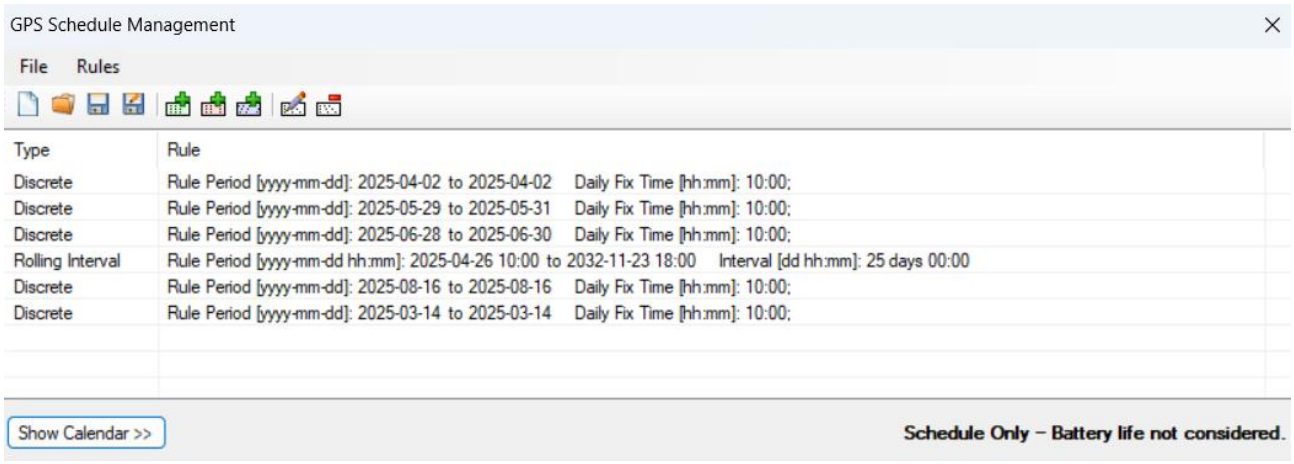


Figure 11. Golden Plover GPS schedule for phase 4 (2024–2025).

Golden Plover Observations and Tagging Effort

Golden Plovers follow a narrower flightpath during pre-nuptial migration (spring) compared to a broad-front post-nuptial migration (autumn and winter), which explains their scarcer presence in Malta during February and March relative to November–January.

Table 6 provides the observations and tagging summary across four phases of the project, while Appendix A offers a detailed daily log of the satellite tagging effort.

Table 6*. Golden Plovers observed and satellite-tagged.*

Phase	Date (dd/mm/yyyy)	Hours	Golden Plover Sightings	Golden Plovers Caught/Weighed	Tagged
1	05/02/2022 – 31/03/2022	191.5	2	0	0
2	29/11/2022 – 31/03/2023	823.5	21	6	5
3	20/10/2023 – 30/03/2024	1,231.5	132	12	10
4	20/10/2024 – 28/02/2025	903.5	47	17	17
	Total	3,150	202	35	32

Table 7 provides satellite tag details and deployment dates.

***Table 7**. Deployment of Golden Plover tags during 2022–2025 (PP-ARG-SOL-40, weight 7.21g with 45cm harness and breast-loop crimp.*

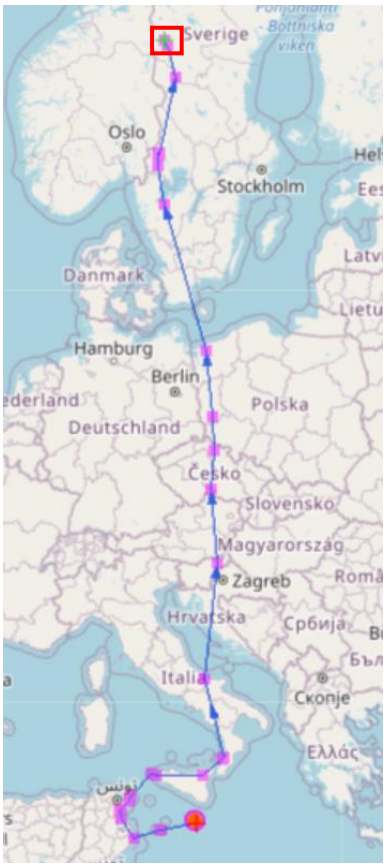
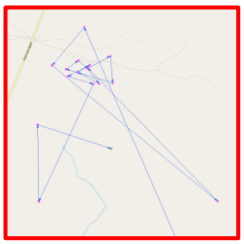
Date (dd/mm/yyyy)	**Location**	**Age**	**Sex**	**Specimen's weight (g)** (without satellite tag)	**Wing length (mm)**	**Tag-to-weight ratio (%)**	**Tag No.**
16/12/2022	Birżebbuġa	Adult	♂	166g	182	4.34	**208612**
30/12/2022	Birżebbuġa	First Year	♂	158g	189	4.56	Not tagged. Released with tagged specimen 208581 (refer to next row).
30/12/2022	Birżebbuġa	First Year	♀	169g	183	4.27	**208581**
07/02/2023	Birżebbuġa	First Year	♂	150g	190	4.81	**208591**
26/02/2023	Birżebbuġa	Adult	♂	168g	186	4.29	**208617**
12/03/2023	Birżebbuġa	First Year	♂	202g	190	3.57	**208612** (re-used)
20/11/2023	Birżebbuġa	First Year	♂	158g	191	4.56	**208614**
20/11/2023	Birżebbuġa	First Year	♀	160g	189	4.51	Not tagged. Released with tagged specimen 208614 (refer to previous row and Figure B).
21/11/2023	Birżebbuġa	Adult	♂	154g	184	4.68	**208615**
21/11/2023	Birżebbuġa	First Year	♀	158g	186	4.56	**208616**
26/11/2023	Birżebbuġa	First Year	♂	164g	182	4.40	**208618**
04/12/2023	Birżebbuġa	First Year	♂	132g	184	5.46	Released untagged. Tag-to-weight ratio >5%
08/12/2023	Birżebbuġa	First Year	♂	171g	196	4.22	**208619**
11/01/2024	Birżebbuġa	Adult	♂	189g	194	3.81	**208620**
12/01/2024	Birżebbuġa	First Year	♀	153g	187	4.71	**208626**
12/01/2024	Birżebbuġa	Adult	♀	165g	180	4.37	**208629**
13/01/2024	Birżebbuġa	Adult	♂	175g	182	4.12	**208621**
14/03/2024	Birżebbuġa	First Year	♂	217g	194	3.32	**208624**
06/11/2024	Birżebbuġa	First Year	♂	150g	178	4.81	**208620** (re-used)
14/11/2024	Birżebbuġa	First Year	♀	158g	181	4.56	**208627**
24/11/2024	Żurrieq	First Year	♀	150g	186	4.81	**208634**
26/11/2024	Birżebbuġa	Adult	♀	181g	185	3.98	**208622**
26/11/2024	Birżebbuġa	First Year	♂	163g	184	4.42	**208623**
26/11/2024	Birżebbuġa	Adult	♂	159g	191	4.53	**208635**
26/11/2024	Birżebbuġa	First Year	♂	166g	190	4.34	**208636**
01/12/2024	Żurrieq	First Year	♀	153g	188	4.71	**208637**
06/12/2024	Żurrieq	First Year	♂	153g	187	4.71	**209224**
10/12/2024	Żurrieq	First Year	♀	152g	188	4.74	**209227**
12/12/2024	Żurrieq	First Year	♀	147g	185	4.90	**209225**
13/12/2024	Żurrieq	Adult	♂	159g	189	4.53	**209226**
14/12/2024	Birżebbuġa	First Year	♂	161g	194	4.48	**208625**
18/12/2024	Birżebbuġa	First Year	♀	167g	186	4.32	**208630**
18/12/2024	Birżebbuġa	First Year	♂	169g	184	4.27	**208631**
16/01/2025	Birżebbuġa	Adult	♀	173g	189	4.17	**208633**
10/02/2025	Birżebbuġa	Adult	♀	157g	187	4.59	**208628**

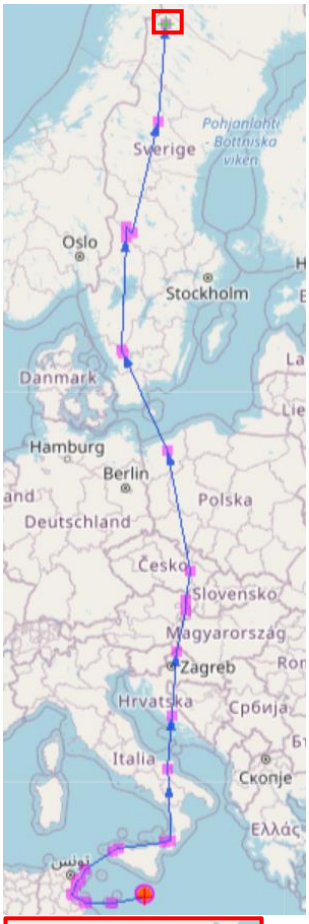
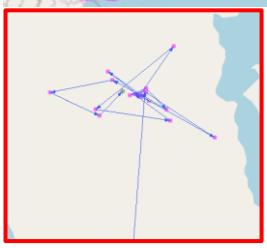
Golden Plover Geolocations

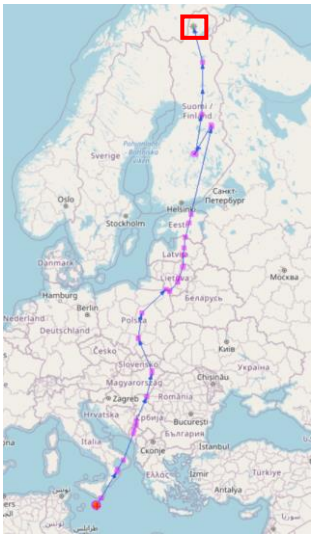
The GPS fixes for the satellite-tagged Golden Plovers are detailed in Table 8. A composite map illustrating the complete migration routes of all tagged individuals is presented in Figure 12.

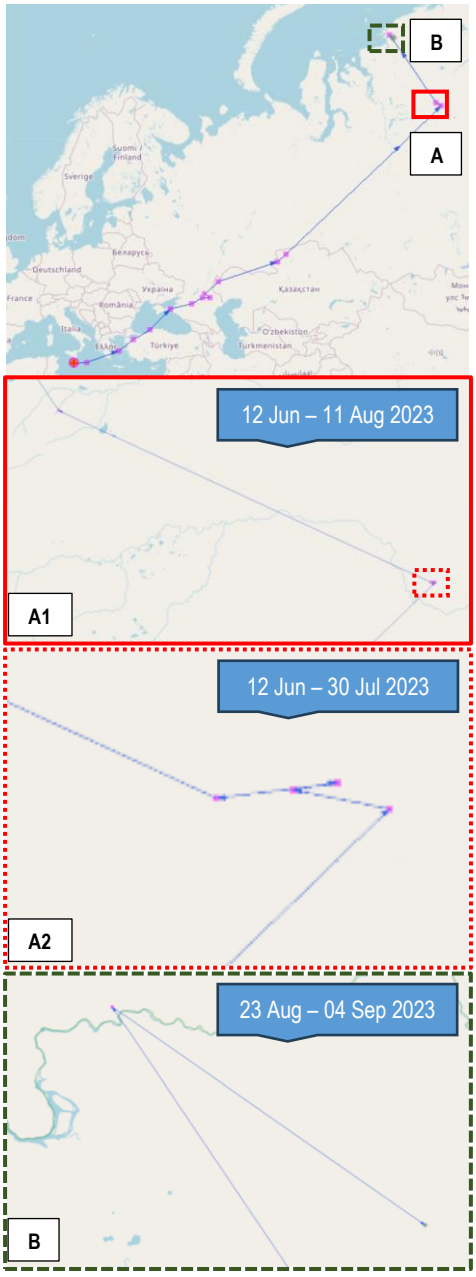
Table 8. GPS tracking data for Golden Plovers, detailing migratory routes, wintering and breeding locations.

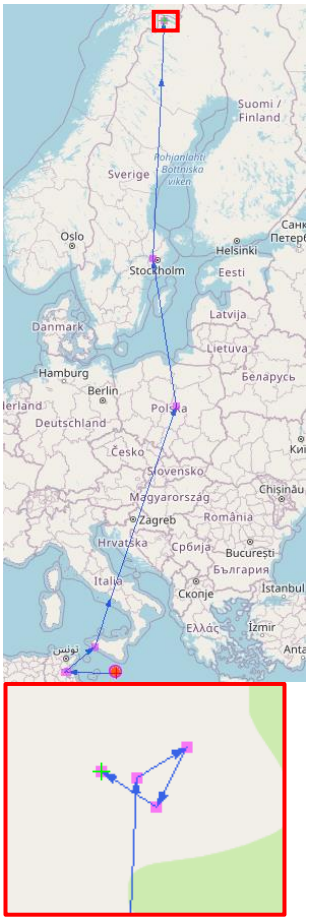
A note about the formatting: Deployment locations and dates are in italics; the last recorded location and date of transmission are in bold. Inset maps show the location of the satellite-tagged individuals during the breeding season.

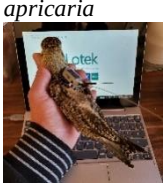
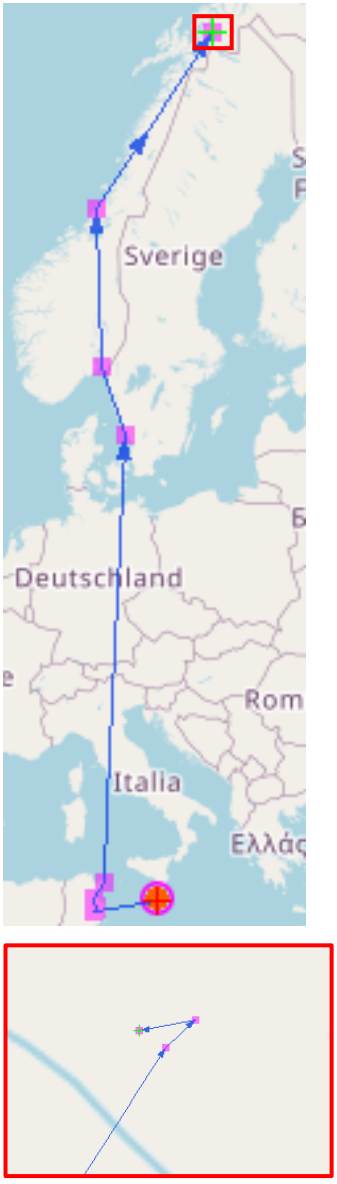
Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208612**	*Birżebbuġa, Malta* **Birżebbuġa, Malta**	*16/12/2022* **17/12/2022** (shot; tag returned to WBRU the following working day)	
Pluvialis apricaria 	**208581**	*Birżebbuġa, Malta* Birżebbuġa, Malta Filfla, Malta Lampedusa Chebba, Tunisia Sidi Bou Ali, Tunisia Enfidha, Tunisia Bouficha, Tunisia Errmal, Tunisia Errmal, Tunisia Hammamet, Tunisia Menzel Temime, Tunisia Menzel Temime, Tunisia Haouaria, Tunisia Nabeul, Tunisia Marettimo, Sicily Favignana, Sicily Randazzo, Sicily Rombiolo, Italy San Gregorio d'Ippona, Italy Campobasso, Italy Rače, Slovenia Studená, Czechia Horka u Staré Paky, Czechia Gmina Brzeźnica, Poland Gmina Gryfice, Poland Grästorp Municipality, Sweden Årjäng Municipality, Sweden Arvika Municipality, Sweden Arvika Municipality, Sweden Härjedalen, Sweden Falkvålen, Sweden **Falkvålen, Sweden**	*30/12/2022* 01/01/2023 02/01/2023 03/01/2023 04/01/2023 09/01/2023 12/01/2023 19/01/2023 20/01/2023 18/02/2023 22/02/2023 26/02/2023 09/03/2023 11/03/2023 13/03/2023 15/03/2023 15/03/2023 17/03/2023 18/03/2023 18/03/2023 20/03/2023 22/03/2023 24/03/2023 26/03/2023 28/03/2023 31/03/2023 01/04/2023 03/04/2023 08/04/2023 08/05/2023 10/05/2023 14/05/2023 **27/07/2023**	 

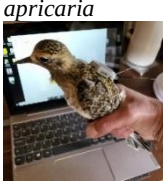
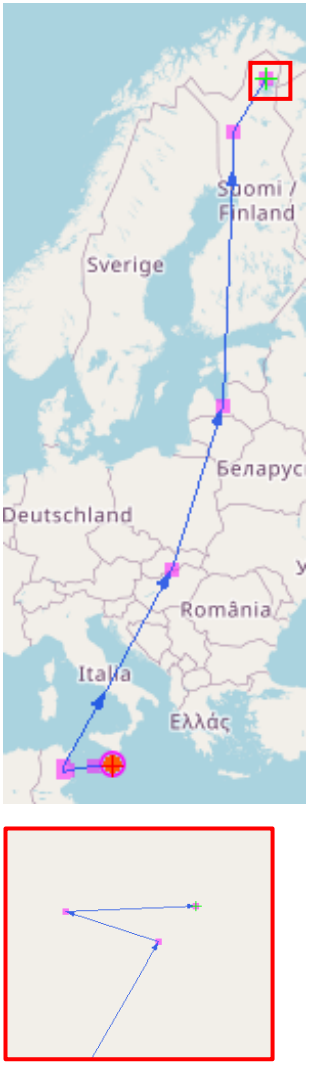
Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208591**	*Birżebbuġa, Malta*	*07/02/2023*	
		Birżebbuġa, Malta	07/02/2023	
		Lampedusa	09/02/2023	
		Mahdia, Tunisia	10/02/2023	
		Mahdia, Tunisia	18/02/2023	
		Moknine, Tunisia	20/02/2023	
		Kalaa Kebira, Tunisia	22/02/2023	
		Sebhika Kelbia, Tunisia	24/02/2023	
		Kondar, Tunisia	26/02/2023	
		Hammamet, Tunisia	28/02/2023	
		Bou Argoub, Tunisia	02/03/2023	
		Dar Chaabane El Fehri, Tunisia	06/03/2023	
		Korba, Tunisia	08/03/2023	
		Haouaria, Tunisia	10/03/2023	
		Trapani, Sicily	12/03/2023	
		Messina, Sicily	14/03/2023	
		Reggio Calabria, Italy	14/03/2023	
		Foggia, Italy	16/03/2023	
		Radonić, Croatia	16/03/2023	
		Središče ob Dravi, Slovenia	18/03/2023	
		Parndorf, Austria	20/03/2023	
		Ebenthal, Austria	22/03/2023	
		Čelechovice na Hané, Czechia	24/03/2023	
		Gmina Świdwin, Poland	26/03/2023	
		Hylte Municipality, Sweden	28/03/2023	
		Gislaved Municipality, Sweden	30/03/2023	
		Torsby Municipality, Sweden	01/04/2023	
		Malung, Sweden	10/04/2023	
		Malung, Sweden	08/05/2023	
		Strömsund Municipality, Sweden	10/05/2023	
		Sorsele Municipality, Sweden	12/05/2023	
		Sorsele Municipality, Sweden	**26/07/2023**	

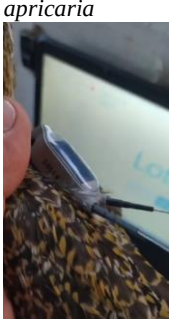
Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208617**	*Birżebbuġa, Malta*	*26/02/2023*	 
		Marsaskala, Malta	26/02/2023	
		Syracuse, Italy	26/02/2023	
		Crotone, Italy	26/02/2023	
		Lecce, Italy	26/02/2023	
		Ozrinići, Montenegro	28/02/2023	
		Novakovići, Montenegro	28/02/2023	
		Kaluđerovići, Serbia	02/03/2023	
		Hercegovačka Goleša, Serbia	02/03/2023	
		Zaovine, Serbia	04/03/2023	
		Tomnatic, Romania	06/03/2023	
		Tiszavasvári, Hungary	08/03/2023	
		Mezőzombor, Hungary	08/03/2023	
		Drochlin, Poland	10/03/2023	
		Koniecpol, Poland	10/03/2023	
		Dłużniewo Duże, Poland	12/03/2023	
		Makauskai, Lithuania	12/03/2023	
		Lebedžiūnai, Lithuania	20/03/2023	
		Krape, Latvia	22/03/2023	
		Kārļi, Latvia	24/03/2023	
		Naukšēni Parish, Latvia	26/03/2023	
		Sõrandu, Estonia	28/03/2023	
		Auküla, Estonia	30/03/2023	
		Ristijärvi, Finland	01/04/2023	
		Ristijärvi, Finland	14/04/2023	
		Hyrynsalmi, Finland	16/04/2023	
		Pielavesi, Finland	18/04/2023	
		Pielavesi, Finland	22/04/2023	
		Tervo, Finland	24/04/2023	
		Keitele, Finland	26/04/2023	
		Tervo, Finland	08/05/2023	
		Pudasjärvi, Finland	10/05/2023	
		Pudasjärvi, Finland	12/05/2023	
		Sodankylä, Finland	14/05/2023	
		Northern Lapland, Finland	16/05/2023	
		Northern Lapland, Finland	**29/07/2023**	

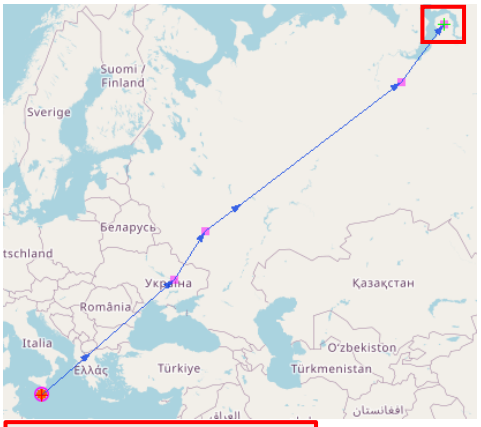
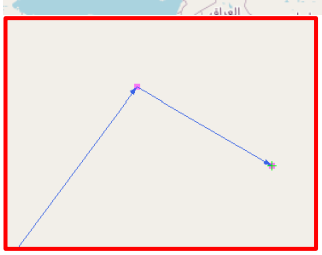
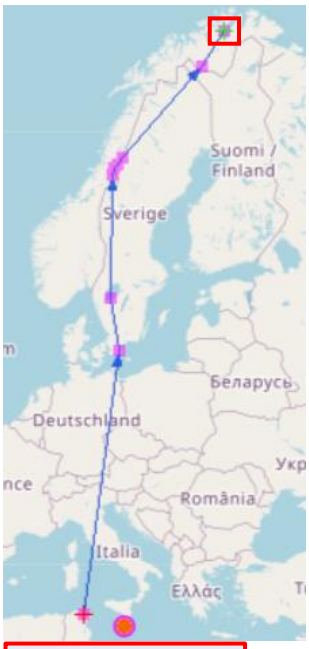
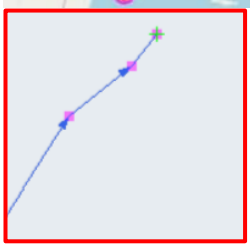
Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208612** (re-used)	*Birżebbuġa, Malta*	*12/03/2023*	
		Birżebbuġa, Malta	21/03/2023	
		Mediterranean Sea (268km from eastern coast of Malta)	23/03/2023	
		Idrousa, Greece (10km NE from Andros Island)	25/03/2023	
		Beylik, Turkey	02/04/2023	
		Black Sea (33km from northern coast of Hatipler, Turkey)	05/04/2023	
		Temryuksky District, Russia	14/04/2023	
		Gorodovikovsky District, Russia	17/04/2023	
		Gorodovikovsky District, Russia	20/04/2023	
		Zavetinsky District, Russia	23/04/2023	
		Beloozerskii, Republic of Kalmykia, Russia	23/04/2023	
		Sarpinsky District, Republic of Kalmykia, Russia	05/05/2023	
		Dizhiembet, Zhanybek District, Kazakhstan	08/05/2023	
		Dizhiembet, Zhanybek District, Kazakhstan	17/05/2023	
		Zhiyenbat, Zhanybek District, Kazakhstan	20/05/2023	
		Zhiyenbat, Zhanybek District, Kazakhstan	23/05/2023	
		Grishenka, Denisov District, Kazakhstan	26/05/2023	
		Grishenka, Denisov District, Kazakhstan	29/05/2023	
		Kostanay District, Kazakhstan	01/06/2023	
		Evenkiysky District, Krasnoyarsk Krai (Siberia), Russia	12/06/2023	
		Evenkiysky District, Krasnoyarsk Krai (Siberia), Russia	11/08/2023	
		Krasnoyarsk Krai (Siberia), Russia	23/08/2023	
		Krasnoyarsk Krai (Siberia), Russia	**04/09/2023**	

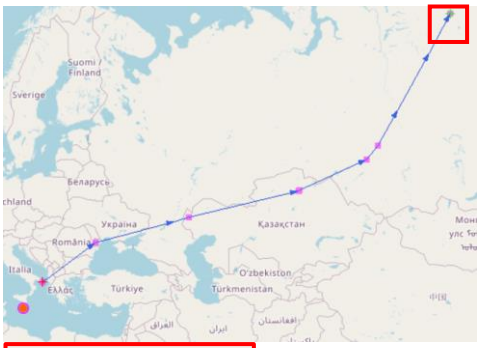
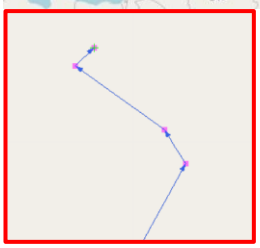
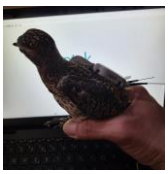
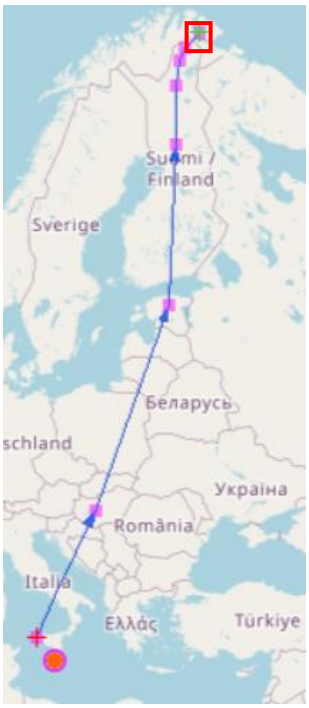
Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208614**	*Birżebbuġa, Malta* Birżebbuġa, Malta Balaoum, Tunisia Dar el Oussef, Tunisia Kondar, Tunisia Kondar, Tunisia El Alam, Tunisia Mazara del Vallo, Trapani, Italy Gmina Żychlin, Poland Färingsö, Sweden Abisko Östra, Sweden Abisko Östra, Sweden Abisko Östra, Sweden **Abisko Östra, Sweden**	*20/11/2023* 22/11/2023 23/11/2023 24/11/2023 19/12/2023 13/01/2024 07/02/2024 03/03/2024 28/03/2024 22/04/2024 16/05/2024 10/06/2024 05/07/2024 **30/07/2024**	
Pluvialis apricaria 	**208615**	*Birżebbuġa, Malta*	*21/11/2023 (10:40am)*	No GPS data
Pluvialis apricaria 	**208616**	*Birżebbuġa, Malta*	*21/11/2023 (02:50pm)*	No GPS data

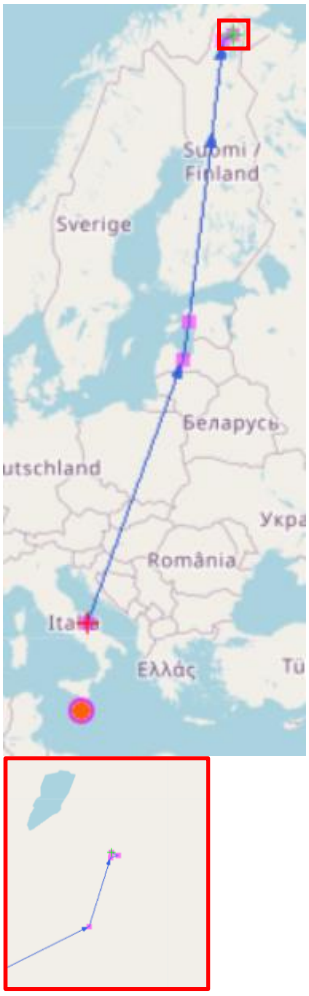
Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208618**	*Birżebbuġa, Malta*	*26/11/2023*	
		Birżebbuġa, Malta	27/11/2023	
		Ech-Chahda Est, Tunisia	30/11/2023	
		Ouled Moulahem Ouest, Tunisia	03/12/2023	
		Sebkhet de Sidi El Hani, Tunisia	28/12/2023	
		Kroussia Ouest, Tunisia	22/01/2024	
		Kondar, Tunisia	16/02/2024	
		Damousse, Tunisia	12/03/2024	
		Falkenberg, Sweden	06/04/2024	
		Råde Municipality, Norway	01/05/2024	
		Steinsdalen, Norway	26/05/2024	
		Sjøvegan, Norway	20/06/2024	
		Sjøvegan, Norway	15/07/2024	
		Sjøvegan, Norway	**09/08/2024**	

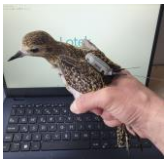
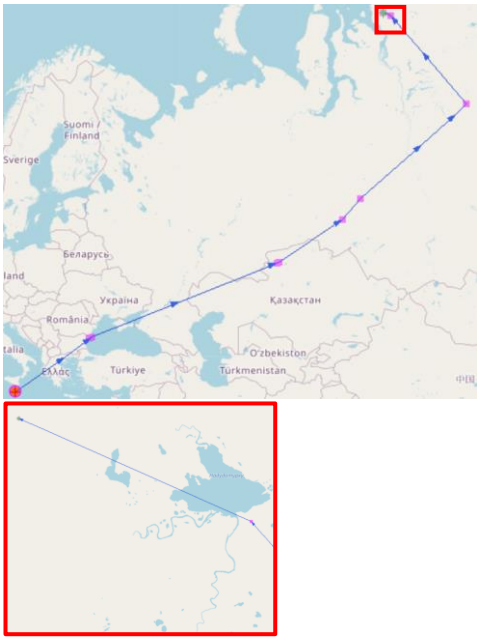
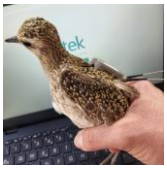
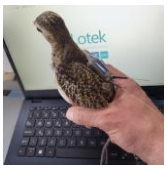
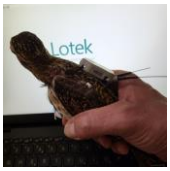
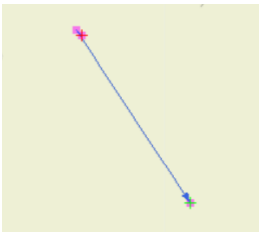
Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208619**	*Birżebbuġa, Malta* Birżebbuġa, Malta Linosa, Italy Bouhlale El Ali Nord, Tunisia Ech-Chahda Est, Tunisia Sidi El Heni Sud, Tunisia Bechachma, Tunisia Lučenec, Slovakia Olaine Municipality, Latvia Kittilä, Finland Inari, Finland Inari, Finland **Inari, Finland**	*08/12/2023* 14/12/2023 18/12/2023 21/12/2023 14/01/2024 08/02/2024 04/03/2024 29/03/2024 22/04/2024 16/05/2024 11/06/2024 06/07/2024 **31/07/2024**	
Pluvialis apricaria 	**208620**	*Birżebbuġa, Malta* **Birżebbuġa, Malta**	*11/01/2024* **11/01/2024** (shot; tag returned to WBRU)	No GPS data
Pluvialis apricaria 	**208626**	*Żurrieq, Malta* **Żurrieq, Malta**	*12/01/2024* **12/01/2024** (possibly shot; tag not returned to WBRU)	No GPS data

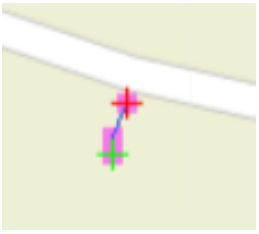
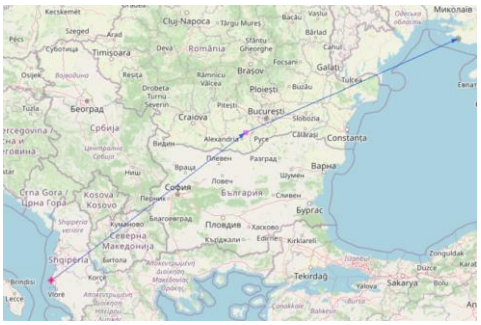
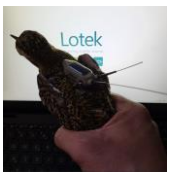
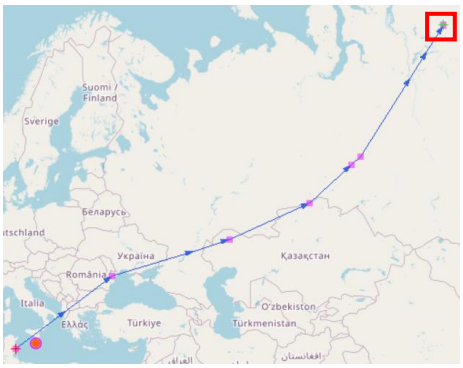
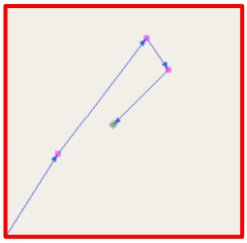
Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208629**	*Birżebbuġa, Malta* Birżebbuġa, Malta Mezraia, Tunisia Sabkhet Sijoumi Sud, Tunisia Budzyń, Poland Larvik Municipality, Norway Kvaløya, Tromsø Municipality, Norway Kvaløya, Tromsø Municipality, Norway Kvaløya, Tromsø Municipality, Norway **Kvaløya, Tromsø Municipality, Norway**	*12/01/2024* 19/01/2024 13/02/2024 09/03/2024 03/04/2024 28/04/2024 23/05/2024 17/06/2024 12/07/2024 **06/08/2024**	
Pluvialis apricaria 	**208621**	*Birżebbuġa, Malta* **Birżebbuġa, Malta**	*13/01/2024* **17/01/2024** (shot; tag returned to WBRU)	No GPS data. Tag 208621 was decommissioned in September 2024 due to battery failure.

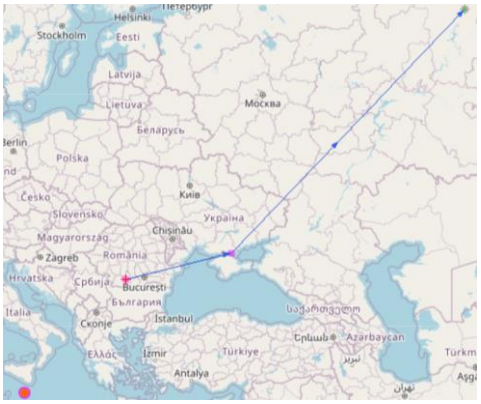
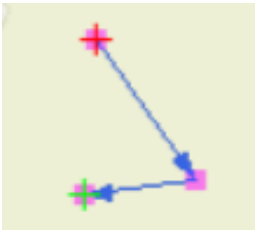
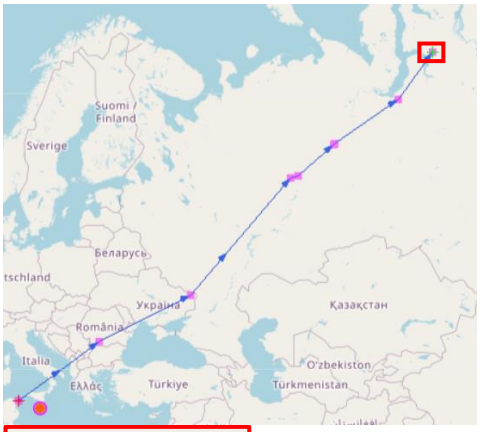
Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208624**	*Birżebbuġa, Malta*	*14/03/2024*	
		Birżebbuġa, Malta	22/03/2024	
		Kulisheve, Dnipropetrovsk Oblast, Ukraine	15/04/2024	
		Domachi, Lipetsk Oblast, Russia	11/05/2024	
			04/06/2024	
		Priuralsky District, Yamalo-Nenets Autonomous Okrug, Russia (Western Siberia)		
		Tazovsky District, Yamalo-Nenets Autonomous Okrug, Russia (Western Siberia)	24/07/2024	
		Tazovsky District, Yamalo-Nenets Autonomous Okrug, Russia (Western Siberia)	**19/08/2024**	
Pluvialis apricaria 	**208620** (re-used)	*Birżebbuġa, Malta*	*06/11/2024*	
		La Marsa, Tunisia	14/03/2025	
		Månslunda, Sweden	02/04/2025	
		Tolsjö, Sweden	26/04/2025	
		Staldvik, Norway	21/05/2025	
		Røyrvik Municipality, Norway	29/05/2025	
		Hattfjelldal Municipality Norway	30/05/2025	
		Kroken, Norway	31/05/2025	
		Kautokeino Municipality, Norway	15/06/2025	
		Porsanger Municipality, Norway	28/06/2025	
		Porsanger Municipality, Norway	29/06/2025	
		Porsanger Municipality, Norway	**30/06/2025**	

Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208627**	*Birżebbuġa, Malta*	*14/11/2024*	 
		Hlavani, Odesa Oblast, Ukraine	02/04/2025	
		Kuygenkol, Kazakhstan	26/04/2025	
		Kulstan, Kazakhstan	21/05/2025	
		Zhanazhol, Kazakhstan	29/05/2025	
		Novopokrovka, Tomsk Oblast, Russia	30/05/2025	
		Argat-Yul, Tomsk Oblast, Russia	31/05/2025	
		Evenkiysky District Krasnoyarsk Krai, Russia	15/06/2025	
		Evenkiysky District Krasnoyarsk Krai, Russia	28/06/2025	
		Evenkiysky District Krasnoyarsk Krai, Russia	29/06/2025	
		Evenkiysky District Krasnoyarsk Krai, Russia	**30/06/2025**	
Pluvialis apricaria 	**208634**	*Żurrieq, Malta*	*24/11/2024*	 
		Salemi, Trapani, Italy	14/03/2025	
		Sárkeresztúr, Hungary	02/04/2025	
		Ageri, Järva County, Estonia	26/04/2025	
		Rovaniemi, Finland	21/05/2025	
		Pohjois-Lappi, Finland	29/05/2025	
		Pohjois-Lappi, Finland	30/05/2025	
		Pohjois-Lappi, Finland	31/05/2025	
		Nesseby Municipality, Varangerbotn, Norway	15/06/2025	
		Tana Municipality, Norway	28/06/2025	
		Tana Municipality, Norway	29/06/2025	
		Tana Municipality, Norway	**30/06/2025**	

Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208622**	*Birżebbuġa, Malta*	*24/11/2024*	
		Campomarino, Campobasso, Italy	14/03/2025	
		Slampe, Tukums Municipality, Latvia	02/04/2025	
		Hälvati, Pärnu County, Estonia	26/04/2025	
		Pohjois-Lappi, Finland	21/05/2025	
		Pohjois-Lappi, Finland	29/05/2025	
		Pohjois-Lappi, Finland	30/05/2025	
		Pohjois-Lappi, Finland	31/05/2025	
		Inari, Finland	15/06/2025	
		Inari, Finland	28/06/2025	
		Inari, Finland	29/06/2025	
		Inari, Finland	**30/06/2025**	

Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208623**	*Birżebbuġa, Malta*	*26/11/2024*	
		Trigortsi, Bulgaria	02/04/2025	
		Lugovoye, Kazakhstan Polovnikovka, Kazakhstan	21/05/2025 29/05/2025	
		Tarsky District Omsk Oblast, Russia	30/05/2025	
		Kargasoksky District Tomsk Oblast, Russia	31/05/2025	
		Evenkiysky District Krasnoyarsk Krai, Russia	15/06/2025	
		Evenkiysky District Krasnoyarsk Krai, Russia	28/06/2025	
		Evenkiysky District Krasnoyarsk Krai, Russia	29/06/2025	
		Evenkiysky District Krasnoyarsk Krai, Russia	30/06/2025	
		Evenkiysky District Krasnoyarsk Krai, Russia	10/07/2025	
		Taymyrsky Dolgano-Nenetsky District Krasnoyarsk Krai, Russia	04/08/2025	
		Taymyrsky Dolgano-Nenetsky District Krasnoyarsk Krai, Russia	**16/08/2025**	
Pluvialis apricaria 	**208635**	*Birżebbuġa, Malta*	*26/11/2024*	No GPS data
Pluvialis apricaria 	**208636**	*Birżebbuġa, Malta*	*26/11/2024*	No GPS data
Pluvialis apricaria 	**208637**	*Żurrieq, Malta*	*01/12/2024*	
		Żurrieq, Malta	**26/04/2025** (possibly shot; tag not returned to WBRU)	

Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**209224**	*Żurrieq, Malta*	*06/12/2024*	
		Żurrieq, Malta	**26/04/2025** (possibly shot; tag not returned to WBRU)	
Pluvialis apricaria 	**209227**	*Żurrieq, Malta*	*10/12/2024*	No GPS data
Pluvialis apricaria 	**209225**	*Żurrieq, Malta*	*12/12/2024*	
		Darëzezë e Re, Albania	14/03/2025	
		Merișani, Romania	02/04/2025	
		Tendrivske, Kherson Oblast, Ukraine	**26/04/2025**	
Pluvialis apricaria 	**209226**	*Żurrieq, Malta*	*13/12/2024*	
		Hanshir al Raqubah, Tunisia	14/03/2025	
		Kam'yans'ke, Odesa Oblast, Ukraine	02/04/2025	
		Kimer-Sayek-Kul', Kazakhstan	26/04/2025	
		Zhambyl District, Kazakhstan	21/05/2025	
		Zhambyl District, Kazakhstan	29/05/2025	
		Kargasoksky District Tomsk Oblast, Russia	30/05/2025	
		Alexandrovsky District Tomsk Oblast, Russia	31/05/2025	
		Taymyrsky Dolgano-Nenetsky District, Krasnoyarsk Krai, Russia	15/06/2025	
		Taymyrsky Dolgano-Nenetsky District, Krasnoyarsk Krai, Russia	28/06/2025	
		Taymyrsky Dolgano-Nenetsky District, Krasnoyarsk Krai, Russia	29/06/2025	
		Taymyrsky Dolgano-Nenetsky District, Krasnoyarsk Krai, Russia	**30/06/2025**	

Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria 	**208625**	*Birżebbuġa, Malta*	*14/12/2024*	
		Piatra – Olt, Romania	14/03/2025	
		Heniches'kyi District Kherson Oblast, Ukraine	02/04/2025	
		Bychina, Perm Krai, Russia	21/05/2025	
Pluvialis apricaria 	**208630**	*Birżebbuġa, Malta*	*18/12/2024*	
		Birżebbuġa, Malta	**26/04/2025** (possibly shot; tag not returned to WBRU)	
Pluvialis apricaria 	**208631**	*Birżebbuġa, Malta*	*18/12/2024*	
		El Haouaria Sud, Tunisia	14/03/2025	
		Preajba de Jos, Romania	02/04/2025	
		Pysarivka, Luhansk Oblast, Ukraine	26/04/2025	
		Cherdynskiy Rayon, Perm Krai, Russia	21/05/2025	
		Kamgort, Perm Krai, Russia	29/05/2025	
		Beryozovsky District, Russia	30/05/2025	
		Nadymsky District, Russia	31/05/2025	
		Nadymsky District, Russia	15/06/2025	
		Tazovsky District, Russia	28/06/2025	
		Tazovsky District, Russia	29/06/2025	
		Tazovsky District, Russia	**30/06/2025**	
Pluvialis apricaria 	**208633**	*Birżebbuġa, Malta*	*16/01/2025*	
		Lapsi, l/o Siġġiewi, Malta	**30/05/2025** (shot; tag retrieved on 04/06/2025 by WBRU, assisted by EPU)	

Species	Tag No.	Location of GPS fixes	Date (dd/mm/yyyy)	Map
Pluvialis apricaria	**208628**	*Birżebbuġa, Malta*	*10/02/2025*	No GPS data

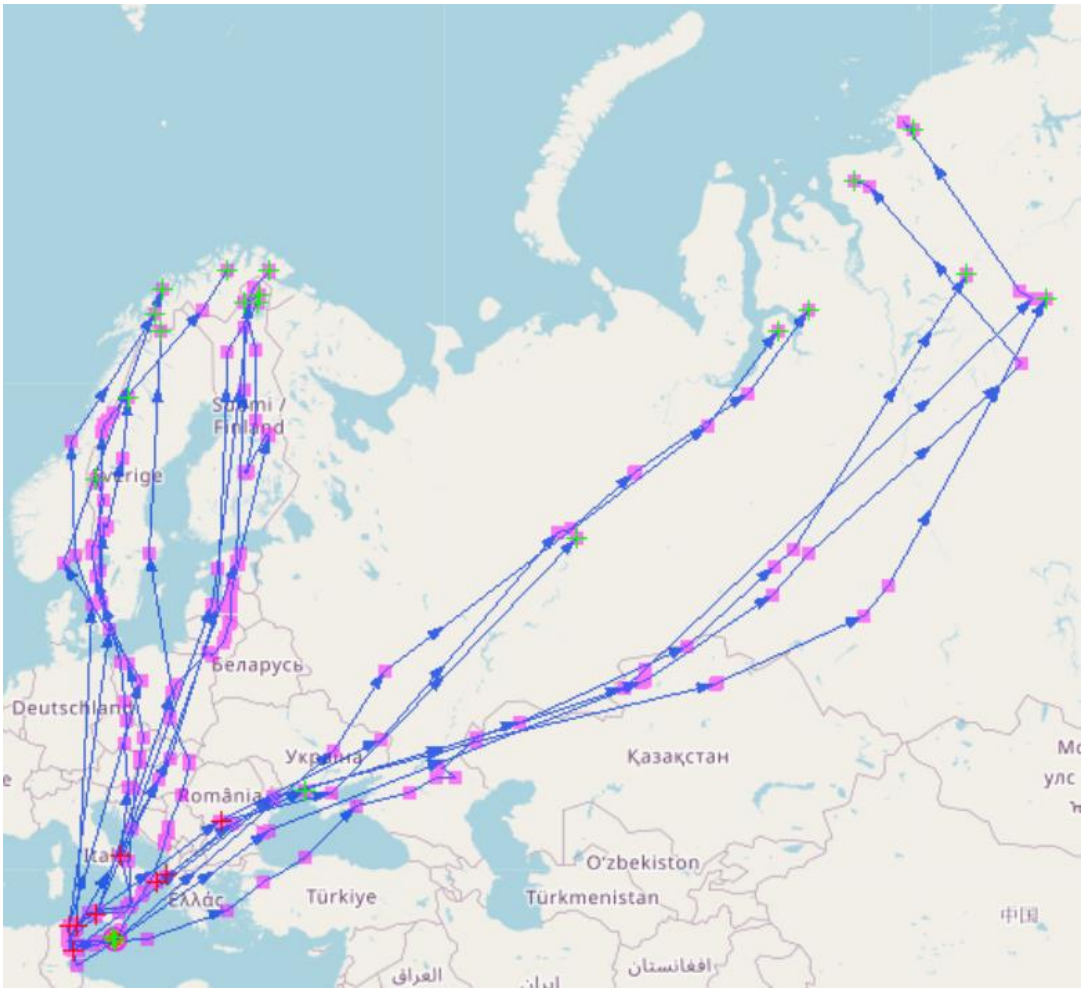


Figure 12. Composite map illustrating the wintering grounds, breeding grounds, and migration routes of satellite-tagged Golden Plovers (data from 30 Dec 2022 to 16 Aug 2025). Source: movebank.org, study name "Migration of Golden Plovers and Song Thrushes", study ID 1995912295.

Update on Golden Plover tracking data from previous reporting periods

Phases 1 and 2

Although deployed 39 days apart, the Golden Plovers with Tags **208581** and **208591** followed nearly identical migration routes during both the post-nuptial and pre-nuptial periods toward their breeding grounds in Sweden. They wintered in separate locations in Tunisia for 68 and 26 days, respectively, departing for Europe from two different sites in Cap Bon (Nabeul on March 13, 2023, and Haouaria on March 8). While their movements overlapped in some regions, it is unlikely the birds were in the same area concurrently due to the temporal partitioning of their GPS fixes. Both tags stopped transmitting after July 2023.

The Golden Plover with Tag **208617** followed a completely different path, heading north-northeast through nine countries before arriving in Ristijärvi, Finland, on April 1, 2023. It spent two weeks there, moved south, and then gradually headed north to its breeding ground in Northern Lapland, Finland, on May 16, 2023. This tag also ceased transmissions after July 2023.

The fourth Golden Plover, fitted with Tag **208612**, flew east toward Greece and Turkey after an 11-day stopover in Birżebbuġa. From mid-April to mid-May 2023, this bird was recorded in Southern Russia and Western Kazakhstan. It left Northern Kazakhstan and arrived in Central Siberia (Krasnoyarsk) between June 1 and June 12. The bird spent 60 days in the Evenkiysky District, Siberia, from June 12 to August 11, 2023. On August 23, 2023, it was recorded further north in the Taymyrsky Dolgano-Nenetsky District before beginning its post-nuptial migration on September 4, 2023. No further GPS fixes were recorded after this date.

Phase 3

Between October 20, 2023, and March 31, 2024, 12 Golden Plovers were caught (11 during post-nuptial migration and one during pre-nuptial migration). Ten were fitted with a satellite tag. Only five of these tags transmitted data during the breeding season.

On November 20, 2023, two first-year Golden Plovers (one male, one female) were captured simultaneously. Due to the tags' intensive schedule at the time of deployment, only the male was tagged because active tags must be kept at least one metre apart. Both birds were then released together (Figure B). A first-year male caught on December 4, 2023, was not tagged as it weighed less than the minimum requirement of 147g and was immediately released after its biometrics were recorded. On November 21, 2023, satellite tags were fitted on two Golden Plovers, which were caught and released separately. The tags subsequently failed to record the minimum of three GPS fixes. This suggests two possible scenarios:

- The birds were shot before the tags could record sufficient data (tags not returned).
- The birds met at some point after their release, and the close proximity of their tags (less than one metre apart) caused both to malfunction.

The Golden Plovers with Tags **208614, 208618, 208619**, and **208629** wintered in Tunisia. Tag **208629**'s last successful GPS fix from Malta was on January 19, 2024, and its first from Tunisia was on February 13, 2024, as its schedule was set to record fixes every 25 days after the first week of deployment. During pre-nuptial migration, these four birds followed a similar north-northeast flightpath, moving through northwest Europe and southern Scandinavia before continuing to their breeding grounds in Sweden (n=1), Norway (n=2), and Finland (n=1).

The fifth Golden Plover, with Tag **208624**, flew northeast toward Greece, Romania, and Ukraine after spending at least a week in Birżebbuġa. It then continued to its breeding grounds in Russia, where it was recorded south of Moscow in mid-May 2024 and in Western Siberia from June onward.

Golden Plover tracking data for current reporting period

To conserve battery life and increase the chance of data transmission during the breeding season—a primary focus of this study—the GPS schedule for Phase 4 tags was modified. Tags were programmed to start data collection on March 14, 2025, instead of immediately upon deployment. From October 20, 2024, to February 28, 2025, a total of 17 Golden Plovers were captured and tagged. Of these, 16 were caught during post-nuptial migration and one during pre-nuptial migration.

During the first GPS fix on March 14, 2025, seven tags transmitted geodata. Three individuals were still on their wintering grounds in Tunisia (Tags **208620**, **209226** and **208631**), while four had started their pre-nuptial migration: two in Italy (Tags **208634** and **208622**), one in Romania (Tag **208625**) and one in Albania (Tag **209225**). Two tags (**208623** and **208627**) did not transmit data on this date, but subsequent geolocations were recorded on April 2, 2025, from Bulgaria and Ukraine, respectively. Tag **209225** ceased transmission on April 26, 2025, while in Ukraine, before reaching its breeding grounds.

Satellite-tagged Golden Plovers breeding in Russia followed an east-north-easterly migratory route that splits into two distinct flyways when they reached the Black Sea, with some specimens heading towards Kazakhstan prior to reaching their breeding grounds in Siberia. Those breeding in Norway, Finland, and Sweden followed a central-European flyway consistent with the flyway recorded during the previous project phases. The last GPS fix was transmitted on August 16, 2025 (Tag **208623**), marking the end of the current data collection period. A final report encompassing all GPS fixes will be drafted once the remaining tag is deployed.

Golden Plover location tracking data analysis (2022–2025): wintering and breeding grounds

Between 2022 and 2025, satellite tags were deployed on 32 Golden Plovers. Data were successfully transmitted from 17 tags (53%) during the breeding season. Table 9 summarizes all recorded GPS locations for these specimens from both the wintering and breeding grounds.

***Table 9**. A summary of wintering and breeding grounds for satellite-tagged Golden Plovers.*

Tag number	**Wintering grounds**	**Wintering period** (first–last fixes) (dd/mm/yyyy)	**Breeding grounds**	**Breeding period** (first–last fixes) (dd/mm/yyyy)	**Number of GPS fixes**	**Breeding period fix frequency** (days) *
208581	Tunisia	04/01/2023 – 13/03/2023	Falkvålen, Sweden	14/05/2023 – 27/07/2023	18	2
208591	Tunisia	10/02/2023 – 10/03/2023	Sorsele Municipality, Sweden	12/05/2023 – 26/07/2023	19	2
208617	N/A	N/A	Northern Lapland, Finland	16/05/2023 – 29/07/2023	19	2
208612	N/A	N/A	Evenkiysky District, (Central Siberia), Russia	12/06/2023 – 11/08/2023	5	12
208614	Tunisia	23/11/2023 – 07/02/2024	Abisko Östra, Sweden	16/05/2024 – 30/07/2024	4	25
208618	Tunisia	30/11/2023 – 12/03/2024	Sjøvegan, Norway	20/06/2024 – 09/08/2024	3	25
208619	Tunisia	21/12/2023 – 04/03/2024	Inari, Finland	11/06/2024 – 31/07/2024	3	25
208629	Tunisia	13/02/2024 (19/01/2024?) – 09/03/2024	Kvaløya, Norway	23/05/2024 – 06/08/2024	4	25
208624	N/A	N/A	Tazovsky District (Western Siberia), Russia	24/07/2024 – 19/08/2024	2	25
208620	Tunisia	– 14/03/2025	Porsanger Municipality, Norway	28/06/2025 – 30/06/2025	3	1
208627	N/A	N/A	Evenkiysky District (Central Siberia), Russia	15/06/2025 – 30/06/2025	4	15, 1
208634	N/A	N/A	Tana Municipality, Norway	28/06/2025 – 30/06/2025	3	1
208622	N/A	N/A	Inari, Finland	15/06/2025 – 30/06/2025	4	15, 1
208623	N/A	N/A	Evenkiysky–Taymyrsky Dolgano-Nenetsky Districts (Central Siberia), Russia	31/05/2025 – 16/08/2025	7	15, 1
209225	N/A	N/A	*Inconclusive [Russia]*	N/A	N/A	N/A
209226	Tunisia	– 14/03/2025	Taymyrsky Dolgano-Nenetsky District (Central Siberia), Russia	15/06/2025 – 30/06/2025	4	15, 1
208625	N/A	N/A	Bychina, Perm Krai, Russia	21/05/2025 –	1	15, 1

208631	Tunisia	– 14/03/2025	Tazovsky District (Western Siberia), Russia	28/06/2025 – 30/06/2025	3	1

Note: The number in the "Breeding season fix frequency (days)" column represents the frequency of GPS fixes in days (e.g., "2" means a fix was recorded every two days, whereas "15, 1" means a fix every fifteen days followed by a daily fix).

Table 10 lists the key stopover sites used by satellite-tagged golden plovers during their northbound (pre-nuptial) migration.

***Table 10**. Northbound migration of satellite-tagged Golden Plovers: stopover sites.*

Northeast European (West Continental) population	**Siberian population**
Sicily	Greece
Italy	Turkey
Croatia	Albania
Montenegro	Bulgaria
Serbia	Romania
Slovenia	Ukraine
Hungary	Kazakhstan
Romania	
Czechia	
Poland	
Lithuania	
Latvia	
Estonia	

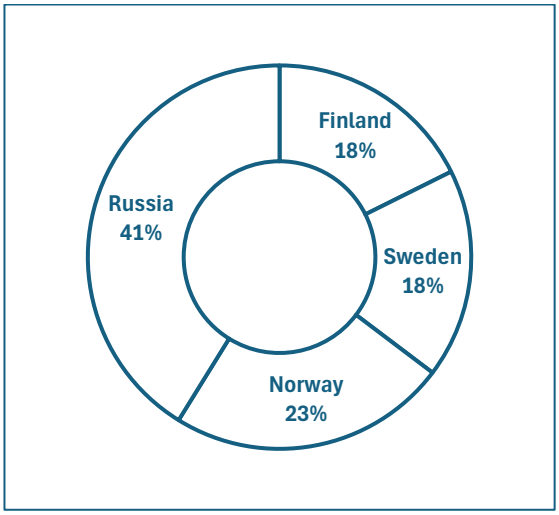


Figure 13. Proportional distribution of satellite-tagged Golden Plovers across their breeding grounds, based on the project's satellite tagging data from 14 May 2023 to 16 Aug 2025 (refer to Table 9).

Based on the project's GPS data from 14 May 2023 to 16 Aug 2025, 17 satellite-tagged Golden Plovers spent the breeding season in four countries: Finland (n=3), Sweden (n=3), Norway (n=4), and Russia (n=7), as shown in Table 9 and illustrated in Figure 13.

According to the study's data, 35.3% of the satellite-tagged Golden Plovers bred within the territory of the European Union.

7. Proposed Satellite Tagging Period: 01 November 2025 – 10 January 2026

Following the retrieval of Tag **208633** from Lapsi on June 4, 2025, the project is proposed to resume from November 1, 2025, to January 10, 2026. Only one satellite tagging site will be used, and the project will conclude immediately after the final tag is deployed. Consistent with previous study periods, the satellite tagging site and licensee details will be provided to the Police for monitoring and compliance purposes.

Duration and hunting season

The proposed tagging period coincides with an open hunting and, possibly, a live-capturing season for both species. However, limiting the study to prohibited hours offers no foreseeable benefit. Data from previous phases show that all tagged Golden Plovers delayed their onward migration for an average of 4 days (min. 1 day | max. 11 days), remaining in the tagging area even during permitted hunting hours. Furthermore, the remaining tag cannot be recharged indefinitely, so earlier deployment is preferable. For Song Thrushes, this was not a significant concern, as all specimens overwintered within bird sanctuaries (where hunting and live-capturing are prohibited) and began their pre-nuptial migration during the closed season.

Tagging and hunting risk

It should be noted that the live-capturing special licence for Golden Plovers and Song Thrushes includes a condition that requires licensees to immediately release any specimen fitted with a scientific ring or satellite tag. Nonetheless, there are no guarantees that a tagged specimen will not be hunted or captured, especially since tagged birds are known to delay onward migration for a few days post-deployment.

Experience from this research confirms that it is impossible to distinguish a satellite-tagged Golden Plover from an untagged one while the bird is in flight. This means that tagged birds have the same chance of being shot as untagged birds, regardless of whether they are released during prohibited hours. However, when a bird is resting or foraging, a satellite tag can be identified from a distance using an image magnifying device, as demonstrated in Figures 14–17.

Figure 14. Golden Plover with Tag 208581. The satellite tag is barely visible from this distance (60 metres) and angle. The photo was taken in Birżebbuġa on January 1, 2023, two days post-tagging, just before the specimen migrated to Tunisia.

Figure 15. A magnified view of Figure 14, confirming the presence of the tag (circled).

Figure 16. Dorsal view of Golden Plover with Tag 208624. The satellite tag is clearly visible from this distance (20 metres) and angle. The photo was taken in Birżebbuġa on March 14, 2024, approximately three hours post-tagging and eight days before the specimen migrated to Russia.

Figure 17. Ventral view of Golden Plover with Tag 208624. From this angle, it is difficult to confirm the presence of the satellite tag.

8. Data Monitoring and Reporting

The location of satellite-tagged specimens will continue to be monitored throughout the lifespan of the tags as the data is automatically imported through the Movebank online data repository[11]. The main findings of this study will also be included in the report on the conservation status of Golden Plover and Song Thrush. A final report will be presented to the Committee once the last tag ceases to transmit data.

9. Conclusion

The primary goal of this research was to address the European Commission's 2019 request to enhance the knowledge base on Malta's Golden Plover and Song Thrush reference populations through satellite tracking.

This reporting period marks the end of the **Song Thrush** tagging component, as all 30 tags procured for this species have either been deployed (n=21) or decommissioned (n=9). The project yielded comprehensive data on their wintering grounds, confirming that all tagged specimens overwintered in the same area where they were tagged before departing Malta in late March to early April.

Conclusive breeding ground data was obtained from seven specimens, each providing multiple GPS fixes from their breeding territory. They spent the breeding season (April–June) in Romania (n=2), Bulgaria (n=2), Slovakia (n=1), Hungary (n=1), and Ukraine (n=1). Data from five other specimens was inconclusive, as only one GPS fix was received from continental Europe after they left Malta. The data confirms that Song Thrushes follow a distinct SW–NE pre-nuptial migration route, aligning with previous observations by Spina and Volponi (2008). The study has shown that 85.7% of the satellite-tagged Song Thrushes bred within the territory of the European Union.

The **Golden Plover** tracking data provided valuable insights into both wintering and breeding grounds. All GPS data from the wintering period showed that the specimens wintered in Tunisia. Data from 17 satellite-tagged specimens revealed breeding locations in four countries: Sweden (n=3), Finland (n=3), Norway (n=4), and Russia (n=7). The study confirmed that Golden Plovers satellite-tagged in Malta belong to the Swedish, Finnish, Norwegian and Russian populations of *Pluvialis apricaria altifrons*. Novel data on the Siberian population in Russia has been recorded. The study has shown that 35.3% of the satellite-tagged Golden Plovers bred within the territory of the European Union.

The project has also thoroughly documented the post-deployment movement of Golden Plovers in Malta, confirming that most specimens delay their onward migration by an average of four days (and up to 12 days). During this time, they remain near the research site before continuing their migration.

The final Golden Plover tag, if it remains functional, will be deployed during the proposed study period from November 1, 2025, to January 10, 2026. Despite the solar-recharging capability of these tags, frequent GPS fixes and extended recharging periods between phases have been shown to deplete and damage batteries.

To optimize battery life and maximize data collection during the breeding season, the schedule programmed during the previous phase (Phase 4) will be maintained for the final study period, and therefore the first fix will be scheduled to commence on March 14, 2026.

[11] The data used in this report were accessed from the project's data repository in Movebank (movebank.org, study name "Migration of Golden Plovers and Song Thrushes", study ID 1995912295), available at: https://www.movebank.org/cms/webapp?gwt_fragment=page%3Dstudies%2Cpath%3Dstudy1995912295. Last accessed: 29 August 2025.

Appendix A: Satellite tagging effort activity logs (Feb 2022 – Feb 2025)

This appendix contains the daily activity log for the Golden Plover satellite tagging component. It details all Golden Plover sightings from a single site in Birżebbuġa, Malta, from February 2022 to February 2025, and sightings of other species observed during the wintering and pre-nuptial migration periods between February 2022 and March 2024.

Activity log (satellite tagging effort) during period Feb–Mar 2022 (Phase 1)

Date (dd/mm/yyyy)	**Hours**	**Birds observed** *Note:* Data is limited to birds on passage and wintering.	**Golden Plovers Caught/Weighed**	**Tagged**
05/02/2022	3	**Song Thrush** at 11am | White Wagtail | Robin	0	0
06/02/2022	4.5	White Wagtail | Robin	0	0
08/02/2022	2	White Wagtail | Robin	0	0
10/02/2022	8.5	White Wagtail | Robin	0	0
12/02/2022	6	White Wagtail | Robin	0	0
13/02/2022	4	White Wagtail | Robin	0	0
15/02/2022	1	White Wagtail | Robin	0	0
17/02/2022	1.5	White Wagtail | Robin	0	0
19/02/2022	4	White Wagtail | Robin	0	0
26/02/2022	4.5	White Wagtail | Robin	0	0
28/02/2022	10.5	White Wagtail | Robin	0	0
01/03/2022	6	White Wagtail | Robin	0	0
02/03/2022	5.5	White Wagtail | Robin	0	0
03/03/2022	6	White Wagtail | Robin	0	0
04/03/2022	4	White Wagtail | Robin	0	0
05/03/2022	8.5	White Wagtail | Robin	0	0
06/03/2022	4.5	White Wagtail | Robin	0	0
07/03/2022	10	White Wagtail | Robin	0	0
08/03/2022	1	White Wagtail | Robin	0	0
10/03/2022	2.5	White Wagtail | Robin	0	0
12/03/2022	7	White Wagtail | Robin	0	0
13/03/2022	5	**Golden Plover** at 7:30am (heard) | White Wagtail | Robin	0	0
14/03/2022	2	White Wagtail | Robin	0	0
17/03/2022	2.5	White Wagtail | Robin	0	0
18/03/2022	2.5	White Wagtail | Robin	0	0
19/03/2022	4	House Martin (x6) | White Wagtail | Robin	0	0
20/03/2022	9	Hoopoe | Ruff (x4) | Nightingale | Yellow Wagtail (x4) | Northern Wheatear (♂ ♀) | White Wagtail | Robin	0	0
21/03/2022	3.5	Barn Swallow (x2) | White Wagtail | Robin	0	0
22/03/2022	2.5	White Wagtail | Robin	0	0
24/03/2022	2.5	**Song Thrush** at 17:24 | Woodlark | White Wagtail | Robin	0	0
25/03/2022	2.5	Wood Sandpiper (heard) | White Wagtail | Robin	0	0

Activity log (satellite tagging effort) during period Feb–Mar 2022 (Phase 1)

Date (dd/mm/yyyy)	Hours	Birds observed *Note:* Data is limited to birds on passage and wintering.	Golden Plovers Caught/Weighed	Tagged
26/03/2022	9	Quail | Subalpine Warbler (♂♀) | White Wagtail | Robin	0	0
27/03/2022	2	Yellow Wagtail (*Motacilla flava feldegg*) (x5) | Tawny Pipit | White Wagtail | Robin	0	0
28/03/2022	9	**Golden Plover** at 07:45 | Greater Short-toed Lark (x3) | Corn Bunting | Hoopoe | White Wagtail | Robin	0	0
29/03/2022	8.5	Tree Pipit (x3) | Tawny Pipit | Northern Wheatear (3♂ 2♀), **Song Thrush** (x4), Tree Pipit | Robin	0	0
30/03/2022	11.5	Common Kestrel ♂ | Common Swift (x5) | Northern Wheatear (♂ ♀) | Tree Pipit (x2) | Subalpine Warbler (♂ ♀) | Greater Short-toed Lark (x3) | Robin | Zitting Cisticola and Sardinian Warbler observed feeding pulli	0	0
31/03/2022	11	Greater Short-toed Lark (x4) | Tree Pipit | **Song Thrush** at 08:39 (x2) | Hoopoe | Quail (x2) | Subalpine Warbler (♂ ♀) | **Song Thrush** at 10:00 | Yellow Wagtail (mixed flock *M. f. flava* and *feldegg*) (x20) | Leucistic Spanish Sparrow ♀ | Chiffchaff | Red-rumped Swallow	0	0
Total hours (Feb–Mar 2022)	**191.5**			

Activity log (satellite tagging effort) during period Nov 2022–Mar 2023 (Phase 2)

Date (dd/mm/yyyy)	Hours	Birds observed *Note:* Data is limited to birds on passage and wintering.	Golden Plovers Caught/Weighed	Tagged
In the shaded rows, observation data are limited to Golden Plover sightings from 20 October to 28 November, the period during which the author awaited the Ornis Committee's deliberation and the publication of the Government Notice.				
04/11/2022		2 Golden Plovers	0	0
08/11/2022		6 Golden Plovers	0	0
12/11/2022		Golden Plover	0	0
14/11/2022		2 Golden Plovers	0	0
16/11/2022		Golden Plover	0	0
19/11/2022		Golden Plover	0	0
21/11/2022		4 Golden Plovers	0	0
25/11/2022		2 Golden Plovers (1,1)	0	0
26/11/2022		7 Golden Plovers (1,2,2,2)	0	0
27/11/2022		2 Golden Plovers (1,1)	0	0
28/11/2022		Golden Plover	0	0
A total of 29 Golden Plovers were sighted during period 04/11/2022 – 28/11/2022.				
29/11/2022	5.5	White Wagtail | Robin | Meadow Pipit	0	0
30/11/2022	10	White Wagtail | Robin | Meadow Pipit	0	0
01/12/2022	9	White Wagtail | Robin | Meadow Pipit	0	0
02/12/2022	6.5	White Wagtail | Robin | Meadow Pipit | **Golden Plover**	0	0
03/12/2022	17	White Wagtail | Robin | Meadow Pipit | **Golden Plover**	0	0
04/12/2022	9	White Wagtail | Robin | Meadow Pipit	0	0
05/12/2022	11	White Wagtail | Robin | Meadow Pipit	0	0
06/12/2022	3.25	White Wagtail | Robin | Meadow Pipit	0	0

Activity log (satellite tagging effort) during period Nov 2022–Mar 2023 (Phase 2)

Date (dd/mm/yyyy)	**Hours**	**Birds observed** *Note:* Data is limited to birds on passage and wintering.	**Golden Plovers Caught/Weighed**	**Tagged**
07/12/2022	13	White Wagtail | Robin | Meadow Pipit | **2 Golden Plovers (1,1)**	0	0
08/12/2022	13	White Wagtail | Robin | Meadow Pipit	0	0
09/12/2022	11	White Wagtail | Robin | Meadow Pipit	0	0
10/12/2022	9.5	White Wagtail | Robin | Meadow Pipit	0	0
11/12/2022	11.5	White Wagtail | Robin | Meadow Pipit	0	0
12/12/2022	5	White Wagtail | Robin | Meadow Pipit	0	0
13/12/2022	7.25	White Wagtail | Robin | Meadow Pipit	0	0
14/12/2022	11	White Wagtail | Robin | Meadow Pipit	0	0
15/12/2022	6.5	White Wagtail | Robin | Meadow Pipit	0	0
16/12/2022	10.5	White Wagtail | Robin | **Golden Plover**	**1**	**1**
17/12/2022	18	White Wagtail | Robin | Meadow Pipit	0	0
18/12/2022	20	White Wagtail | Robin | Meadow Pipit	0	0
19/12/2022	14.5	White Wagtail | Robin | Meadow Pipit	0	0
20/12/2022	10	White Wagtail | Robin | Meadow Pipit	0	0
21/12/2022	12.25	**8 Golden Plovers (7,1)** | White Wagtail | Robin | Meadow Pipit	0	0
22/12/2022	17.25	White Wagtail | Robin | Meadow Pipit	0	0
23/12/2022	11	White Wagtail | Robin | Meadow Pipit	0	0
24/12/2022	10.75	White Wagtail | Robin | Meadow Pipit	0	0
25/12/2022	11.25	White Wagtail | Robin | Meadow Pipit	0	0
26/12/2022	10	White Wagtail | Robin | Meadow Pipit	0	0
27/12/2022	14	White Wagtail | Robin | Meadow Pipit	0	0
28/12/2022	6	White Wagtail | Robin | Meadow Pipit	0	0
29/12/2022	10.25	White Wagtail | Robin | Meadow Pipit	0	0
30/12/2022	13	White Wagtail | Robin | Meadow Pipit | **2 Golden Plovers**	**2**	**1**
31/12/2022	6	White Wagtail | Robin | Meadow Pipit	0	0
01/01/2023	5	White Wagtail | Robin | Meadow Pipit	0	0
02/01/2023	14.5	White Wagtail | Robin | Meadow Pipit	0	0
03/01/2023	11.25	White Wagtail | Robin | Meadow Pipit	0	0
04/01/2023	10.25	White Wagtail | Robin | Meadow Pipit | **Golden Plover**	**1**	**1**
05/01/2023	7.5	White Wagtail | Robin | Meadow Pipit	0	0
06/01/2023	11	White Wagtail | Robin | Meadow Pipit	0	0
07/01/2023	13.5	White Wagtail | Robin | Meadow Pipit	0	0
08/01/2023	8.75	White Wagtail | Robin | Meadow Pipit	0	0
09/01/2023	8.5	White Wagtail | Robin | Meadow Pipit	0	0
10/01/2023	6.5	White Wagtail | Robin | Meadow Pipit	0	0
11/01/2023	2	White Wagtail | Robin | Meadow Pipit	0	0
12/01/2023	2.25	White Wagtail | Robin | Meadow Pipit	0	0
13/01/2023	2.75	White Wagtail | Robin | Meadow Pipit	0	0
14/01/2023	7.5	White Wagtail | Robin | Meadow Pipit	0	0
15/01/2023	7.5	White Wagtail | Robin | Meadow Pipit	0	0
18/01/2023	1.25	White Wagtail | Robin | Meadow Pipit	0	0
19/01/2023	3	White Wagtail | Robin | Meadow Pipit	0	0

Activity log (satellite tagging effort) during period Nov 2022–Mar 2023 (Phase 2)

Date (dd/mm/yyyy)	**Hours**	**Birds observed** *Note:* Data is limited to birds on passage and wintering.	**Golden Plovers Caught/Weighed**	**Tagged**
21/01/2023	1	White Wagtail | Robin | Meadow Pipit	0	0
23/01/2023	1.5	White Wagtail | Robin | Meadow Pipit	0	0
24/01/2023	3	White Wagtail | Robin | Meadow Pipit	0	0
25/01/2023	2.5	White Wagtail | Robin | Meadow Pipit	0	0
26/01/2023	2	White Wagtail | Robin | Meadow Pipit	0	0
27/01/2023	1.25	White Wagtail | Robin | Meadow Pipit	0	0
28/01/2023	1	White Wagtail | Robin | Meadow Pipit	0	0
30/01/2023	1.5	White Wagtail | Robin | Meadow Pipit	0	0
31/01/2023	4	White Wagtail | Robin | Meadow Pipit | 3 Serins	0	0
01/02/2023	4	White Wagtail | Robin | Meadow Pipit	0	0
03/02/2023	1.5	White Wagtail | Robin | Meadow Pipit	0	0
04/02/2023	5.75	White Wagtail | Robin | Meadow Pipit	0	0
05/02/2023	5.5	White Wagtail | Robin | Meadow Pipit	0	0
07/02/2023	7	White Wagtail | Robin | Meadow Pipit | **Golden Plover**	**0**	**0**
08/02/2023	5	White Wagtail | Robin | Meadow Pipit	0	0
11/02/2023	6.5	White Wagtail | Robin | Meadow Pipit	0	0
12/02/2023	7.5	White Wagtail | Robin | Meadow Pipit	0	0
14/02/2023	2	White Wagtail | Robin | Meadow Pipit	0	0
18/02/2023	6.5	White Wagtail | Robin | Meadow Pipit	0	0
19/02/2023	7.5	White Wagtail | Robin | Meadow Pipit | Barn Swallow | Blackcap ♀	0	0
22/02/2023	2.5	White Wagtail | Robin | Meadow Pipit	0	0
23/02/2023	1.75	White Wagtail | Robin | Meadow Pipit	0	0
24/02/2023	6.5	Quail (calling ♂) | White Wagtail | Robin | Meadow Pipit | **Golden Plover**	0	0
25/02/2023	9.75	White Wagtail | Robin | Meadow Pipit | **Golden Plover**	0	0
26/02/2023	16.25	White Wagtail | Robin | Meadow Pipit | Collared Dove | Blackcap ♀ | **Golden Plover** | Blackcap ♂ | House Martin	**1**	**1**
27/02/2023	7.5	White Wagtail | Robin | Quail (calling ♂) | Meadow Pipit	0	0
28/02/2023	12	White Wagtail | Robin | Quail (calling ♂) | Meadow Pipit	0	0
01/03/2023	12	White Wagtail | Robin | Meadow Pipit	0	0
02/03/2023	9.25	White Wagtail | Robin | Meadow Pipit	0	0
03/03/2023	13.75	Chiffchaff | White Wagtail | Robin | Meadow Pipit | Quail (calling ♂) | Stonechat ♀	0	0
04/03/2023	11	White Wagtail | Robin | Black Redstart | Meadow Pipit	0	0
05/03/2023	7	White Wagtail | Robin | 2 Swallows | Short-toed Lark | Meadow Pipit | House Martin	0	0
06/03/2023	10.75	Tree Sparrow | Black Redstart | White Wagtail | Robin | Meadow Pipit	0	0
07/03/2023	5.5	White Wagtail | Robin | Meadow Pipit | 6 Squacco Herons | Swallow	0	0
08/03/2023	4	White Wagtail | Robin | Meadow Pipit | 2 Greenfinches	0	0
09/03/2023	2	White Wagtail | Robin | Meadow Pipit	0	0
10/03/2023	1.5	White Wagtail | Robin | Meadow Pipit	0	0

Activity log (satellite tagging effort) during period Nov 2022–Mar 2023 (Phase 2)

Date (dd/mm/yyyy)	**Hours**	**Birds observed** *Note:* Data is limited to birds on passage and wintering.	**Golden Plovers Caught/Weighed**	**Tagged**
11/03/2023	4	White Wagtail | Robin | Meadow Pipit | Black Redstart	0	0
12/03/2023	5.75	White Wagtail | Robin | Meadow Pipit | **Golden Plover**	**1**	**1**
13/03/2023	4	White Wagtail | Robin | Meadow Pipit	0	0
14/03/2023	2	White Wagtail | Robin | Meadow Pipit	0	0
15/03/2023	2.5	White Wagtail | Robin | Meadow Pipit	0	0
16/03/2023	6	White Wagtail | Robin | Chiffchaff | Black Redstart	0	0
17/03/2023	4	White Wagtail | Robin | Spotted Flycatcher | Meadow Pipit | Chiffchaff	0	0
18/03/2023	10.5	Garden Warbler | White Wagtail | Robin | Meadow Pipit | Chiffchaff | Black Redstart	0	0
19/03/2023	7	White Wagtail | Robin | Meadow Pipit | Chiffchaff	0	0
20/03/2023	1.75	Robin | Chiffchaff	0	0
21/03/2023	9.25	Northern Wheatear ♂ | Tree Sparrow | Common Whitethroat | Quail (calling ♂) | 14 Yellow Wagtails (*Motacilla flava flava, M. f. feldegg, M. f. superciliaris, M. f. cinereocapilla*) | Chiffchaff | 16 Short-toed Larks | Subalpine Warbler ♂ | Swift | Robin | Blackcap ♂	0	0
22/03/2023	4	Swallows | Short-toed Lark | Nightingale | Robin | 2 Chiffchaffs | Hoopoe | Black Redstart | 2 Meadow Pipits	0	0
23/03/2023	9.5	Robin | Chiffchaff | 2 Short-toed Larks | 9 Glossy Ibises | 2 Yellow Wagtails | Swallows | House Martins | Tree Sparrow | Swift | 2 Grey Herons | Blackcap ♂ | Quail (calling ♂) | Hoopoe | Black Redstart ♂	0	0
24/03/2023	3.5	Robin | Chiffchaff | Yellow Wagtail | Northern Wheatears (2♂) | Meadow Pipit | Black Redstart | Hoopoe	0	0
25/03/2023	11	Robin | Yellow Wagtail | Swallows | Northern Wheatear ♀ | Song Thrush | Black Redstart ♂	0	0
26/03/2023	8	Robin | Northern Wheatear ♂♀ | Yellow Wagtail | Pallid Harrier ♂ | Swift | Subalpine Warbler ♂ | Swallows | Chiffchaff	0	0
27/03/2023	5.5	Robin | Hoopoe | Spotted Flycatcher | 2 Yellow Wagtails | Quail (calling ♂) | 4 Swifts | Chiffchaff	0	0
28/03/2023	11.5	Robin | Bee-eaters | Blackcap ♂ | Swallows | Quail (calling ♂) | Swifts | Chiffchaff | Meadow Pipit	0	0
29/03/2023	3.5	Yellow Wagtail | Common Whitethroat	0	0
30/03/2023	12	Collared Dove | Quail (calling ♂) | Sardinian Warblers (♂♀ feeding pulli) | Blackcap ♀ | Northern Wheatear ♂	0	0
31/03/2023	12	Blackcap ♀ | Quail (calling ♂) | Blackcap ♂ | Northern Wheatear ♀ | 37 White Storks @ 12:41pm | Greater Short-toed Lark | Tree Sparrow | Chiffchaff | Marsh Harrier ♂ | Swallows | Swifts | Robin	0	0
Total hours (Nov 2022–Mar 2023)	**823.5**			

Activity log (satellite tagging effort) during period Oct 2023–Mar 2024 (Phase 3)

Date (dd/mm/yyyy)	**Hours**	**Birds observed** *Note:* Data is limited to birds on passage and wintering.	**Golden Plovers Caught/Weighed**	**Tagged**
20/10/2023	9.5	White Wagtail	0	0

Activity log (satellite tagging effort) during period Oct 2023–Mar 2024 (Phase 3)

Date (dd/mm/yyyy)	**Hours**	**Birds observed** *Note:* Data is limited to birds on passage and wintering.	**Golden Plovers Caught/Weighed**	**Tagged**
21/10/2023	6	White Wagtail	0	0
22/10/2023	8.5	**Golden Plover** | Chiffchaff | White Wagtail | Robin	0	0
23/10/2023	8.5	Chiffchaff | White Wagtail | Robin	0	0
24/10/2023	8.5	Chiffchaff | White Wagtail | Robin	0	0
25/10/2023	10.75	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
26/10/2023	8.5	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
27/10/2023	8.5	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
28/10/2023	8.75	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
29/10/2023	10.5	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
30/10/2023	11.5	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
31/10/2023	11.5	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
01/11/2023	12.5	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
02/11/2023	13	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
03/11/2023	12	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
04/11/2023	12.5	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
05/11/2023	9	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
06/11/2023	12	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
07/11/2023	11	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
08/11/2023	11	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
09/11/2023	13.5	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
10/11/2023	13.25	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
11/11/2023	11.5	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
12/11/2023	13.5	**Golden Plover |** Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
13/11/2023	10.5	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
14/11/2023	14	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
15/11/2023	13.5	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
16/11/2023	13.25	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
17/11/2023	11	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
18/11/2023	13.5	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
19/11/2023	13.5	**45 Golden Plovers** (9, 18, 6, 2, 5, 5) | Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
20/11/2023	13.5	**9 Golden Plovers** (1, 2, 3, 2, 1) | Chiffchaff | White Wagtail | Robin | Meadow Pipit	**2**	**1**
21/11/2023	13.5	**2 Golden Plovers** (1, 1) | Chiffchaff | White Wagtail | Robin | Meadow Pipit	**2**	**2**

Activity log (satellite tagging effort) during period Oct 2023–Mar 2024 (Phase 3)

Date (dd/mm/yyyy)	**Hours**	**Birds observed** *Note:* Data is limited to birds on passage and wintering.	**Golden Plovers Caught/Weighed**	**Tagged**
22/11/2023	10.5	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
23/11/2023	15.25	**2 Golden Plovers |** Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
24/11/2023	12	**10 Golden Plovers |** Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
25/11/2023	5	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
26/11/2023	12.5	**9 Golden Plovers** (1, 1, 7) | Chiffchaff | White Wagtail | Robin | Meadow Pipit	**1**	**1**
27/11/2023	10	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
28/11/2023	7.5	**2 Golden Plovers** (1, 1) | Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
29/11/2023	8.25	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
30/11/2023	13	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
01/12/2023	13	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
02/12/2023	12.5	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
03/12/2023	13	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
04/12/2023	12.25	**Golden Plover |** Chiffchaff | White Wagtail | Robin | Meadow Pipit	**1**	**0** (132g)
05/12/2023	12	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
06/12/2023	8.5	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
07/12/2023	8	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
08/12/2023	12	**Golden Plover |** Chiffchaff | White Wagtail | Robin | Meadow Pipit	**1**	**1**
09/12/2023	14	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
10/12/2023	12	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
11/12/2023	13.5	**Golden Plover |** Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
12/12/2023	11.5	**Golden Plover |** Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
13/12/2023	12	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
14/12/2023	11	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
15/12/2023	11.5	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
16/12/2023	12	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
17/12/2023	6	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
18/12/2023	1.5	Chiffchaff | Stonechat | White Wagtail | Robin | Meadow Pipit	0	0
19/12/2023	6.25	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
20/12/2023	10	**3 Golden Plovers** (1, 1, 1) | White Wagtail | Robin | Meadow Pipit	0	0
21/12/2023	6.75	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
22/12/2023	6	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
23/12/2023	9.5	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
24/12/2023	4.5	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0

Activity log (satellite tagging effort) during period Oct 2023–Mar 2024 (Phase 3)

Date (dd/mm/yyyy)	**Hours**	**Birds observed** *Note:* Data is limited to birds on passage and wintering.	**Golden Plovers Caught/Weighed**	**Tagged**
26/12/2023	16	**2 Golden Plovers** (1, 1) | Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
27/12/2023	11	White Wagtail | Robin | Meadow Pipit	0	0
28/12/2023	11.75	White Wagtail | Robin | Meadow Pipit	0	0
29/12/2023	11.5	**Golden Plover |** White Wagtail | Robin | Meadow Pipit	0	0
30/12/2023	11	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
31/12/2023	9	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
01/01/2024	7.25	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
02/01/2024	8.75	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
03/01/2024	4.25	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
04/01/2024	3.25	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
05/01/2024	7.75	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
06/01/2024	9	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
07/01/2024	10.25	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
09/01/2024	9.75	**Golden Plover |** Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
10/01/2024	8	**7 Golden Plovers** (4, 3) | White Wagtail | Robin | Meadow Pipit	0	0
11/01/2024	13.5	**11 Golden Plovers** (1, 1, 1, 2, 4, 1, 1) | Chiffchaff | White Wagtail | Robin | Meadow Pipit	**1**	**1**
12/01/2024	18	**11 Golden Plovers** (1, 6, 1, 1, 1, 1) | Chiffchaff | White Wagtail | Robin | Meadow Pipit | Stonechat | Common Kestrel	**2**	**2**
13/01/2024	18.5	**6 Golden Plovers** (1, 1, 3, 1) **|** Chiffchaff | White Wagtail | Robin | Meadow Pipit	**1**	**1**
14/01/2024	6.75	Chiffchaff | Robin | Black Redstart | Stonechat | White Wagtail | Meadow Pipit	0	0
27/01/2024	7	Chiffchaff | Robin | Black Redstart | Stonechat | White Wagtail | Meadow Pipit	0	0
01/02/2024	1.75	Chiffchaff | Robin | Black Redstart | Stonechat | White Wagtail | Meadow Pipit	0	0
02/02/2024	2.5	Chiffchaff | Robin | Black Redstart | Stonechat | White Wagtail | Meadow Pipit	0	0
03/02/2024	4	Chiffchaff | Robin | Black Redstart | Stonechat | White Wagtail | Meadow Pipit	0	0
04/02/2024	7.75	Chiffchaff | Robin | Black Redstart | Stonechat | White Wagtail | Meadow Pipit	0	0
05/02/2024	1	Chiffchaff | Stonechat | White Wagtail | Meadow Pipit	0	0
06/02/2024	3	Chiffchaff | White Wagtail | Meadow Pipit	0	0
07/02/2024	2.5	Chiffchaff | Stonechat | White Wagtail | Meadow Pipit	0	0
08/02/2024	2	Chiffchaff | Stonechat | White Wagtail | Meadow Pipit	0	0
09/02/2024	4	White Wagtail | Meadow Pipit	0	0
10/02/2024	8.25	Chiffchaff | Stonechat | White Wagtail | Meadow Pipit	0	0
11/02/2024	4.75	Black Redstart | Stonechat | White Wagtail | Meadow Pipit | Common Linnet	0	0
13/02/2024	3	Chiffchaff | White Wagtail | Meadow Pipit	0	0
15/02/2024	2.25	Chiffchaff | White Wagtail | Robin | Meadow Pipit	0	0
16/02/2024	3.5	Chiffchaff | White Wagtail | Meadow Pipit	0	0

Activity log (satellite tagging effort) during period Oct 2023–Mar 2024 (Phase 3)

Date (dd/mm/yyyy)	**Hours**	**Birds observed** *Note:* Data is limited to birds on passage and wintering.	**Golden Plovers Caught/Weighed**	**Tagged**
17/02/2024	7	**Golden Plover** | Chiffchaff | Eurasian Blackcap | Common Starling | Robin | Black Redstart | Stonechat | Meadow Pipit | Garden Warbler	0	0
18/02/2024	8.5	Chiffchaff | Robin | Stonechat | White Wagtail | Meadow Pipit	0	0
20/02/2024	3	White Wagtail | Robin | Meadow Pipit	0	0
21/02/2024	7	Chiffchaff | Common Starling | Black Redstart | Stonechat | White Wagtail | Meadow Pipit	0	0
22/02/2024	10.25	Chiffchaff | Eurasian Blackcap | Black Redstart | Stonechat | White Wagtail Meadow Pipit | Common Linnet	0	0
23/02/2024	8.5	Chiffchaff | Common Starling | Black Redstart | Stonechat | White Wagtail | Meadow Pipit	0	0
24/02/2024	7.75	Chiffchaff | Robin | Stonechat | Tree Sparrow | White Wagtail | Meadow Pipit	0	0
25/02/2024	9	**3 Golden Plovers** (2, 1) | Common Swift | Barn Swallow | Chiffchaff | Subalpine Warbler | Robin | Tree Sparrow | Meadow Pipit	0	0
26/02/2024	8.5	Robin | Stonechat | White Wagtail | Meadow Pipit	0	0
27/02/2024	6.25	Chiffchaff | Stonechat | Meadow Pipit	0	0
28/02/2024	11.5	House Martin | Chiffchaff | Common Starling | Robin | Black Redstart | Stonechat | White Wagtail | Meadow Pipit | Spectacled Warbler	0	0
29/02/2024	8.5	Chiffchaff | Black Redstart | Stonechat | Tree Sparrow | Meadow Pipit	0	0
01/03/2024	5	Barn Swallow | Common Greenshank	0	0
02/03/2024	7.75	Chiffchaff | Robin | Black Redstart | Stonechat | Meadow Pipit	0	0
03/03/2024	8	Great Cormorant | Barn Swallow | Robin | Black Redstart | Stonechat | White Wagtail | Meadow Pipit | Song Thrush | Common Linnet	0	0
04/03/2024	2.5	White Wagtail | Meadow Pipit	0	0
05/03/2024	2.5	White Wagtail | Robin | Meadow Pipit	0	0
06/03/2024	4.5	White Wagtail | Robin	0	0
07/03/2024	2	White Wagtail | Robin | Meadow Pipit	0	0
09/03/2024	2	White Wagtail | Robin | Meadow Pipit	0	0
10/03/2024	5.5	Barn Swallow | White Wagtail | Meadow Pipit	0	0
12/03/2024	2	Robin | Meadow Pipit	0	0
13/03/2024	3.5	Robin | Meadow Pipit	0	0
14/03/2024	8.5	**Golden Plover |** Western Marsh Harrier | Barn Swallow | Chiffchaff | Eurasian Blackcap **|** Robin | Black Redstart | White Wagtail | Meadow Pipit | Subalpine Warbler | Spectacled Warbler	**1**	**1**
15/03/2024	4	White Wagtail | Meadow Pipit | Black-crowned Night Heron	0	0
16/03/2024	5.5	Barn Swallow | Chiffchaff | White Wagtail | Meadow Pipit	0	0
17/03/2024	7.5	Barn Swallow | Chiffchaff | Eurasian Blackcap | Black Redstart | Northern Wheatear | White Wagtail | Common Starling | Stonechat	0	0
18/03/2024	1.75	Meadow Pipit | Common Starling	0	0

Activity log (satellite tagging effort) during period Oct 2023–Mar 2024 (Phase 3)

Date (dd/mm/yyyy)	**Hours**	**Birds observed** *Note:* Data is limited to birds on passage and wintering.	**Golden Plovers Caught/Weighed**	**Tagged**
19/03/2024	11.25	Northern Wheatear | Meadow Pipit | Black-crowned Night Heron | Common Starling	0	0
20/03/2024	3	Barn Swallow | Chiffchaff | Black Redstart | Stonechat	0	0
21/03/2024	10.5	Sedge Warbler | Barn Swallow | House Martin | Northern Wheatear | Meadow Pipit	0	0
22/03/2024	12	Collared Dove | Hoopoe | Barn Swallow | Chiffchaff | Subalpine Warbler | Yellow Wagtail (*Motacilla flava superciliaris*) | Meadow Pipit | Black Redstart | Stonechat | Northern Pintail	0	0
23/03/2024	9	Collared Dove | Hoopoe | Barn Swallow | Chiffchaff | Meadow Pipit | Tree Pipit | Common Quail (calling ♂)	0	0
24/03/2024	10	Barn Swallow | Chiffchaff | Subalpine Warbler | Robin | Northern Wheatear | Yellow Wagtail (*Motacilla flava superciliaris*) | Meadow Pipit	0	0
25/03/2024	8.5	Common Swift | Barn Swallow | Chiffchaff | Subalpine Warbler | Robin | Tree Sparrow | Meadow Pipit	0	0
26/03/2024	10.5	Common Swift | Barn Swallow | Robin | Yellow Wagtail (*Motacilla flava superciliaris*) | Meadow Pipit | Tree Pipit | Tawny Pipit | Whimbrel	0	0
27/03/2024	10	Collared Dove | Common Swift | Western Marsh Harrier | Common Kestrel | Barn Swallow | House Martin | Willow Warbler | Chiffchaff | Robin | Northern Wheatear | Tree Sparrow | Yellow Wagtail (*Motacilla flava superciliaris*) | Meadow Pipit | Tree Pipit | Slender-billed Gull | Black Kite | Tawny Pipit | Linnet	0	0
28/03/2024	7	Common Swift | Barn Swallow | House Martin | Chiffchaff | Robin | Northern Wheatear | Meadow Pipit | Tawny Pipit	0	0
29/03/2024	10.5	Yellow Wagtail (*Motacilla flava superciliaris*) | Tree Sparrow	0	0
30/03/2024	3.25	Yellow Wagtail (*Motacilla flava superciliaris*)	0	0
Total hours (Oct 2023–Mar 2024)		**1,231.5**		

Activity log (satellite tagging effort) during period Oct 2024–Feb 2025 (Phase 4)

Date (dd/mm/yyyy)	**Hours**	**Golden Plovers observed** *Note:* Numbers in parentheses indicate total observations per sighting if daily count exceeds one.	**Golden Plovers Caught/Weighed**	**Tagged**
20/10/2024	14	0	0	0
21/10/2024	10.75	0	0	0
22/10/2024	10.5	0	0	0
23/10/2024	11.25	0	0	0
24/10/2024	12.5	0	0	0
25/10/2024	13	0	0	0
26/10/2024	12	0	0	0
27/10/2024	8.5	0	0	0
28/10/2024	10	0	0	0
29/10/2024	13	0	0	0
30/10/2024	9.5	0	0	0
31/10/2024	12.75	0	0	0

Activity log (satellite tagging effort) during period Oct 2024–Feb 2025 (Phase 4)

Date (dd/mm/yyyy)	**Hours**	**Golden Plovers observed** *Note:* Numbers in parentheses indicate total observations per sighting if daily count exceeds one.	**Golden Plovers Caught/Weighed**	**Tagged**
01/11/2024	11.25	0	0	0
02/11/2024	10	0	0	0
03/11/2024	9	0	0	0
04/11/2024	12.25	0	0	0
05/11/2024	11.25	**1**	0	0
06/11/2024	14.25	**1**	1	1
07/11/2024	12	0	0	0
08/11/2024	9	0	0	0
09/11/2024	11.25	0	0	0
10/11/2024	10	0	0	0
11/11/2024	11.25	0	0	0
12/11/2024	11.5	0	0	0
13/11/2024	11.5	0	0	0
14/11/2024	12	**2** (1, 1)	**1**	**1**
15/11/2024	11.25	0	0	0
16/11/2024	12	0	0	0
17/11/2024	11	0	0	0
18/11/2024	12.25	0	0	0
19/11/2024	10.5	0	0	0
20/11/2024	11	**1**	0	0
21/11/2024	10.5	0	0	0
22/11/2024	5.5	0	0	0
23/11/2024	11	0	0	0
24/11/2024	12.25	**2** (1, 1)	**1**	**1**
25/11/2024	9	**6** (4, 1, 1)	0	0
26/11/2024	11	**2** (2)	**1**	**1**
27/11/2024	13.5	**1**	0	0
28/11/2024	12.5	0	0	0
29/11/2024	12.5	0	0	0
30/11/2024	8.75	0	0	0
01/12/2024	11.5	**1**	**1**	**1**
02/12/2024	9	0	0	0
03/12/2024	7	0	0	0
04/12/2024	11	**2** (2)	0	0
05/12/2024	10	0	0	0
06/12/2024	10.75	**4** (1, 3)	**1**	**1**
07/12/2024	6	**1**	0	0
08/12/2024	4.5	0	0	0
09/12/2024	7.5	0	0	0
10/12/2024	12	**1**	**1**	**1**
11/12/2024	11.5	0	0	0
12/12/2024	9.75	**4** (1, 1, 2)	**1**	**1**
13/12/2024	12.25	**1**	**1**	**1**

Activity log (satellite tagging effort) during period Oct 2024–Feb 2025 (Phase 4)

Date (dd/mm/yyyy)	**Hours**	**Golden Plovers observed** *Note:* Numbers in parentheses indicate total observations per sighting if daily count exceeds one.	**Golden Plovers Caught/Weighed**	**Tagged**
14/12/2024	11.5	**1**	**1**	**1**
15/12/2024	13	0	0	0
16/12/2024	5.25	0	0	0
17/12/2024	6.5	0	0	0
18/12/2024	10.5	**2** (2)	**2**	**2**
19/12/2024	5.5	0	0	0
20/12/2024	9.5	**1**	0	0
21/12/2024	10.25	0	0	0
22/12/2024	7.75	0	0	0
23/12/2024	3.25	0	0	0
24/12/2024	11.75	0	0	0
25/12/2024	3.25	0	0	0
26/12/2024	11.25	**5** (1, 1, 2, 1)	**3**	**3**
27/12/2024	11.75	0	0	0
28/12/2024	4.5	0	0	0
29/12/2024	6.75	0	0	0
30/12/2024	7.5	0	0	0
31/12/2024	10	0	0	0
01/01/2025	3	0	0	0
02/01/2025	9.5	0	0	0
03/01/2025	9.25	0	0	0
04/01/2025	6.75	0	0	0
05/01/2025	2	0	0	0
07/01/2025	5	0	0	0
09/01/2025	9	0	0	0
10/01/2025	5	0	0	0
11/01/2025	4	0	0	0
12/01/2025	6	0	0	0
13/01/2025	8.75	0	0	0
14/01/2025	9	0	0	0
15/01/2025	6.75	0	0	0
16/01/2025	8.75	**1**	**1**	**1**
17/01/2025	8.5	0	0	0
18/01/2025	7.5	**1**	0	0
19/01/2025	3	0	0	0
20/01/2025	2	0	0	0
21/01/2025	3.25	0	0	0
22/01/2025	2.25	0	0	0
25/01/2025	3.5	0	0	0
30/01/2025	2.5	0	0	0
06/02/2025	1.25	0	0	0
08/02/2025	11	**2** (1, 1)	0	0
10/02/2025	9	**2** (2)	**1**	**1**

Activity log (satellite tagging effort) during period Oct 2024–Feb 2025 (Phase 4)

Date (dd/mm/yyyy)	**Hours**	**Golden Plovers observed** *Note:* Numbers in parentheses indicate total observations per sighting if daily count exceeds one.	**Golden Plovers Caught/Weighed**	**Tagged**
13/02/2025	4.5	0	0	0
25/02/2025	8.5	**2** (2) [observed foraging with a satellite-tagged Golden Plover]	0	0
28/02/2025*	2.75	0		
		Total number of caught/satellite-tagged Golden Plovers (20/10/2024 – 28/02/2025)	**17**	**17**

* The project concluded on 28 February 2025 due to battery failure of the remaining tag (Tag 208632), which was subsequently decommissioned on 01 March 2025.

Total hours during current reporting period (Oct 2024–Feb 2025)	**903.5**
Total hours (Feb 2022–Feb 2025)	**3,150** (191.5 + 823.5 + 1,231.5 + 903.5)