ACTIONS A

PREPARATORY AND RESEARCH ACTIONS

LIFE FALKON
LIFE on the move

PROJECT ACTIONS REPORT

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ACTION A1

Assessing the conservation status of populations breeding at the northern distribution range and identifying suitable project intervention sites

Action A.1 of LIFE FALKON Project mainly focused on gathering updated information on the population status of lesser kestrel in the four Project Areas. Data were collected during breeding season 2019 and in all the cases the survey protocol adopted by LIFE FALKON team was successful and led to the discovery of previously unknown colony sites while updating the information about the population size in the Project Areas.

In the Po Plain (Project Area 1, Northern Italy) the total size of the population resulted in 71±15 breeding pairs in 2018-2019 and raised to 120±20 in 2021, distributed over 24 buildings, grouped in 19 colonies all hosted in rural buildings scattered in an intensive agricultural landscape. LIFE FALKON team discovered 12 of these colony sites during the 2019 survey.
Mean (±SD) colony size In Project Area 1 resulted of 3.9±2.5 pairs, with a maximum of 10-13 pairs in a single colony. The 12 nests surveyed in Project Area 1 revealed a clutch size of 3.4±1.5 eggs (min 2, max 5), of which 3.3±1.3 successfully hatched.

In Ioannina (Project Area 2, Ioannina, Epirus, Greece), the population summed up 67-72 breeding pairs, in two distinct localities of Ioannina city. Most of the pairs (ca. 97%) are nesting in buildings within the historical centre of the city, whereas the remaining 3% (2 pairs) is located in the University of Epirus campus, situated approximately 5 km. away from the city centre.

In Komotini, (Project Area 3, Thrace, Greece) the 2019 census revealed the presence of 89 breeding pairs located in 5 different colonies, some of which are breeding in artificial nest provided by earlier projects.

Lastly, in Lemnos Island (Project Area 4, Eastern Aegean sea, Greece) we censused 179-214 breeding pairs, distributed in 18 distinct colonies, (always within villages) the majority of which is exclusively situated in

the eastern half of the island. Moreover, LIFE FALKON team described 9 new colonies in Lemnos Island during these surveys, which account for ca. 12% of the total population.

The breeding phenology of the three populations was found to be similar among Greek sites, with arrivals in February-March, egg-laying in April and fledging mostly concentrated in late June, while a delayed phenology was observed for the Project Area 1 with the bulk of arrivals in April, egg-laying in May and last fledglings in mid-July. The main threats to the local populations all resulted to be anthropogenic since no or very low predation rate was registered at the nest in all the Project Areas. Overall, the local populations seem viable but small with the lack of potential breeding sites as the main limiting factor potentially threatening the long-term persistence of these populations in the absence of concrete support interventions.

Eventually, in preparation of C actions of the project, the LIFE FALKON team identified during 2019 the sites where the nestboxes will be installed over the four Project Areas. At the same time, in Project Area 1, the sites where the five nesting towers will be erected were identified, including those that will host the cage for the realization of the hacking programme.

Figure A1.1
Population surveys were realized visiting a series of buildings and applying the standard observation protocol developed by LIFE FALKON

ACTION A2

Development of technical blueprints for the construction of nesting towers and of protocols for nestbox installation

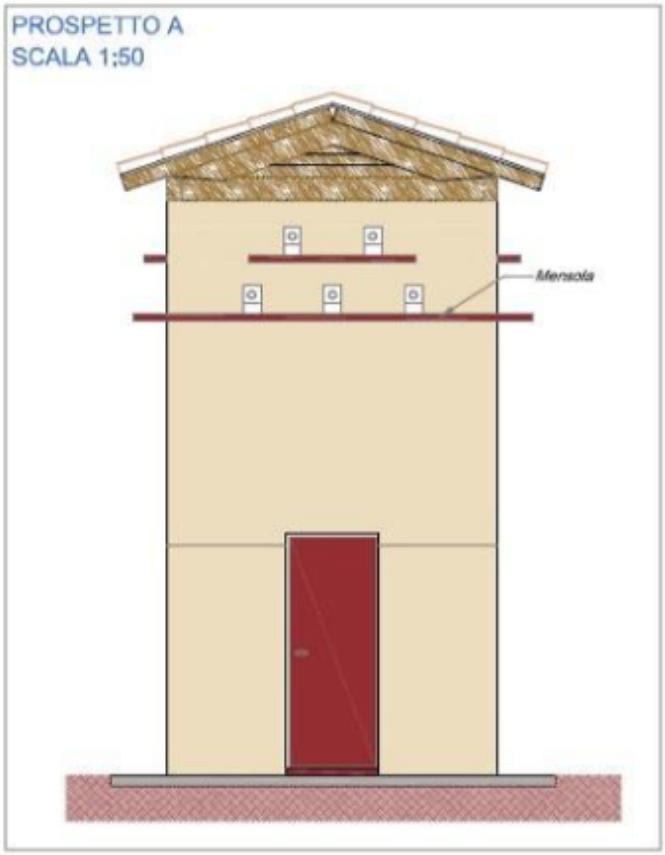
During 2018 and 2019, LIFE FALKON worked on developing a set of nestbox models suited for lesser kestrels and to be installed on either electric lines or buildings. To do so, the team revised the available scientific literature on the argument, scanned the available models on the European market and built some prototype that was tested in active lesser kestrel colonies.

Thanks to this work, in which local ornithological associations were actively involved, LIFE FALKON developed two different typologies of nest boxes: one suited for the installation on buildings (produced in three different colours to better match the different architectural styles of the study areas) and the other one suited to be deployed on poles of (safe!) electric lines.
Additionally, LIFE FALKON developed 'smart' nestboxes (suited for setting a video-recording system of the inside of the nest) and roof-adapted nestboxes that will both be deployed on the towers.
Overall, four typologies of nestboxes were eventually defined: three were completely designed by LIFE FALKON.

In the same period, engineers and ornithologists of the team worked together to design the nesting towers: small buildings of 5 m height that will be placed in Project Area 1. The nesting towers were designed to offer 22 safe nesting sites and minimise the risk of nest predation while respecting the local architectural style.
The design of the LIFE FALKON nesting towers is reasoned to be cheap and easily replicable, allowing to reuse it for constructing new towers in the coming years in Italy and Greece as well as beyond the Project Areas.
One of the nesting towers was designed with a cage, suited to host adult lesser kestrels (see Action C2) and with a different distribution of nestboxes, suited to host and raise translocated chicks.

As part of the A2 action, all the permits to install nestboxes on buildings and low-voltage electric lines in all the Project Areas were obtained. Similarly, permits to build nesting towers were also obtained, together with a series of agreements with landowners and/or local stakeholders to grant the long-term (>20 years) maintenance of the nestboxes and nesting towers.

The planned schedule for the realization of this action suffered a delay due to the restrictions introduced by the 2020 lockdowns in both Italy and Greece, but is now respecting the amended deadline of this Action.



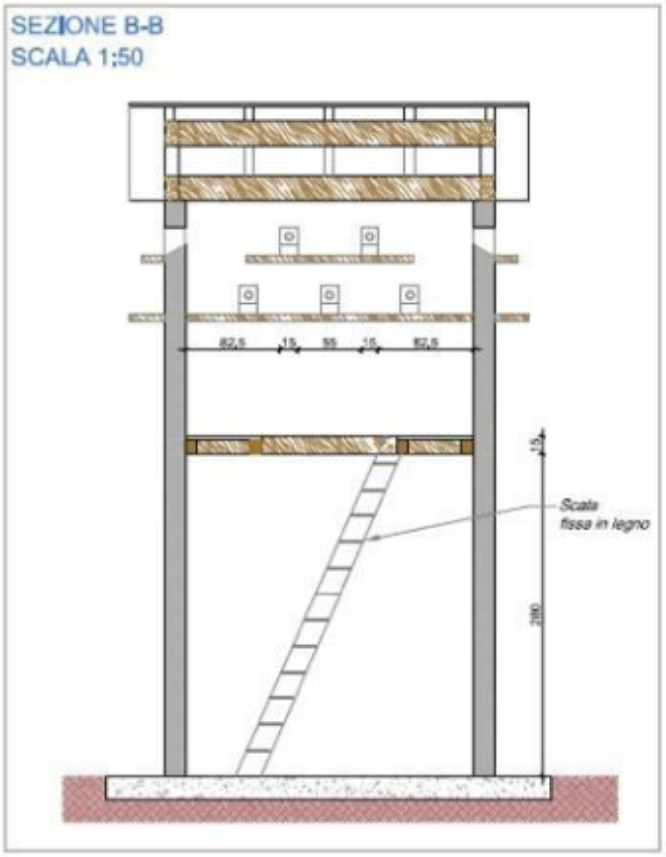


Figure A2.1
Extract of the executive plan of one of the two kinds of nesting tower

ACTION A3.1

Assessing the genetic similarity of source and target populations

Action C2 involves realizing a hacking program by translocating nestlings from a source population to attract lesser kestrels to breed in safe breeding sites. Unfortunately, because of the small size of the Po Plain population, it is not feasible to use locally-hatched nestlings for hacking.
Action A3 aims at identifying the most appropriate source population for translocations. According to IUCN guidelines, the assessment of the genetic similarity between the potential source and the target population is mandatory.

By sub-Action A3.1, the genomic structure of the target south-central Po Plain population was thus compared with that of three potential source populations from southern Italy (Apulia, Basilicata, Sicily), which are geographically (and possibly genetically) distinct. We first describe the global genomic structure of the species and then assess the genetic similarity of potential source (Mediterranean) and target (Po Plain) populations in order to identify the best candidate source population to be used for hacking.
Overall, we gathered 96 biological samples from 15 sites throughout the entire species' distribution, from the Iberian peninsula to Mongolia (Fig. A3.1.1).

Sequencing libraries were constructed using a ddRAD protocol, which resulted in over 35,000 SNPs markers included in the analyses of population structure and similarity.
European and East Asian populations formed two clearly separate clusters, whereas Israel (ISR) and Turkish (TUR) populations seemed to be the result of the admixture of these two main genetic pools.
Several phylogenetic analyses indicated a greater genetic similarity among European populations on one hand and East Asian birds on the other (Fig. A3.1.1).
Specifically, the Po Plain population was genetically close to Southern Italy and Greek populations.

We conclude that, from a population genetics point of

view, the most suitable source populations for hacking are those from Southern Italy or Greece, whereas other populations, including the Sicily and Iberian ones, may be less suitable.
These suitable source populations are large, show high levels of genetic diversity and show the lowest population differentiation and the highest genetic similarity with the Po Plain population.

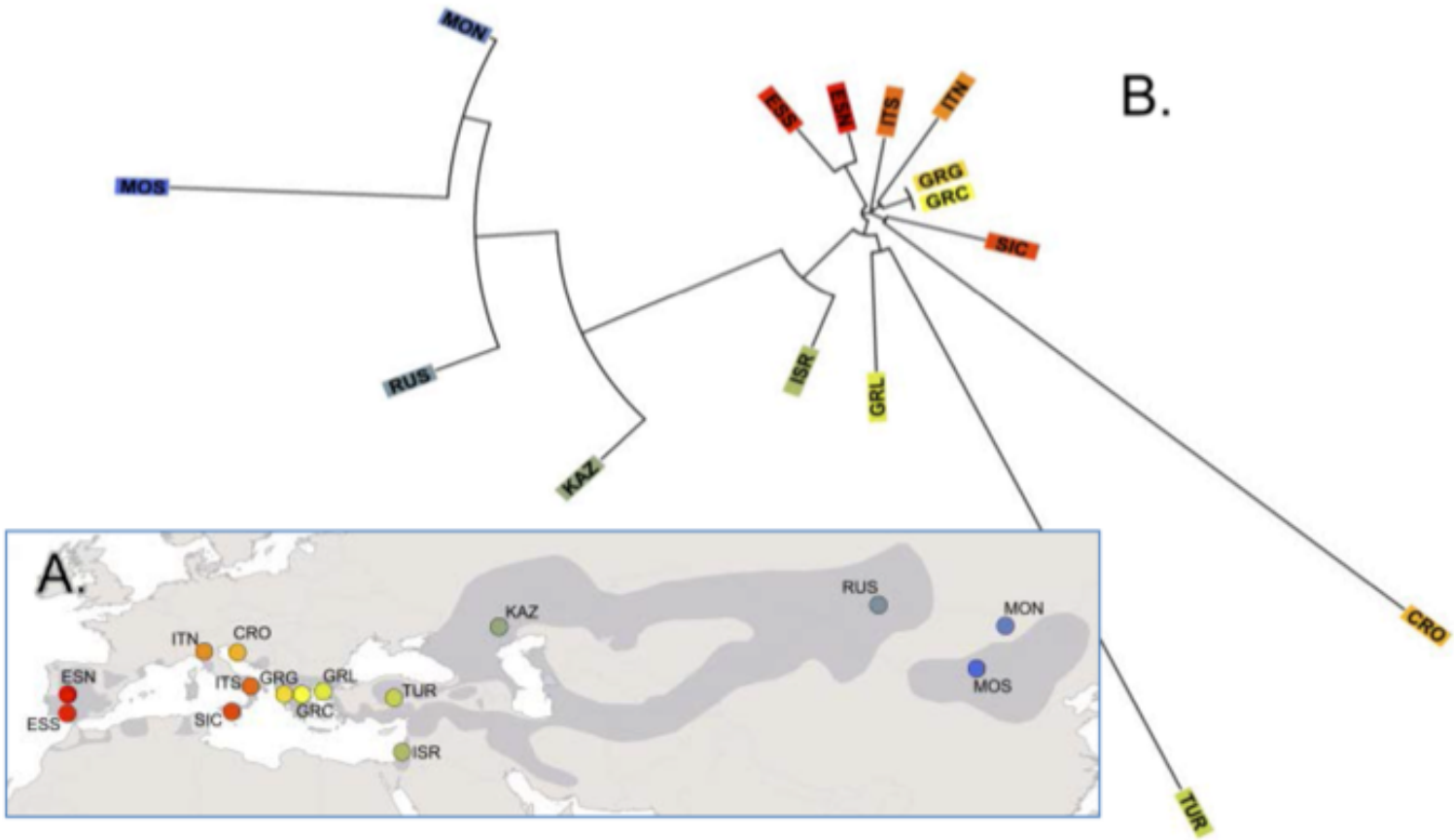


Figure A3.1.1.
A) Sampling locations to assess population genetic structure, with distribution range in grey shade;
B) neighbour-joining tree of sampled populations based on pairwise Jost's D.

European populations (warmer colours) cluster together, while East Asian populations (colder colours) form a separate cluster.

ACTION A3.2

Migration and wintering behaviour of lesser kestrels from the Po Plain and from potential source populations for hacking activity

Action A3.2 of LIFE FALKON Project aimed at identifying the most adequate source population for hacking activity (Action C2) characterizing both the migratory behaviour and the wintering range of the target populations (Project Area 1) and that of several possible source populations: Matera (Basilicata, this action), Apulia and Sicily, for which available data exists from previous project (Sarà et al. 2019).
Additionally, we collected data from two Greek populations (LIFE Falkon Project Area 2, Ioannina, and 4, Lemnos) in order to compare the behaviour of Italian populations with those of another Mediterranean population.

Within the framework of the action, a total of 53 birds were equipped with GPS tags in the Italian (South-central Po Plain and Matera) and Greek (Lemnos and Ioannina) project areas in 2019.
Twenty-eight birds returned to their breeding colonies during spring 2020. Twenty-four devices contained the complete migration cycle. Unfortunately, all the four devices from Ioannina did not record any data.
By combining these data to the data collected in the previous years in Apulia and Sicily, we could analyse complete tracks of 37 individuals during the post-breeding migration, 32 during the non-breeding period, and 31 during the pre-breeding migration.

We observed that individuals breeding in Po Plain, the focal population of Action C2, behaved similarly to their Italian counterparts when migrating and wintering, which matches our expectations. Indeed, Po Plain individuals took the same migratory routes as individuals from the other Italian populations and spent the non-breeding period in the same African regions (Mauritania, Mali, Burkina, Benin, Nigeria and Niger). Conversely, they differed more from the Greek population which migrate further East and spent the non-breeding period in Nigeria, Niger, Chad and Sudan.

We concluded that the best choice for the source

population to conduct the translocation is thus an Italian population.

Action A3.1 revealed that individuals from Po Plain are genetically similar to individuals from Matera, while they differ from Apulian and Sicilian individuals.
We therefore conclude that the optimal choice of a source population for performing the hacking activities envisaged by Action C2 is the Matera population, which also is a large and stable population.

Figure A3.2.1.
Map showing the migration tracks and non-breeding grounds of 37 individual Lesser Kestrels from the five investigated populations. Solid lines refer to pre-breeding migrations, dotted lines to post-breeding ones. Non-breeding areas contours are estimated based on 99% Utilization Distribution.