Racing Pigeon Post

Which route do our pigeons really take from Barcelona?

Part 2.

In the first part we presented our project using geolocators. How we came to these devices, why we use them and not GPS loggers and how the first tests went.

The Barcelona weekend was of course D-day, now it had to happen. Jelle Jellema had three pigeons basketed with geolocators and had the necessary confidence in them not to let us down. We all know now that Barcelona 2013 was a very tough race which only the valiant ones came through. The straight line distance from Barcelona to Nijverdal is 1260 km so under these circumstances it certainly was no piece of cake. Of the first four arriving pigeons there were three with geolocators. These are the pigeon's arrival times and the provisional National results of the ZLU:

18.58hrs 08-2027103 332nd National (113th hens)

19.39hrs 09-1783744 423rd National (138th hens)

07.01hrs 08-2027077 847th National (253rd hens)

From this we can safely conclude that the geolocators do not impede the pigeons from being able to put up a top performance, a lot different to all the GPS loggers that we tried earlier. The same weekend Ultsje Jellema sent two pigeons to Cahors. Ideally both flights would overlap and we could establish the route taken by the pigeons and we could use the data from Cahors as a

reference. Cahors, the cock that Ultsje sent had a number of leg feathers clipped so that maximum light could fall on the geolocator. Of the two pigeons he sent one was lost, the other was listed as the 3rd Steggerda pigeon and 18th in the Frisian Fondclub, 09-1653620 timed at 15.51 won a decent prize from 901 birds. After returning home, the geolocators were read and the data analysed. The computer programme developed for this makes it a breeze. The data is then presented as in the picture below:

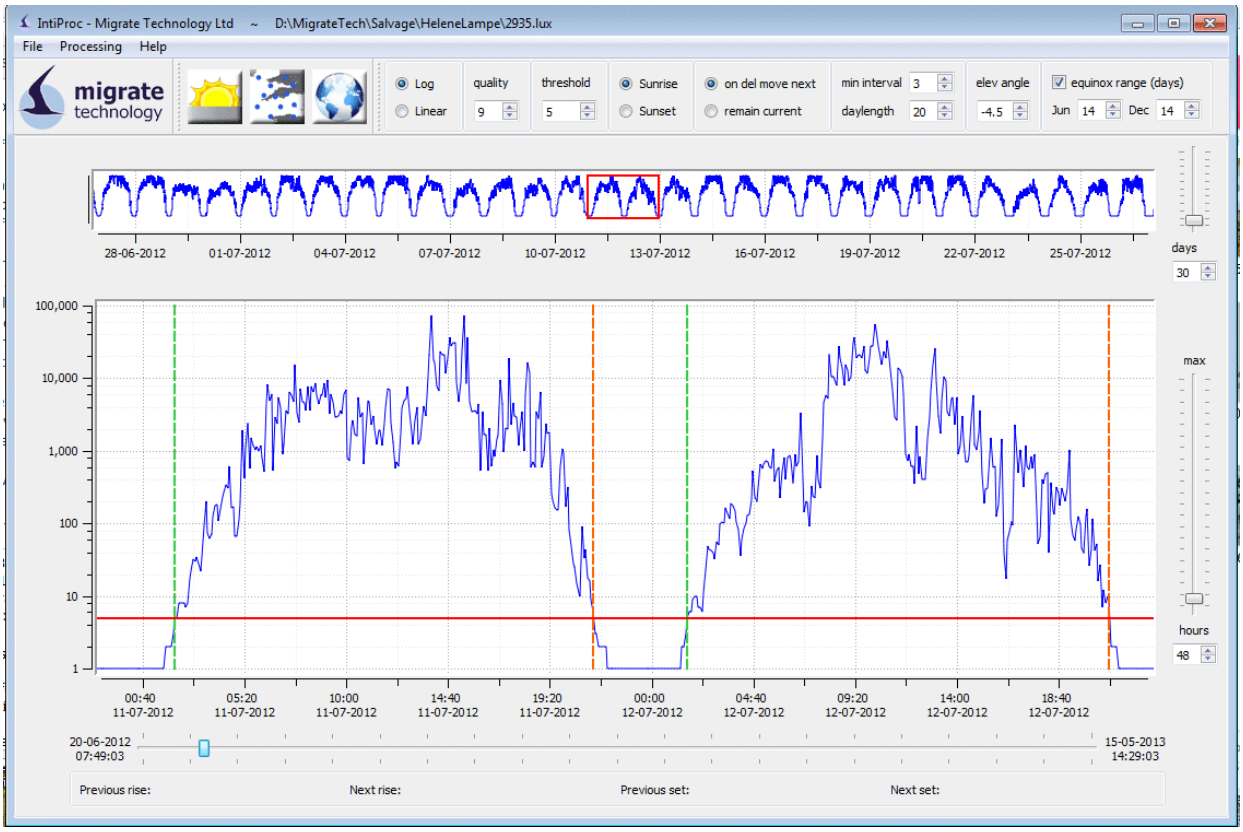

Figure 1: Two beams with wave patterns.

The top bar is a shrunken view over a longer time period. The area blocked in red is the part selected (11th and 12th July 2012 in this case), which is then shown magnified below. The blue pattern shows the light intensity on the day. The light intensity is shown on the vertical axis, graded on the left starting at 1 and rising to 100,000 lux. Horizontally, the times of the day are shown between a green and red vertical line. The green and the red line shows that the light increases (sunrise) and decreases (sunset) from and to around 10 lux (twilight). The night between them is very clear; the light level is not far above the 1 lux. From anywhere in the Northern Hemisphere it is known for each day when the

sun rises and sets. This is used by fanciers to set the times for neutralization or hours of darkness.

This data, and the amount of light that the geolocators have saved, makes it possible to calculate where the pigeon was overnight. A very brief explanation is under Figure 2.

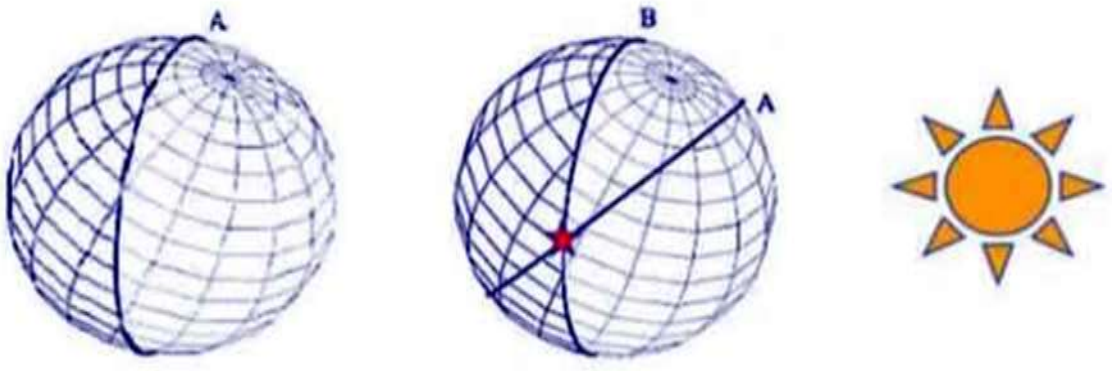

Figure 2. Showing the earth with the sun to the right.

The bold circle around the earth is the boundary between day and night. To the left of the line is the night on earth and to the right, where the sun shines, it is day. The right globe shows the earth about 12 hours later. The sun is still on the right, but the earth has turned almost 180°. Circle B now gives the boundary between day and night. Now if we want to find the place where the sun rose on the left and where 12 hours later it rose on the right, then it must be at a point on both A and B. This position is where the two lines intersect, indicated by a red asterisk. If we know the times of sunrise and sunset and the date we can calculate the exact location where these lines intersect and thus the position around midnight.

Four pigeons, five nights.

In the first part it was indicated that the geolocators have mainly been used in research on migratory birds such as waders, swallows and terns. These species move over a greater period of time and therefore there are many observations available over that long period containing many nights. So we used a device that

is not specifically designed for racing pigeons, which is a shortcoming. This did not allow us to show anything with the data from Ruffec, because it was just a one day race and the pigeons did not have to stay out overnight. For Barcelona we knew definitely that the pigeons would be out overnight and also Cahors the heavy flight conditions made for an overnight stay. This information we could use to make our calculations, based on the assumption that the pigeons would not move between sunset and sunrise (although this is not necessarily a fact). In addition, there must be sufficient light received, otherwise it is only possible to estimate the latitude as it is a lot harder with longitude. For us this was the most interesting aspect as we wanted to know whether the pigeons went along the west coast of France to fly home or along the eastern side, so we needed to take the risk. Below we describe each pigeon and the results we now have:

F956, trip with two nights.

On Sunday morning at 7 am this pigeon was back home, so for the experiment this was perfect because she was twice overnight and therefore can be calculated with more certainty. The luminosity which has been recorded is shown in Figure 3 but it is not of the intensity shown in the loops in Figure 1. The moments of liberation and homecoming are marked with a red arrow, which are clearly distinguishable. It is also striking that the light pattern on day one is much more stable than the second day. Only in the afternoon of July 6 there appear more lines which could mean that the pigeon on the first day travelled a shorter distance.

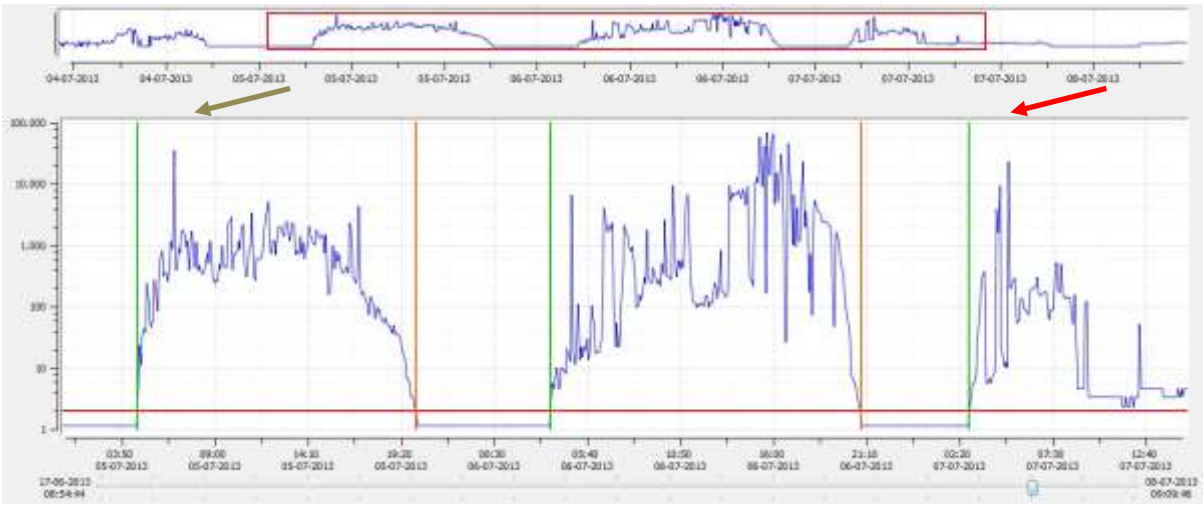

Figure 3: intensity of F956 during the period July 5 / July 7.

F957, Second to the loft.

A smooth but hard trip for this hen that was home just after 7.30pm on Saturday, she was a little over 40 minutes later than her loft mate who came first. Even with her you can see the wave pattern and a clear peak at homecoming and at liberation. On July 7, she is already in the loft, which means the sunset is less well defined; we have manually marked this (solid red line at 6th July evening instead of dotted line). The measurements in the afternoon clearly increased between three and seven hours, producing a clearer footprint.

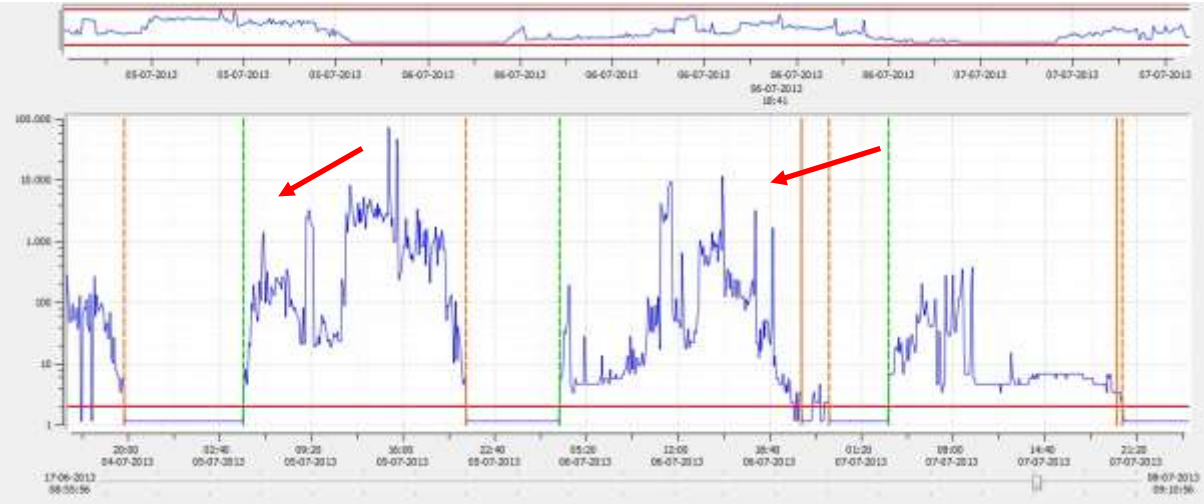

Figure 4: Intensity of F957, morning flight July 5th to evening July 6th.

F958, first to the loft.

This was the first hen to arrive with a geolocator at 18:58 and is the 3rd pigeon in NIC Borne. It has a much more stable light pattern than F957, both on the first and on the second day. Striking on her first flying day is the brightness reduced at night, just before 2100 pm, she would then be roosting (almost 12 hour flight). On the second day there is a dip in brightness around 1400 hours (1600 hours our time), perhaps a drink break? We cannot retrieve the intensity measurements or the temperature.

Figure 5: Intensity of F958, the first home on July 6.

The F960 at Cahors, a different picture on the same day.

With this cock of Ultsje we first trimmed the leg feathers so that they would keep the geolocator free from the shade as much as possible. The fruit of this is shown by Figure 6. While the three hens at Barcelona show intensity values between 1,000 and 10,000 lux, this is very different for F960. The light levels are truncated at 100,000 but during the afternoon of July 5 they were probably still higher. It is also a much less erratic pattern, although of course we are dealing with a more constant airspeed and altitude. The liberation at 14:00 (12h UTC) is clearly visible, as well as the return the next day at 15:15 (13:15 standard time).

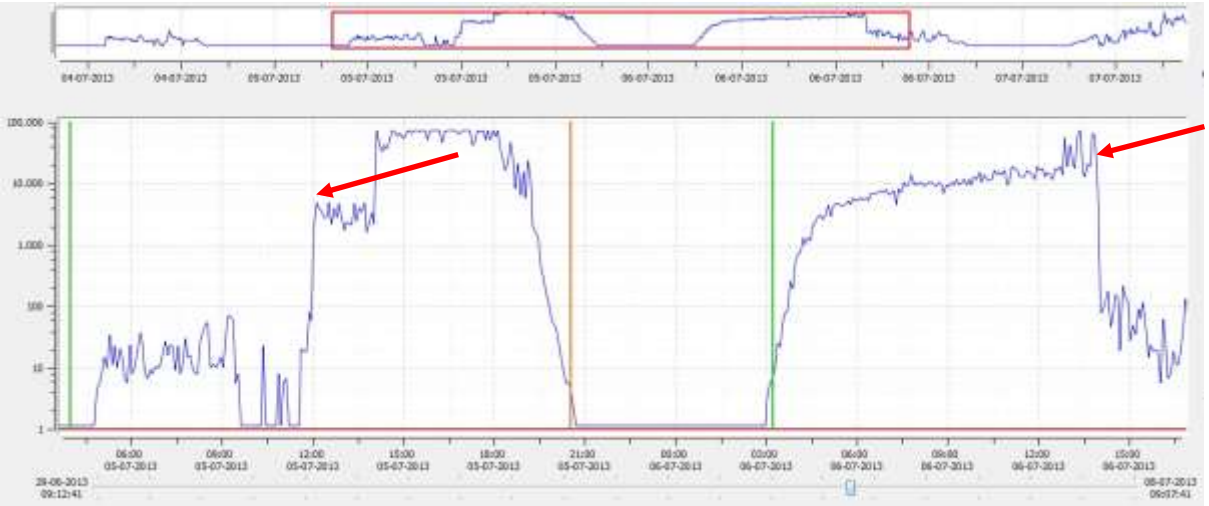

Figure 6: Light intensity measured during Cahors F960 on 5th and 6th July.

For F960 there is more data available because Ultsje Jellema has been in the habit of weighing the pigeons. Regularly the weights of the pigeons are recorded both at basketing and returning so the condition gradient becomes visible. Pigeons being prepared for basketing put on some weight and pigeons generally lose weight before they arrive at home. The amount of weight loss also says something about the deviation of the flight line after all the more distance a pigeon travels the more fat they will use to get home. These measurements have now been available for several years and have been already developed in a graph which is shown in figure 7. As the pigeons have to travel more miles, the percentage weight loss is greater equally if a pigeon is flying a little it does not need to consume too much energy. In particular, the steepness of the line can be used to say 1) whether a pigeon is economical in its energy use or not, and 2) how far a pigeon has been flying if you know what the weight loss in % has been.

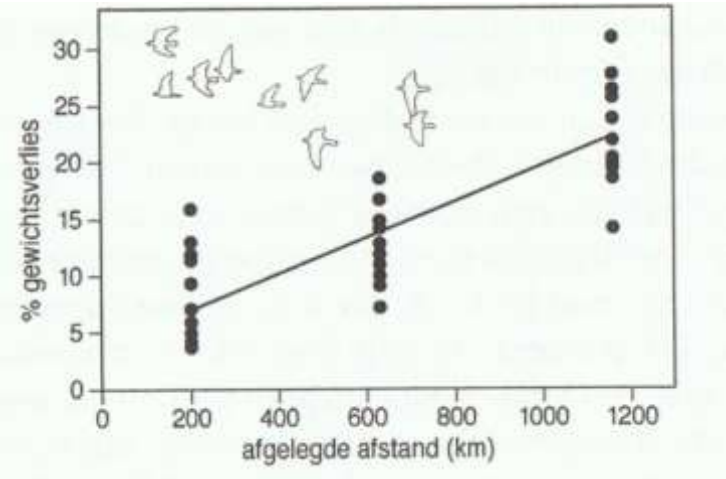

Figure 7: weight loss versus distance,
the result of three years of weight measurements U. Jellema

When F960 was basketed this cock weighed 480 grams and on return a weight of 400 grams, which means that 17% of its weight at basketing has been consumed during the flight. Of course this is not an exact science, because while staying in the basket one pigeon might eat and drink more than another, causing weight in the digestive tract. With this weight and the early prize (direct

flight) we can deduce from the figures that this pigeon must have flown between 900 and 1100 km, roughly. This seems to be fairly accurate.

Probable overnight place.

Previously this technique required all kinds of complicated calculations to adjust and determine the location nowadays this happens in the background within the program. The key question is, where were the pigeons themselves during their stay? That is, given the low accuracy of this technique it cannot be said with certainty. As indicated above, the latitude especially is pretty accurate and clearly 5° east was not the latitude for all three pigeons. 5° east is important because almost the entire Rhone Valley is at that latitude. In the table below are the probable coordinates displayed for the 4 pigeons. The latitude is a lot more secure than the longitude, which may differ just one or two points, meaning that the pigeon may have been found 50 km to the north or south. Furthermore the distance "as the crow flies" is shown in the last column. This shows that the pigeons fly more mileage than we account for, for all four pigeons deviate from a straight line, F960 is still the least on the first flying day. That is also the closest to an average rate of speed of a pigeon with moderate headwind.

GEOLOCATOR NR.	FLIGHT	LATITUDE	LONGITUDE	DISTANCE TO NIGHT LANDING PLACE
F956	BARCELONA	51	3,7	1090 km (2nd Night)
F957	BARCELONA	47	1,7	633 km in 11 hours (57 km/h)
F958	BARCELONA	49	1,2	835 km in 13 hours (64 km/h)
F960	CAHORS	48	3,7	480 km in 7 hours (70 km/h)

Table 1: calculated on eight sites and perpendicular distance from liberation to night landing place.

Of course, these coordinates can also be plotted on a map, and we have done that in the final image.

Figure 8: Markers of the Barcelona birds night spots (A, B, C), the blue marker shows the night spot of the Cahors cock. At the top are the two lofts of Jellema Sr. and Jr. and under the planes the liberation points Barcelona and Cahors

It is striking that the F960 from Cahors has picked the easternmost night spot. This pigeon is on the same latitude as the F956 and we know that she was at home on July 7th at 7 pm and may therefore have been sitting just two hours from the loft. This means that they are already close to the Belgian border. Where this pigeon has been the first night is to less well known and we

therefore prefer to omit it until we have better information. The fact is that a lot of pigeons came home much later than Jelle's three pigeons, since all three have earned a neat position on the result. On Monday they were still timing in Belgium and also in (Northern) Netherlands with less than 25% home. These pigeons have spent the night further south than the pigeons in this experiment and it is obvious that they remain "stuck" in the Rhone Valley or that they have gone around the Pyrenees for their first night. The map above shows that all pigeons have taken the west coast of France route to go home, something that no one had expected in advance. Depending on the location of the home loft, it can be better for the pigeons to take the east side but with the Mistral present it may not be the easiest route. "Detours" on the west side are perhaps more inviting under harsh conditions, in addition to which many Dutch pigeons have used this route for all other flights.

So this first analysis of the data gathered with the geolocators has given us a small glimpse of the potential route home of our Barcelona pigeons. Our experiment is not over yet, because we have two pigeons equipped with a geolocator at Orange and it is intended that F956, 957 and 958 go to Perpignan. We will tell all about that in the final Part 3.

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Part 1.