Stag Beetle News

In this 4th newsletter, we will look at the first scientific paper based on the stag beetle transect data, we give an overview of the 2021 transect walks and we have some nice research news for you. If you missed the 3 previous newsletters, find them here.

Overview of the 2021 transects

For 2021, already 188 transect walks have been submitted. But people from the Netherlands still have to upload about 180 transect walks from more than 30 transects. Also from other countries more data is still coming in. The number of transect walks strongly increased in Poland, The Netherlands, Belgium and Spain. In Portugal and UK the number of transect walks entered declined but hopefully some data will still be entered in the coming weeks. We also estimate that some transects were discontinued due to the Corona pandemic but hopefully they can be started up again this year.

Country	Nr. transects	Nr. transect walks
Belgium	12	58
Poland	3	13
Portugal	10	61
Slovenia	>1	>1
Spain	>7	>40
Switzerland	1	5
The Netherlands	>30	+-180
United Kingdom	4	10

First paper about our network published

Jens Zarka & Arno Thomaes (Research Institute for Nature and Forest, Belgium)

Recently a first scientific paper about our citizen science project was published. In this paper we report on the start-up and initial findings of the European Stag Beetle Monitoring Network (ESBMN), our international network of stag beetle (*Lucanus cervus*) monitoring schemes which aims to promote the same transect monitoring all over Europe. A network in 14 countries with 7 universities, 4 governmental research institutes or administration bodies and 6 NGOs involved in the research conservation and monitoring of this species ensures the promotion of this monitoring method in the different countries.

Till 2020, 195 transect walks were set up in a total of 13 countries (Figure 1).

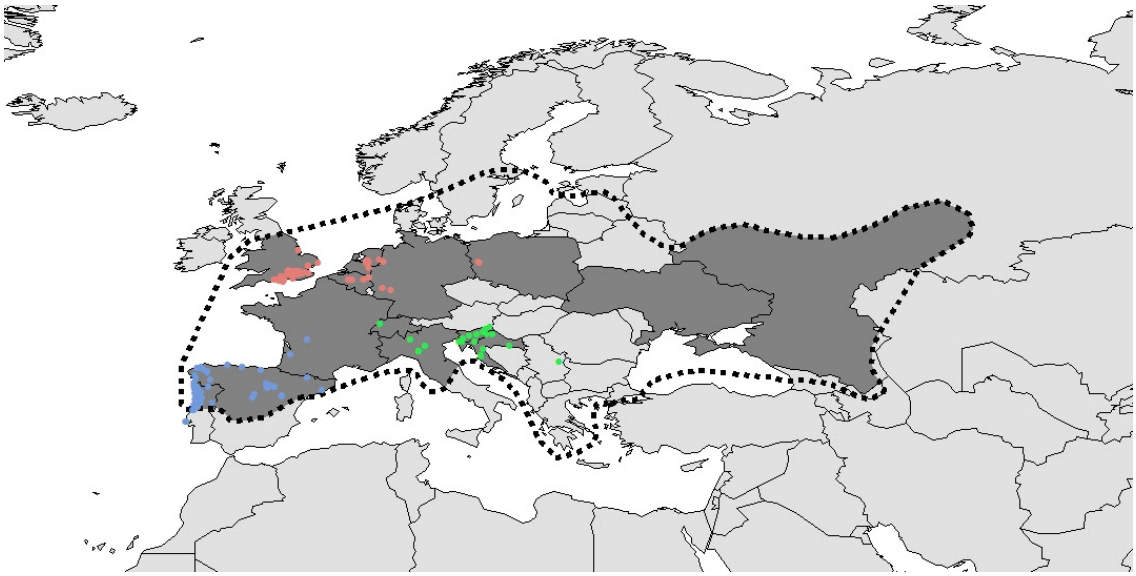

Figure 1. Range (dashed line) of Lucanus cervus and monitoring transects (dots). Countries in dark grey are represented in the European stag beetle monitoring network. Different colours of transects represent different regions (red = north; green = southeast; blue = southwest).

With the data you collected, we could analyse some general patterns explaining the presence of stag beetles. First of all, increasing temperature had a positive effect on the number of observations during a transect walk in all three regions. In the southwest this pattern was least clear (Figure 2). An optimal temperature for stag beetle observations seems to be around 25 °C but might differ a bit between regions.

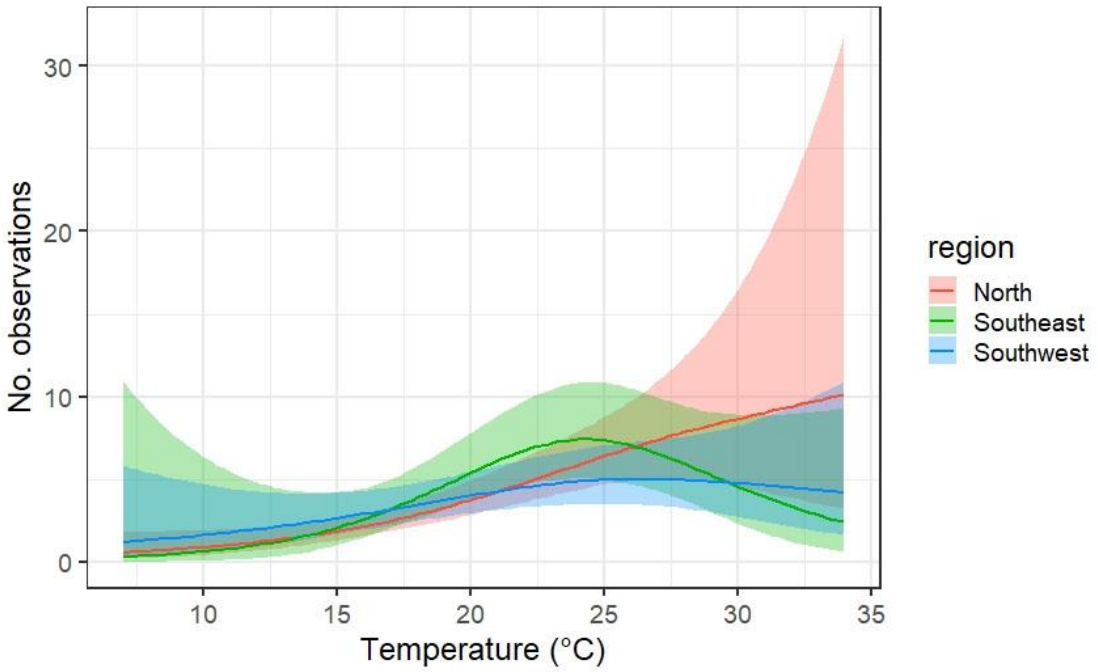

Figure 2. Temperature effect on the number of observations along a transect walk given for three regions. Model outcome is plotted as a line with the confidential interval as a ribbon, after taking into account the effect of the other variables in the model.

Next to that, we also found that starting the transect walk a bit earlier or later in the evening didn't had a huge impact on the amount of stag beetles seen (Figure 3). In the southwest more individual where observed before sunset, while the opposite pattern was found in the north. In the southeast there may be an optimum 20 minutes before sunset.

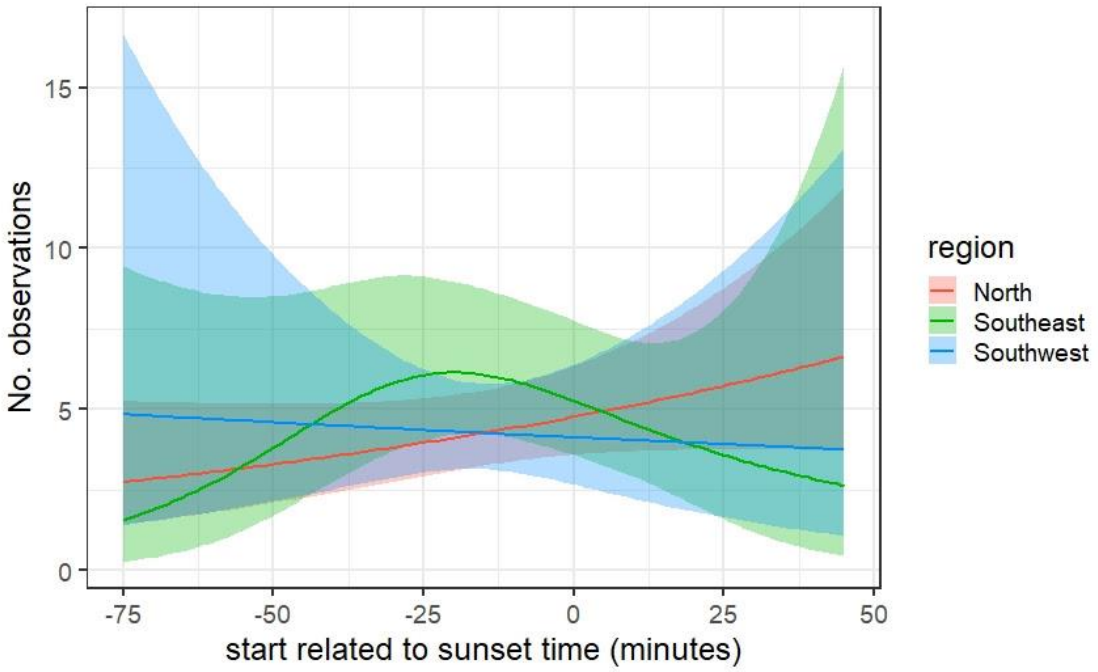

Figure 3. Effect of starting time on the number of observations along a transect walk given for three regions. Model outcome is plotted as a line with the confidential interval as a ribbon, after taking into account the effect of the other variables in the model.

It is still too early to analyse the data for any trends of the species as we only started in 2016. The annual number of transect walks have increased strongly over the years and if similar efforts are maintained in the future, trend analysis will be possible. So it is very important to maintain monitoring your transect so we have long term data to find any trends.
If you want to make a difference by becoming part of our monitoring network you can **register here**. As a volunteer you provide us with important data vital for the monitoring of this species.

The full scientific paper can be accessed freely via: **https://doi.org/10.3390/insects12090813**
based on: Thomaes, A., Barbalat, S., Bardiani, M., Bower, L., Campanaro, A., Fanega Sleziak, N., Gonçalo Soutinho, J., Govaert, S., Harvey, D., Hawes, C., Kadej, M., Méndez, M., Meriguet, B., Rink, M., Rossi De Gasperis, S., Ruyts, S., Jelaska, L.Š., Smit, J., Smolis, A., Snegin, E., Tagliani, A. & Vrezec, A. 2021. The

European Stag Beetle (*Lucanus cervus*) Monitoring Network: International Citizen Science Cooperation Reveals Regional Differences in Phenology and Temperature Response. Insects, 12(9), 813

New red list category comming soon

A red list is a scientific assessment of the chance of extinction made for a group of species. Red lists can be made at national as well at international level. A first red list of the European dead-wood beetles was made in 2010. In this list, a total of 436 species were evaluated. The European stag beetle (*Lucanus cervus*) was considered 'Near threatened' in this first assessment. In total, 11% of all the species were considered endangered, 13% near threatened and 48% not endangered while for 28% sufficient data was lacking to evaluate their status.
The IUCN Red List Assessments become officially outdated after 10 years, so it is time to reassess these species. IUCN Cambridge is leading this new effort that enrols five specialists (Keith Alexander, UK; Benoit Dodelin, France; Nicklas Jansson, Sweden; Jiri Schlaghamersky, Czech Republic; Marcos Méndez, Spain). By the end of 2022 a new assessment will be ready.

Science news

Eagle owls fancier of stag beetle delicacy

Eline Van Riet & Arno Thomaes (Research Institute for Nature and Forest, Belgium)

Based on: Overmann, M. & Töpfer, T. 2021. Eurasian Eagle Owls *Bubo bubo* Opportunistically Prey on Stag Beetles *Lucanus cervus*. Ornithological Science, 20(2), 235-240, https://doi.org/10.2326/osj.20.235

Overall we know little about the impact of predation on the European stag beetle. Various books provide a list of species that have been found to predate on adults stag beetles including crows, woodpeckers, large bat species, fox and mustelids. But the impact on the stag beetle or the role they play in the total food pallet of these animals is less well known. However, a recent paper published on the food of a particular nest of Eagle owls (*Bubo bubo*) that seemed to fancy the stag beetle delicacy (Fig. 1).

Fig. 1: Eagle owls (Bubo bubo) from this study in the quarry in Bonn-Oberkassel (©Matthias Overmann)

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This particular group of Eagle owls lives in a disused quarry in Bonn-Oberkassel (Germany). The home range of the animals is embedded in a mosaic of suburban settlements with forests, fields and vineyards. Eagle owls are known to have a very broad food spectrum, ranging from birds to medium-sized mammals and various arthropods which is easily studied from the indigestible food remains found in their pellets.
Near the nest, 22 pellets were collected and the included body parts studied. The pellets contained 48 individuals belonging to eight vertebrate and two invertebrate prey species, which included the unmistakable mandibles of at least 29 (57%) male stag beetle (*Lucanus cervus*, Fig. 2a and 3). The remaining invertebrates belonged to 3 lesser stag beetles (*Dorcus parallelipipedus*). Looking at biomass, the beetles represented only 1.5% (154g; *L. cervus*: 145g) of a total consumed biomass of 10.569 g (Fig. 2b). Despite being the most abundant, the beetles make up only a small minority of the biomass of the food pattern found.
The study also lists 19 other studies that have found European stag beetle remains in pellets of Eagle owls where the abundance varies from 0.02 to 2%. The biomass of arthropods will always be considerably lower than that of vertebrates and thereby also its nutritional value.
As reason why these birds feed on beetles, the researchers interpret this as a purely opportunistic feeding of a temporary overabundant food source. A second reason could be found by juvenile owls which practice their hunting skills by “preying” on objects through quick walking and jumping. The abundance of slow-flying stag beetles at the end of June, early July may have formed an ideal target for practice.

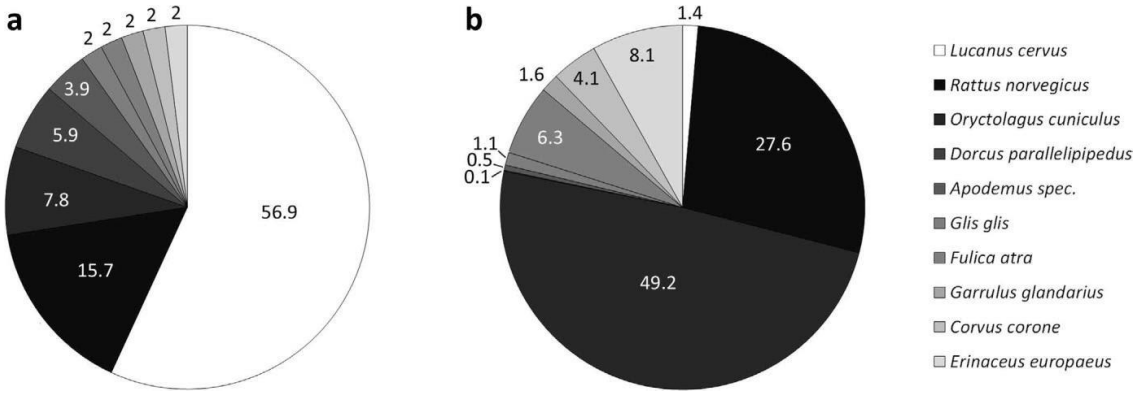

Fig. 2: Relative amount of ten prey species calculated from food remains of the Eagle owl (Bubo bubo). Fig. 1a: species found in the pellets, Fig. 1b: biomass represented by the found species. Figure reproduced from Overmann & Töpfer (2021)

Fig. 3: One of the studied pellets of the Eagle owl (Bubo bubo) with several Stag beetle heads (Lucanus cervus) and an elytra of a Lesser stag beetles (Dorcus parallelipipedus) clearly visible (©Matthias Overmann)

How citizen science has contributed to current knowledge of stag beetle distribution in Spain

Marcos Méndez (Area of Biodiversity and Conservation, Universidad Rey Juan Carlos, Spain)

Based on: Méndez, M. & Cortés-Fossati, F. (2021). Relative contribution of citizen science, museum data and publications in delineating the distribution of the stag beetle in Spain. Insects, 12(3): 202

Conservation of threatend insects such as the stag beetle requires a reliable knowledge of where they are, i.e., their spatial distribution. However, distribution data are hard to obtain because they demand the work of many people as well as funding for country-wide surveys. The lack of distribution data is known as the "Wallacean shortage", after Alfred Rusel Wallace (1823-1913), founder of the biogeography, the discipline that studies where living beings occur on Earth and why. The accumulated work of many generations of scientists now provides to sources of data that can overcome this Wallacean shortage: (1) data already available in museum collections, and (2) data already available in the entomological literature. Is this enough? If not, what else can be done? Would citizen science projects be an efficient way to survey extensive territories? I have recently assessed the value of each of these sources of information in delineating the Spanish distribution of the European stag beetle.

We found that citizen science quickly contributed more new grid cells to the Iberian distribution map than the other two sources (Fig. 1). While data from publications and museums date back to the late XVIII and early XX century, respectively, they accumulated much less new grid cells than citizen science, that started in 1994 in Spain (Fig. 1). The power of citizen science is undeniable! Nevertheless, out of the 734 Spanish grid cells of 10 x 10 km from which the presence of the stag beetle has been reported, almost 25% were uniquely contributed by museum or publication data. This means that citizen science has not been able to cover all sites with presence of stag beetles. Two implications can be drawn from these results. First, further efforts are needed to increase citizen participation in understudied areas. Second, museum and publication data have a role to play in large countries where human population is unequally distributed. Scientists and citizens have complementary roles in overcoming the Wallacean shortage.

The full scientific paper can be accessed freely via: **https://doi.org/10.3390/insects12030202**

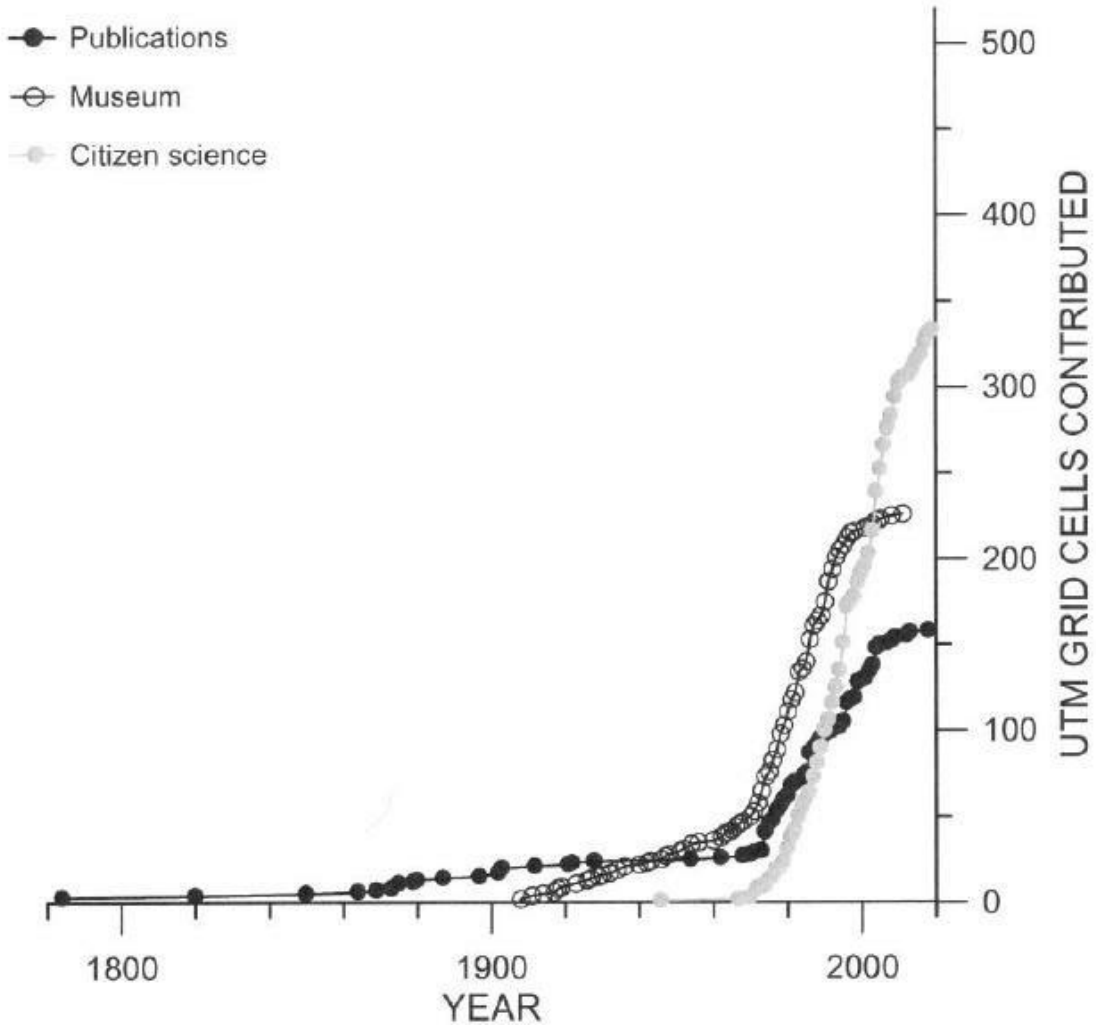

Fig. 1. Accumulation with time of new grid cells contributed by citizen science, publications and museum data to the distribution of the stag beetle in Spain. Figure reproduced from Méndez & Cortés-Fossati (2021)

This Newsletter was developed by Arianna Tagliani and Arno Thomaes with support from PTES.

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