

**NEW RESULTS OF THE SPANISH SECTORAL FEDERATION OF WEAPONS AND AMMUNITION  
(F.S.A.) CONCERNING THE USE OF LEAD SHOT IN THE TERRESTRIAL ENVIRONMENT**

The Spanish Sectoral Federation of Weapons and Ammunition continues to make firm progress in its research on the incidence of lead shot on non-predatory birds in the terrestrial environment. After the publication of the study entitled “INCIDENCE AND REPERCUSSION OF LEAD PELLETS INTRODUCED INTO THE TERRESTRIAL ENVIRONMENT ON TERRESTRIAL GAME BIRDS” by the Spanish Sectoral Federation of Weapons and Ammunition in January 2019, two conclusions made it necessary to continue with the research:

- Second conclusion: “The results of the analyses performed as well as the observations made on the tissues of some specimens suggest that an environmental exposure to other sources of Pb may have perhaps occurred in some specimens, particularly the ones from urban environments. Future studies could corroborate or refute this hypothesis.”
- Third conclusion: “There are doubts about the possible existence of samples with Pb fragments embedded in their tissues, especially given the high concentrations found in some specimens coinciding with an absence of any clinical signs. New studies on other tissues may clear up this doubt.”

Taking into account the recommendations made by the research team, a decision was taken to conduct a new study entitled “PRESENCE OF PELLETS AND HEPATIC LEAD LEVELS IN GAME BIRDS HUNTED WITH LEAD-FREE AMMUNITION”, which would analyse samples of game birds hunted with lead-free ammunition (steel) chosen from among the game birds and strata which were found to have the highest Pb concentrations in the previous study carried out in 2019.

Three species were chosen for three specific strata: the wild common quails sampled in the province of Zamora, the acclimated red-legged partridges sampled in the province of Ciudad Real and the common woodpigeons sampled in the province of Zamora. The work was performed with a total of 94 samples, which once more places it at the forefront of the most important and well-developed studies in Spain and Europe. In this study, the sampling was done with firearms (shotguns) using lead-free ammunition — more precisely steel shot — to avoid any possible sources of error:

- The first of which is the possible confusion when determining the origin of the pellets “suspected” of having been ingested and found in the crop, gizzard or intestines. By using steel ammunition when sampling areas where only lead shot is used, it can be ensured that the presence of steel pellets in the sampled birds’ digestive apparatus can only come from a gunshot and that any lead pellets found there have not been fired.
- The second error consists of the samples’ possible contamination when lead shot is used for the sampling. In all the different studies appearing in the scientific literature, the use of lead-based ammunition has generally been the method followed to obtain samples, a fact that no author seems to have cast into doubt and which could in some way call into question this sampling methodology.

Comparing the results obtained in the previous report published in 2019 with this report's findings throws up the following percentages of the population "suspected" of having ingested some lead pellets in the 2019 study and certain of having done so in the 2020 study:

|            | Lead pellets                                     |  |
|------------|--|--|
|            | Study using steel 2020<br>Certainty of ingestion | Study using lead 2019<br>High suspicion of ingestion (*) |
| Crops      | 0.00%  | 1.19%  |
| Gizzards   | 1.06%  | 2.78%  |
| Intestines | 0.00%  | 1.98%  |

(\*) The high suspicion of ingestion in 2019 results from the presence of Pb pellets in the crop, gizzard and intestines without being attributed to a gunshot (evident perforation or pellets embedded in feathers).

In view of the results, it is evident that the presence of lead pellets "suspected" of having been ingested by the species sampled is significantly lower when compared to the 2019 report, as only one acclimated red-legged partridge specimen was found to have lead pellets in the gizzard which had definitely been ingested. No specimen was found to have lead pellets in the crop or intestines.

As far as lead concentrations in the liver are concerned, they could be described as very low and below the average that appears in the scientific bibliography consulted. The table below shows a comparison of the 2019 report's findings with those of this current report:

|                                 | Study using steel 2020 | Study using lead 2019 |
|---------------------------------|------------------------|-----------------------|
| Liver concentration (> 1.5 ppm) | 1.06%                  | 3.21%                 |

The fall in the number of specimens is also significant, just one specimen (the red-legged partridge specimen with Pb pellets in the gizzard) out of 94 was found to have a high Pb concentration in the liver (7.189 ppm). It was also the only specimen showing clinical signs that could be attributed to the ingestion of lead pellets from the terrestrial environment. In addition, some specimens were found in this study to have lead concentrations slightly above the strictest value deemed as environmental contamination (0.65 ppm), thereby suggesting that the origin of the lead has nothing to do with the ammunition employed in hunting activities. Moreover, several recently published scientific papers introduce new sources of lead contamination in different bird species, a fact which makes new consequences emerge:

- Arrondo, E., Navarro, J., Pérez-García, J. M., Mateo, R., Camarero, P. R., Rodríguez Martín-Doimeadios, R. C., Jiménez-Moreno, M., Cortés-Avizanda, A., Navas, I., García-Fernández, A. J., Sánchez-Zapata, J. A., Donázar, J. A. 2020. Dust and bullets: Stable isotopes and GPS tracking disentangle lead sources for a large avian scavenger. *Environmental Pollution* 266 (Part 3), 115022.
- Sánchez-Virosta, P., León-Ortega, M., Calvo, J. F., Camarero, P. R., Mateo, R., Zumbado, M., Luzardo, O. P., Eeva, T., García-Fernández, A. J., Espín, S. 2020. Blood concentrations of 50 elements in Eagle owl (*Bubo bubo*) at different contamination scenarios and related effects on plasma vitamin levels. *Environmental Pollution* 265 (Part A), 115012.

Lastly, only 1.06% of the population under study had a Pb concentration in the liver compatible with the consumption of lead pellets according to the new study. Said value is extremely low and was additionally recorded for a non-wild species, an acclimated red-legged partridge whose singular origin could have an influence on ingestion and feeding habits.

In light of this recently conducted study, the Spanish Sectoral Federation of Weapons and Ammunition can give further credence to the conclusions it had previously presented according to the 2019 Report, which can be summed up as follows:

- ✓ The use of lead shot to obtain samples aimed at determining Pb concentrations or the location of pellets in the birds sampled turns out to be a source of errors. Any study that is subsequently conducted in this respect should discard the use of lead shot for sampling purposes due to the errors it may cause in the results.
- ✓ The percentage of the population suspected of being affected by lead is negligible. As can be seen, the percentage is situated at around 1% (1.06%) when lead-free ammunition (steel in this case) is used and the same protocol followed.
- ✓ The lead shot employed for small game hunting constitutes no risk at all for the state of conservation of the populations under study.
- ✓ The problem posed by the presence of lead concentrations in terrestrial birds has always been attributed to the use of lead-based ammunition, but once different research paths have been opened up (i.e. isotopes), said risk seems to fade away while new sources of lead are revealed.