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Data Article

An open dataset of anticoagulant rodenticides in liver samples from California kingsnakes and raptors in Gran Canaria (Canary Islands, Spain)

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Dataset link: Table 1. Snakes data: concentration of anticoagulant rodenticides detected in liver (ng/g), total number of rodenticides, biometric, geographical and necropsy findings). (Original data)
Dataset link: Table 2. Raptors data: concentration of anticoagulant rodenticides detected in liver (ng/g), total number of rodenticides per animal and geographical information. (Original data)

ABSTRACT

It is well known that rodenticides are widely used, and there are multiple routes by which they can reach non-target wildlife species. Specifically, in the Canary Islands, a high and concerning incidence of these compounds has been reported. However, in this scenario, reptiles remain one of the least studied taxa, despite their potential suitability as indicators of the food chain and environmental pollution has been noted on several occasions. In this context, the California Kingsnake (*Lampropeltis Californiae*), widely distributed on the island of Gran Canaria, occupies a medium trophic level and exhibits feeding habits that expose it to these pollutants, could be studied as a potential sentinel of exposure to these compounds. For this reason, 360 snake livers were analyzed by LC-MS/MS. Similarly, 110 livers of birds of prey were sampled. Thus, we present the analysis of 10

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anticoagulant rodenticides (warfarin, diphacinone, chlorophacinone, coumachlor, coumatetralyl, brodifacoum, bromadiolone, difethialone, difenacoum and flocoumafen) in both data series; snakes, and raptors. Furthermore, this dataset includes biological data (weight, length, sex, colour, and design pattern), geographic data (distribution area and municipalities) and necropsy findings that could be of interest for a better understanding of this snake species and for future studies.

Specifications Table

Subject	Environmental Science: Health, Toxicology and Mutagenesis
Specific subject area	Relevant sampling data and analysis of anticoagulant rodenticides in the liver of the California kingsnakes and raptors from Gran Canaria (Canary Islands, Spain).
Data format	Raw data
Type of data	Tables
Data collection	Liver samples were collected during necropsy and subsequently stored at -20 ºC until the moment of their processing for analysis by Agilent 1290 UHPLC liquid chromatography coupled to Agilent 6460 triple quadrupole mass spectrometry (Agilent Technologies, Palo Alto, USA). Geographic data were recorded in the field and biometric data and relevant necropsy findings were taken in the laboratory facilities during necropsies. The testing period took place between 2021-2022 for snakes and 2020-2022 for raptors. All samples were analysed by the Toxicology Unit of the University of Las Palmas de Gran Canaria.
Data source location	Institution: Toxicology Unit, Research Institute of Biomedical and Health Sciences (IUIBS), University of Las Palmas de Gran Canaria City/Town/Region: Las Palmas de Gran Canaria Country: Spain
Data accessibility	Repository name: Mendeley Data Data identification number: DOI Table 1: 10.17632/gd884g8g7s.2 DOI Table 2: 10.17632/6g4ftskcsf.2 Direct URL to data: Table 1: https://data.mendeley.com/datasets/gd884g8g7s/2 Table 2: https://data.mendeley.com/datasets/6g4ftskcsf/2
Related research article	Beatriz Martín-Cruz, Martina Cecchetti, Katherine Simbaña-Rivera, Cristian Rial-Berriel, Andrea Acosta-Dacal, Manuel Zumbado-Peña, Luis Alberto Henríquez-Hernández, Ramón Gallo-Barneto, Miguel Ángel Cabrera-Pérez, Ayose Melián-Melián, Alejandro Suárez-Pérez, Octavio P. Luzardo. Potential exposure of native wildlife to anticoagulant rodenticides in Gran Canaria (Canary Islands, Spain): Evidence from residue analysis of the invasive California Kingsnake (Lampropeltis californiae), Science of The Total Environment, Volume 911, 2024,168761, ISSN 0048-9697, 10.1016/j.scitotenv.2023.168761 [1]

1. Value of the Data

- The dataset we present carries significance as it records the levels of key anticoagulant rodenticides found in a collection of 360 California kingsnakes (*Lampropeltis californiae*) in Gran Canaria. The values presented here can potentially serve as baseline concentrations for the snakes inhabiting this island.

- This dataset would be invaluable for researchers conducting biomonitoring studies on these pollutants in reptiles, a field that has seen fewer studied compared to other taxa [2–4].
- Beyond the raw data on contaminants, the inclusion of biometric data and potential signs of rodenticide exposure can be utilized for future investigations, providing comprehensive insights.
- Moreover, the raptor data offer further details about the considerable rodenticide exposure experienced by the endemic fauna in the Canary Islands [5–7].

2. Data Description

Snake dataset focuses on data related to 360 snakes captured on the island of Gran Canaria in the context of the eradication campaign during the years 2021-2022. In summary, it presents information on the analysis of anticoagulant rodenticides, along with biometric data, geographical distribution, and relevant necropsy findings for future studies. Analytical results include concentrations of each detected compound and the ΣARs in ng/g ww liver, along with the total number of rodenticides per animal. Biological values include sex (F = females; M= males and I= unknown sex), weight (in g), fat weight (in g), snout vent-length (SVL; in cm), color pattern (normal = black or brown color; albinos) and design pattern (striped or banded) are detailed. Geographical distribution data is defined by municipality and distribution area: main area (MA: municipalities of Telde, Santa Brígida, Valsequillo and San Mateo), secondary area (SA: municipality of Gáldar and Agaete), tertiary area (TA: municipalities of San Bartolomé de Tirajana and Mogán) and quaternary area (QA: municipality of Las Palmas de Gran Canaria). Additionally, the capture method (trap or manual) is shown, and the observation of lesions or relevant necropsy findings are detailed using the following numerical coding: 0= no lesions; 1=external and superficial wounds; 2=external and deep bleeding wounds; 3= bleeding in the oral cavity; 4=bloody feces; 5= generalized hemorrhages.

Raptor dataset presents data for the series of 110 raptors collected as part of the Poisoning Control and Prevention Strategy in the Canary Islands between 2020-2022 [8]. These birds of prey came from the wild or recovery centers where they were admitted and subsequently died. The series comprises six raptors endemic to the Canary Islands: *Tyto alba* (n = 10), *Asio otus* (n = 36), *Falco tinnunculus* (n = 39), *Accipiter nisus* (n = 10), *Falco pelegrinoides* (n = 1) and *Buteo buteo insularum* (n = 14). This table provides the analytical results of the rodenticides detected per animal, as well as their ΣARs expressed in ng/g ww liver. The total number of rodenticides per bird is also provided. Finally, geographical distribution by municipalities is detailed for those animals for which such information was available.

3. Experimental Design, Materials, and Methods

3.1. Sampling Area and Sample Collection

Snake carcasses and raptor livers were received at the Toxicology Unit of the ULPGC. For the sampling areas, only those birds of prey found on the island of Gran Canaria were admitted, representing a large proportion of the island. The admitted snakes came from the four regions of the island where they are established (MA: municipalities of Telde, Santa Brígida, Valsequillo and San Mateo), secondary area (SA: municipality of Gáldar and Agaete), tertiary area (TA: municipalities of San Bartolomé de Tirajana and Mogán) and quaternary area (QA: municipality of Las Palmas de Gran Canaria), collectively covering a significant part of the island's territory [9–11].

Only snakes in good states of conservation, allowing for the correct extraction of the livers, and correctly stored raptor livers were admitted to the study. The snake series comprised 360 individuals captured in 2021-2022, and the raptor series included 110 raptors of six different

species: *Tyto alba* ($n = 10$), *Asio otus* ($n = 36$), *Falco tinnunculus* ($n = 39$), *Accipiter nisus* ($n = 10$), *Falco pelegrinoides* ($n = 1$) and *Buteo buteo insularum* ($n = 14$) found between 2020-2022. The raptor livers analyzed came from carcasses found by environmental officers in the wild or from recovery centers where they had been euthanized or had died after admission. These raptors were subsequently necropsied at the Department of Veterinary Pathology at the University of Las Palmas. The snakes came from captures made during the eradication campaign on the island of Gran Canaria and were subsequently euthanized by the entity in charge of this campaign. The carcasses were kept at -20 ºC until necropsy at the toxicology service facilities and the extracted livers were kept at the same temperature until analysis.

3.2. Standards and Elements

Certified AR standards and procedural-internal standard (P-IS, (±) – Warfarin -d5) of maximum purity (between 93.1% and 99.8% from Honeywell, Morristown, NJ, USA) were used to determine 10 analytes of interest: warfarin, diphacinone, cholorophacinone, coumachlor, coumatetralyl, brodifacoum, bromadiolone, difethialone, difenacoum and flocoumafen. All the solvents employed were of the highest purity available (ACN and MeOH >99,9%; FA 98%). The method employed consisted of an extraction by QuEChERS method previously validated [12–14], followed by a LC-MS/MS analysis using Agilent 1290 UHPLC (Agilent Technologies, Palo Alto, USA) coupled to an Agilent 6460 triple-quadrupole mass spectrometer.

3.3. Sample Preparation and Instrumental Analysis

Livers taken from necropsies were stored at -20 °C until analysis. 1 gram of liver representative of the whole organ was taken for extraction using the method already described by our team [12,14] In the same way, Quality Control samples (prepared at 2 ng/g), blanks and the ten calibration points of the curve (ranging from 0.195–100 ng/g) were prepared in chicken liver matrix. Before extraction, all samples including QCs, blanks and curve were spiked with P-IS. Finally, all concentrations were presented in wet weight basis. The quantitative analyses were performed by an Agilent 1290 UHPLC liquid chromatograph coupled with an Agilent 6460 triple quadrupole mass spectrometer (Agilent Technologies, Palo Alto, USA).

Limitations

The collection of data on raptors has some limitations compared to the data collected for the snake series. In the case of these birds, as they were carcasses found in the wild or animals treated in recovery centers by external organizations, we did not have biometric data of the specimens or some geographical data, nor the exact freshness status of the cadaver. However, only livers from carcasses in good condition, not in an advanced state of decomposition, were admitted.

Ethics Statements

The authors had read and follow the ethical requirements established for the publication. No animals were euthanized for the purpose of the article. Specimens for the study were captured within the framework of a governmental eradication plan for the invasive exotic reptile and euthanized by a veterinarian following the procedure outlined in the aforementioned eradication plan [15]. Prior to their final disposal, the carcasses were donated to SERTOX for biometric study

and liver extraction for chemical analysis. Similarly, raptor livers were provided by the government for toxicity analysis as part of the Poisoning Control and Prevention Strategy in the Canary Islands [8]. In accordance with RD53/2013, which establishes the basic standards applicable to the protection of animals used in experimentation and other scientific purposes, including teaching [16], additional approval from the animal experimentation ethics committee is not required.

Data Availability

Table 1. Snakes data: concentration of anticoagulant rodenticides detected in liver (ng/g), total number of rodenticides, biometric, geographical and necropsy findings). (Original data) (Mendeley Data).

Table 2. Raptors data: concentration of anticoagulant rodenticides detected in liver (ng/g), total number of rodenticides per animal and geographical information. (Original data) (Mendeley Data).

CRediT Author Statement

Beatriz Martín-Cruz: Conceptualization, Formal analysis, Investigation, Data curation, Writing – original draft; **Cristian Rial-Berriel:** Validation, Methodology, Investigation; **Andrea Acosta-Dacal:** Validation, Methodology, Investigation; **Ramón Gallo-Barneto:** Investigation; **Miguel Ángel Cabrera-Pérez:** Investigation; **Octavio P. Luzardo:** Conceptualization, Resources, Writing – review & editing, Visualization, Supervision, Project administration, Funding acquisition.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] B. Martín-Cruz, M. Cecchetti, K. Simbaña-Rivera, C. Rial-Berriel, A. Acosta-Dacal, M. Zumbado-Peña, L.A. Henríquez-Hernández, R. Gallo-Barneto, M.Á. Cabrera-Pérez, A. Melián-Melián, A. Suárez-Pérez, O.P. Luzardo, Potential exposure of native wildlife to anticoagulant rodenticides in Gran Canaria (Canary Islands, Spain): evidence from residue analysis of the invasive California Kingsnake (Lampropeltis californiae), Sci. Total Environ. 911 (2024) 168761, doi:10.1016/j.scitotenv.2023.168761.

[2] D.C. Lettoof, M.T. Lohr, F. Busetti, P.W. Bateman, R.A. Davis, Toxic time bombs: frequent detection of anticoagulant rodenticides in urban reptiles at multiple trophic levels, Sci. Total Environ. 724 (2020), doi:10.1016/j.scitotenv.2020.138218.

[3] M.T. Lohr, R.A. Davis, Anticoagulant rodenticide use, non-target impacts and regulation: a case study from Australia, Sci. Total Environ. 634 (2018) 1372–1384, doi:10.1016/j.scitotenv.2018.04.069.

[4] A.Q. Hoang, M.B. Tu, S. Takahashi, T. Kunisue, S. Tanabe, Snakes as bimonitors of environmental pollution: a review on organic contaminants, Sci. Total Environ. 770 (2021), doi:10.1016/j.scitotenv.2020.144672.

[5] C. Rial-Berriel, A. Acosta-Dacal, M.Á.C. Pérez, A. Suárez-Pérez, A. Melián Melián, M. Zumbado, L.A. Henríquez Hernández, N. Ruiz-Suárez, Á.R. Hernández, L.D. Boada, A. Macías Montes, O.P. Luzardo, Intensive livestock farming as a major determinant of the exposure to anticoagulant rodenticides in raptors of the Canary Islands (Spain), Sci. Total Environ. 768 (2021), doi:10.1016/j.scitotenv.2020.144386.
[6] C. Rial-Berriel, A. Acosta-Dacal, M. Zumbado, L.A. Henríquez-Hernández, Á. Rodríguez-Hernández, A. Macías-Montes, L.D. Boada, M.D.M. Travieso-Aja, B. Martin-Cruz, A. Suárez-Pérez, M.Á. Cabrera-Pérez, O.P. Luzardo, Epidemiology of animal poisonings in the canary islands (Spain) during the period 2014–2021, Toxics 9 (2021), doi:10.3390/toxics9100267.
[7] N. Ruiz-Suárez, L.A. Henríquez-Hernández, P.F. Valerón, L.D. Boada, M. Zumbado, M. Camacho, M. Almeida-González, O.P. Luzardo, Assessment of anticoagulant rodenticide exposure in six raptor species from the Canary Islands (Spain), Sci. Total Environ. 485–486 (2014) 371–376, doi:10.1016/j.scitotenv.2014.03.094.
[8] Orden de, 28 de marzo de 2014, por el que se aprueba la estrategia para la erradicación del uso ilegal de veneno en el medio no urbano de Canarias, Boletín Oficial de Canarias nº 70, de 9 de abril de (2014) https://www.gobiernodecanarias.org/boc/2014/070/006.html.
[9] de la Presidencia de la Agencia Estatal Consejo Superior de Investigaciones Científicas, M.P., por la que se publica la segunda Adenda al Convenio con el Gobierno de Canarias, para el desarrollo del proyecto de investigación <<Análisis del uso del hábitat y de los impactos de la culebra real de California sobre las comunidades nativas de Gran Canaria (Lamproimpact)>>. Boletín Oficial del Estado, no116, de 16 de mayo de 2022, Resolución de 9 de mayo de, 2022. https://www.boe.es/diario_boe/txt.php?id=BOE-A-2022-8061.
[10] R. Gallo, J.A. Mateo, Culebra real de California- Lampropeltis Californiae, in: P. López, J. Martín, F. Martínez-Freiría (Eds.), En: Enciclopedia virtual de los vertebrados Españoles, Museo Nacional de Ciencias Naturales, Madrid, 2020 http://www.vertebradosibericos.org-http://dx.doi.org/10.20350/digitalCSIC/12540.
[11] GESPLAN, Proyecto Post-LIFE LAMPROPELTIS para el control de la culebra real de California (Lampropeltis Californiae) en la isla de Gran Canaria, Gestión y Planeamiento Territorial y Medioambiental,STOPCULEBRA, Datos públicos (2023). https://gesplangis.es/arcgis/apps/dashboards/9d46ff1b76c342f79f6a9ee1b3dc3688 (accessed January 27, 2023).
[12] C. Rial-Berriel, A. Acosta-Dacal, M. Zumbado, O.P. Luzardo, Micro QuEChERS-based method for the simultaneous biomonitoring in whole blood of 360 toxicologically relevant pollutants for wildlife, Sci. Total Environ. 736 (2020), doi:10.1016/J.SCITOTENV.2020.139444.
[13] C. Rial-Berriel, A. Acosta-Dacal, F. González, N. Pastor-Tiburón, M. Zumbado, O.P. Luzardo, Supporting dataset on the validation and verification of the analytical method for the biomonitoring of 360 toxicologically relevant pollutants in whole blood, Data Br. 31 (2020), doi:10.1016/J.DIB.2020.105878.
[14] C. Rial-Berriel, A. Acosta-Dacal, M. Zumbado, L. Alberto Henríquez-Hernández, Á. Rodríguez-Hernández, A. Macías-Montes, L.D. Boada, M. Del Mar Travieso-Aja, B.M. Cruz, O.P. Luzardo, A method scope extension for the simultaneous analysis of POPs, current-use and banned pesticides, rodenticides, and pharmaceuticals in liver, Appl. Food Saf. Biomonitoring (2021), doi:10.3390/toxics9100238.
[15] GESPLAN, Protocolos para la sistematización de las labores de captura y recolección de datos (A1), Gestión y Planeamiento Territorial y Medioambiental- Life10NAT/ES/565- STOPCULEBRA, (2015). https://www.stopculebrareal.com/protocolos-sistematizacion-labores-de-captura-recoleccion-datos/ (accessed December 18, 2022).
[16] Real Decreto 53/2013 de 1 de febrero por el que se establecen las normas básicas aplicables para la protección de los animales utilizados en experimentación y otros fines científicos, incluyendo la docencia, Boletín Oficial del Estado, 34, de 8 de febrero de (2013) https://www.boe.es/eli/es/rd/2013/02/01/53/con.