XX Congreso Ibérico de Entomología

Alicante, del 26 al 30 de junio de 2023

Paremos el declive de los Insectos

LIBRO DE RESÚMENES

CIBIO
CENTRO IBEROAMERICANO DE LA BIODIVERSIDAD

Universitat d'Alacant
Universidad de Alicante

ASOCIACIÓN ESPAÑOLA DE ENTOMOLOGÍA · 1977 ·

SPE
SOCIEDADE PORTUGUESA DE ENTOMOLOGIA

UA
UNIVERSITAT D'ALACANT
UNIVERSIDAD DE ALICANTE
Facultat de Ciències
Facultad de Ciencias

IPAB
INTERACCIONES INSECTO-PATÓGENO-PLANTA Y SUS AGENTES DE BIOCONTROL

XX Congreso Ibérico de Entomología

Paremos el declive de los Insectos

— Alicante —

del 26 al 30 de junio de 2023

https://xxcongresoie.entomologica.es/

LIBRO DE RESÚMENES

Instituto Universitario de Investigación CIBIO
(Centro Iberoamericano de la Biodiversidad)

Universitat d'Alacant
Universidad de Alicante

Asociación española de Entomología

Sociedade Portuguesa de Entomologia

UA Universitat d'Alacant
Facultat de Ciències
Facultad de Ciencias

IPAB Interacciones insecto-patógeno-planta y sus agentes de biocontrol

Maquetación
portada y contraportada: Vicente Cruz Antón
Edición Libro de Resúmenes: Comité organizador

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Contenido

Bienvenida del comité organizador

Queridos socios y amigos:

La Asociación española de Entomología y el Comité Organizador del XX Congreso Ibérico de Entomología se congratulan en dar la bienvenida a este evento científico que, después de 17 años, nos ha reunido de nuevo en Alicante para hablar de Entomología y compartir los resultados y avances en esta ciencia. En 2019, las dos sociedades ibéricas de Entomología, la española y la portuguesa, celebraron, en Madrid, el XVIII Congreso Ibérico que, con gran éxito, organizaron nuestros compañeros de la Universidad Complutense. Ese fue el último encuentro presencial, ya que, en 2021, el XIX Congreso Ibérico de Entomología, por las circunstancias del momento, tuvo que celebrarse en forma no presencial privándonos de la posibilidad de visitar la ciudad de Coimbra, sede del mismo, y disfrutar de la compañía de nuestros colegas portugueses que lograron organizar un congreso con gran éxito de participación y calidad. Ahora volvemos afortunadamente a encontrarnos personalmente en este congreso en el que, durante 5 días, del 26 al 30 de junio de este año, vamos a tener la oportunidad de conocer avances científicos, proyectos de entomología, intercambiar experiencias y debatir sobre iniciativas y propuestas de futuro en el campo de la Entomología.

Lo hemos organizado con mucha ilusión y con la confianza de que tanto las conferencias plenarias que serán impartidas por investigadores de prestigio, como las presentaciones van a estar a la altura de los objetivos propuestos, todo ello complementado con actividades adicionales que van a propiciar buenos momentos de convivencia entre los asistentes.

Alicante, la *Ciudad de la Luz*, nos va a acoger e iluminar para que seamos capaces de aportar soluciones que, en la medida de lo posible, contribuyan a detener el rápido descenso de las poblaciones de insectos y otros artrópodos en una gran parte de nuestros ecosistemas.

El Comité Organizador

Nuestro lema: Paremos el declive de los Insectos

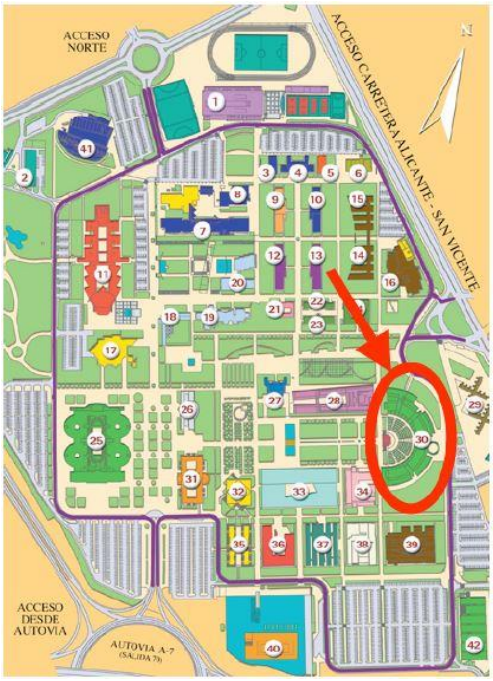
Este congreso internacional tiene como telón de fondo la urgente necesidad de frenar el declive de los insectos ya repetidamente denunciado a nivel planetario. Cada vez son más los estudios que muestran como la continua fragmentación, transformación, contaminación de los hábitats y el cambio climático, están teniendo efectos muy adversos en la diversidad de las comunidades de insectos a múltiples escalas espaciales. La pérdida de especies de insectos es dramática, ya que afecta de forma directa al desarrollo de funciones ecosistémicas vitales para la salud del planeta y la supervivencia del ser humano, como por ejemplo la polinización, la regulación de los ciclos de materia o el control natural de plagas. Además, los insectos son un eslabón clave para el mantenimiento de las cadenas tróficas que mantienen la vida en el planeta, por lo que la pérdida adicional de las funciones ecosistémicas derivadas de sus interacciones con otros seres vivos representa una preocupación justificada que debe motivarnos a ponerle freno. Su declive es la manifestación de una creciente destrucción de la naturaleza que tiene graves repercusiones en la salud humana.

La pandemia generada por la COVID-19 nos ha enseñado que nuestra salud no depende sólo de lo que se logre a través de avances tecnológicos, sino también de la buena salud de nuestros ecosistemas y por tanto de la de los animales y plantas que los pueblan: la visión científica de una Única Salud planetaria (*One Health*) nos ha puesto de manifiesto que nuestra existencia y la resolución de los problemas ambientales y de salud no pueden ser considerados de forma aislada, sin tener en cuenta el entramado de la vida de nuestro planeta conformado por millones de seres vivos y donde los insectos son cualitativa y cuantitativamente una pieza clave e imprescindible.

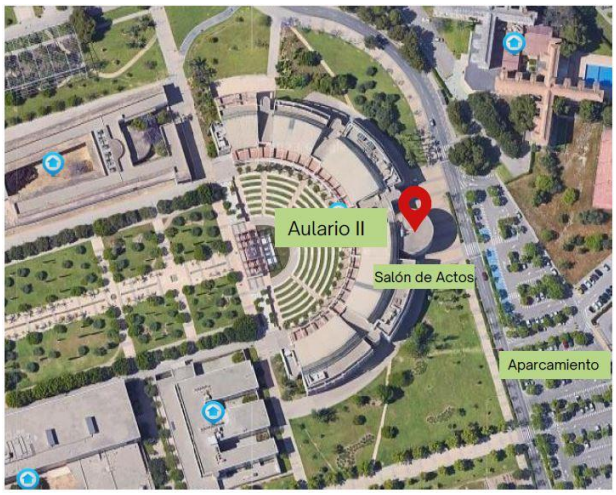
Por todo ello, el objetivo de este congreso es reunir a expertos internacionales en estudios de Entomología cuyas contribuciones ayuden a conocer nuestra biodiversidad, siendo capaces de concienciar a la sociedad de las causas de este grave declive de insectos aportando soluciones que contribuyan a poner freno a lo que ya se considera como uno de los problemas de mayor gravedad por su impacto en el medioambiente y el bienestar humano.

Sede del congreso y lugar de celebración

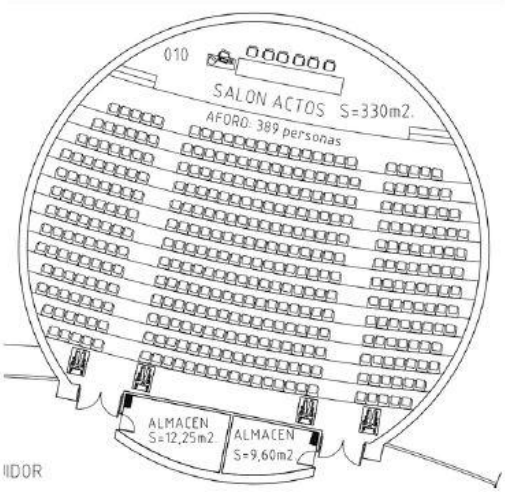
La sede del XX Congreso Ibérico de Entomología es la Universidad de Alicante (https://www.ua.es/) y las sesiones tendrán lugar en el Salón de Actos del Aulario II de su campus principal, situado en el municipio de San Vicente del Raspeig.



Plano del campus principal de la Universidad de Alicante



Localización del Aulario II de la Universidad de Alicante



Salón de Actos del Aulario II de la Universidad de Alicante

Programa de sesiones y actividades

A continuación, se presenta el programa de sesiones y actividades del XX Congreso Ibérico de Entomología. Al final del programa, se relacionan, por áreas temáticas, los pósteres presentados. Los pósteres estarán expuestos todos los días o, en su defecto, el mayor número de días que sus autores puedan, no habiendo sesiones específicas para la defensa de los pósteres en las distintas áreas temáticas en las que se organizan.

LUNES 26 DE JUNIO

Registro y entrega de documentación (12:00-15:30)
Colocación de pósteres
Entrega de presentaciones orales (pdf, power point …) a la organización del congreso

ACTO DE INAUGURACIÓN (16:00-16:30)
Preside: Juan Mora Pastor, Vicerrector de Investigación.
Magdalena García Irles, Decana de la Facultad de Ciencias
María de los Ángeles Marcos García, Presidenta del Comité Organizador XX CIE
Eduardo Galante Patiño, Presidente de la AeE
Artur Serrano, Presidente de la SPEN

PLENARIA I (16:30-17:30): Becoming a mindful entomologist: hacia una vida científica más productiva, creativa, y feliz. Ana Pineda.
Presenta: Mª Ángeles Marcos García.

SESIÓN ORAL I (17:30-18:30). Moderador: Antonio Ricarte.

Difusión y ciencia ciudadana

1. Jan van Kessel the Elder (1626-1679), painter of insects, birds and flowers.
Viejo, J.L.
2. Flebocollect App: citizen science for the monitoring of phlebotomine sand flies in schools.
Gálvez, R.; Barón, J.; Milagres, T.; López de Felipe, M.; Mora-Urda, A.I.; Bermejo, A.

Biodiversidad, biogeografía y conservación

3. Blackflies (Diptera: Simuliidae) from the Huebra river hydrographic basin.
López-Peña, D.; Portillo-Rubio, M.; Lis-Cantín, Á.; Falcó-Garí, J.V.
4. Preliminary results of insect community monitoring in a suburban stretch of the Manzanares river (Madrid).
Young Sánchez Mateos, A.D.; García Sánchez-Colomer, M.R.; Viejo, J.L.

SESIÓN ORAL II (18:30-19:30). Moderador: Antonio Ricarte.

5. Historical factors shape the intraspecific genetic diversity in an endemic dragonfly.
Díaz-Martínez, C.*; López-Estrada, E.K.; Rosas-Ramos, N.; García-París, M.

6. Effect of landscape context on invertebrate abundance and species richness at wildflower compensation areas in Schleswig Holstein, Germany.
Bennett, D.*
7. All they need is research: a four-year study of Dyschiriini (Coleoptera: Carabidae) in the Iberian Peninsula.
Muñoz-Santiago, J.*; Ortuño, V.M.
8. Right in time, right in space: how *Monoctonia pistaciaecola* Stary, 1962 parasitism affects the development of Fordini galls (Hemiptera: Aphididae).
Moreno-González, V.; Casiraghi, A.; Álvarez, R.; Pérez Hidalgo, N.

Cóctel de bienvenida en Terraza Panorámica – Panoramis Life & Business (planta 2) con vistas a los fuegos artificiales: 21:30 en Centro Comercial Panoramis (Puerto)

MARTES 27 DE JUNIO

PLENARIA II (09:00-10:00). El papel de la biodiversidad y los insectos en la salud planetaria. Fernando Valladares.
Presenta: Eduardo Galante.

SESIÓN ORAL III (10:00-11:00). Moderadora: Marta Goula.

9. Interannual diversity shifts in spider assemblages of tree hollows.
Martínez-Devesa, G.*; Hernández-Corral, J.; Micó, E.
10. The temporal succession of saproxylic springtails populations in Mediterranean oak forests of the El Rebollar Natural Area (Salamanca, Spain).
Luciáñez, M.J.; Núñez, A.; Martínez, A.
11. How might trophic guild and microhabitat use affect morphological dispersal traits of saproxylic beetles?
Martínez-Pérez, S.; Aguirrebengoa, M.; Sánchez-Pérez, D.; Galante, E.; Micó, E.
12. On how saproxylic interaction patterns change over time.
Conca-Esquembre, A.; Quinto, J.; Marcos-García, M.A.; Micó, E.

COFFEE BREAK: 11:00-11:30

SESIÓN ORAL IV (11:30-12:30). Moderador: Marcos Méndez.

13. Impact of body size on distribution patterns of phoretic mites in the multi-symbiont host *Rhynchophorus ferrugineus* (Olivier, 1790) (Curculionidae: Coleoptera).
Matos, I.*; Silva, D.; Rangel, L.F.; Santos, M.J.; Ayra-Pardo, C.
14. Faunistics of the Ibero-Balearic butterflies (Lepidoptera: Papilionoidea): present geographic gaps.
García-Barros, E.; Romo, H.; Castro-Cobo, S.; Ledesma, E.; Munguira, M.L.
15. Flying towards extinction: the impact of climate change on mountain butterflies of the genus *Erebia* Dalman, 1816 (Lepidoptera: Nymphalidae).
Romo; H.; García-Barros, E.; Wilson, R.J.; Mateo, R.G.; Munguira, M.L.

16. New Atlas and Red book of the Spanish Butterflies.
Castro-Cobo, S.; García-Barros Saura, E.; Ledesma Ruiz, E.; López Munguira, M.; Romo, H.

SESIÓN ORAL V (12:30-13:30). Moderador: Marcos Méndez.

17. Tracking the pieces of the *Adesmia* Fischer de Waldheim, 1822 puzzle within the arid tribe Adesmiini (Coleoptera: Tenebrionidae).
Mas-Peinado, P.; Kamiński, M.J.; Soldati, L.; Kergoat, G.J.; Condamine, F.L.; Smith, A.
18. Contrasting taxonomic and molecular approaches to assess the hidden biodiversity of Trichoptera and Chironomidae in the Pyrenees (NE Spain).
Acosta, R.; López-Rodríguez, N.; Prat, N.; Cañedo-Argüelles, M.; Cunillera-Montcusí, D.; Ribera, C.; Troncoso, R.; González, M.; Fernández-Calero, J.M.; Fortuño, P.; Soria, M.; Quevedo-Ortiz, G.; Bonada, N.
19. Haplotypic differentiation in wide-ranging species, with cuckoo wasps (Hymenoptera: Chrysididae) as a case study.
Gil-Gutiérrez, A.M.*; Puerta-Rodríguez, L.; Rosas-Ramos, N.; García-Paris, M.
20. Contrasting phylogeographic patterns and ecological distribution models in Iberian *Forficula* Linnaeus, 1758 (Dermaptera: Forficulidae).
Jurado-Angulo, P.*; García-París, M.

COMIDA: 13:30-15:00

MESA REDONDA I (15:00-16:15): ONE HEALTH.
Modera: Xiomara Cantera.
Intervienen: Fernando Valladares, Fernando Maestre, Rubén Bueno Marí

SESIÓN ORAL VI (16:15-17:15). Moderador: José Luis Nieves.

21. Phylogeographic structure of endemic species of the central zone of the Iberian Peninsula affected by agricultural intensification.
Puerta-Rodríguez, L.; Rosas-Ramos, N.; García-París, M.
22. Multi-year phenology modelling of bark beetles (Coleoptera: Curculionidae: Scolytinae) under Mediterranean conditions.
Herrera, C.; Comparini, C.; Leza, M.
23. Boring beetles (Coleoptera: Curculionidae: Scolytinae) in *Pinus pinea* L. pine forests in the Llobregat Delta (prov. Barcelona, Catalonia, Spain).
Torrejón, B.*; Gutiérrez, E.; Goula, M.
24. Climate change as a driver of insect invasions: Dispersal patterns of a species colonizing a new region.
Gil Tapetado, D.; López-Collar, D.; Gómez, J.F.; Mañani-Pérez, J.; Cabrero-Sañudo, F.J.; Muñoz, J.

COFFEE BREAK: 17:15-17:45

SESIÓN ORAL VII (17:45-18:30). Moderador: José Luis Viejo.

25. Mesovoid shallow substratum (MSS): habitat mapping and entomofauna in Portugal.
Eusébio, R.P.*; Fonseca, P.E.; Rebelo, R.; Mathias, M.L.; Reboleira, A.S.P.S.
26. Mediterranean university campuses enhance butterfly (Lepidoptera) and beetle (Coleoptera) diversity.
Arjona, J.M.*; Ibáñez-Álamo, J.D.; Sanllorente, O.
27. Urban arthropods: a meta-analysis.
Sanllorente, O.; Blanco, E.; Sánchez-Tójar, A.; Ibáñez-Álamo, J.D.

SESIÓN ORAL VIII (18:30-19:00). Moderador: José Luis Viejo.

Artrópodos y salud

28. Forensically important arthropods associated with aquatic environments in Malaysia.
Ivorra, T.; Farahnaz, M.A.; Rahimi, R.; Yong, S.K.; Houssaini, J.; Heo, C.C.
29. The use of volatile pyrethroids as spatial repellents for protecting humans by disrupting host-seeking behavior.
Moreno-Gómez, M.; Monsonís-Güell, E.; Miranda, M.A.; Bueno-Marí, R.
30. Assessing the efficacy of three essential oils as surface repellents against the German cockroach *Blattella germanica* (Linnaeus, 1767) (Blattodea: Blattellidae).
Manzanares-Sierra, A.*; Gómez, C.; Abril, S.; Monsonis, E.; Moreno-Gómez, M.

VISITA GUIADA Ciudad de Alicante: 20:30 en la Oficina de Turismo de Alicante (Puerto)

MIÉRCOLES 28 DE JUNIO

PLENARIA III (09:00-10:00): Exploring morphological diversity within a clade of Coleoptera. Mario García París.
Presenta: Estefanía Micó.

SESIÓN ORAL IX (10:00-11:00). Moderador: Javier Quinto.

Taxonomía, sistemática y evolución

31. First description of the immature stages of species of *Pelecocera* Meigen, 1822 hoverflies (Diptera: Syrphidae).
Orengo-Green, J.J.*; Ricarte, A.; Bloss, L.; Marcos-García, M.A.
32. Microtomographic study of the larval anatomy of the hoverfly *Sphaerophoria rueppellii* (Wiedemann, 1820) (Diptera: Syrphidae).
Alba-Tercedor, J.; Marcos García, M.A.
33. Sexual conflict in Lepidoptera, the case of the Cornuti Caltrop in *Peridea anceps* (Goeze, 1781) (Lepidoptera: Notodontidae).
Bernat-Ponce, S.; Cordero, C.; Baixeras, J.
34. DNA barcoding as a tool for taxonomic delimitation of Iberian moths at the specific level.

Ortiz, A.S.; Rubio, R.M.; Guerrero, J.J.; Garre, M.; Girdley, J.; Yela, J.L.

COFFEE BREAK: 11:00-11:30

SESIÓN ORAL X (11:30-12:30). Moderador: José Vicente Falcó.

35. Highly toxic venoms in the clade Araneae.
Cortés-Fossati, F.; Méndez Iglesias, M.
36. Molecular and morphological characterization of the *Kalotermes dispar*-complex (Blattodea: Kalotermitidae) from the Canary Islands.
Hernández-Teixidor, D.; Cussigh, A.; Suárez, D.; García, J.; Scheffrahn, R.H.; Luchetti, A.
37. A review of the genus *Eumerus* Meigen, 1822 (Diptera: Syrphidae) from the Canary Islands, Spain.
Aguado-Aranda, P.*; Miró-Espí, D.; Ricarte, A.; Kelso, S.; Skevington, J.H.; Marcos-García, M.A.
38. Monograph on the Ibero-Balearic Eristalinae (Diptera: Syrphidae): A 'Fauna Ibérica' Project.
Ricarte, A.; Nedeljković, Z.; Aguado-Aranda, P.; Ballester-Torres, I.; Orengo-Green, J.J.; Quinto, J.; Marcos-García, M.A.

SESIÓN ORAL XI (12:30-13:30). Moderador: José Vicente Falcó.

39. Updating the knowledge of the genus *Cheilosia* Meigen, 1822 (Diptera: Syrphidae) in the Sierra Nevada National Park: implications for conservation.
Ballester-Torres, I.*; Nedeljković, Z.; Marcos-García, M.A.; Ricarte, A.
40. Towards a systematic revision of the subgenus *Iberomelia* Mas-Peinado et al., 2018 (*Pimelia*: Tenebrionidae).
Béjar-Hermoza, S.; García-París, M.; Ruiz, J.L.; Castro-Tovar, A.; Mas-Peinado, P.
41. Current state of knowledge of Iberian cynipids (Hymenoptera: Cynipidae), with citations of new or interesting species, new evidence on heterogonic cycles of some species hitherto known by a single generation and the resulting synonymies.
Nieves-Aldrey, J.L.; Gavira, O.; Rodríguez Rojo, M.P.; Gómez, J.F.; Nicholls, J.A.; Gil Tapetado, D.
42. Is national taxonomic entomology declining? Spain as a case study.
Cortés-Fossati, F.; Caro-Miralles, E.; Barreda, J.M.; Caballero-López, B.; Castro, A.; Cuadrado, M.; Díaz-Martínez, C.; Galante, E., Germain, J.; Gil Tapetado, D.; Jiménez-Dalmau, A.; Melic, A.; Munguira, M.L.; Muñoz-Maciá, G.; Sáez, L.; Tormo, J.E.; Verdugo, A.; Yela, J.L.; Méndez, M.

COMIDA: 13:30-15:00

PLENARIA IV (15:00-16:00): How micro-computed tomography (micro-CT) is revolutionising entomological understanding. A powerful tool beyond the purely anatomical. Javier Alba.
Presenta: José Ramón Verdú.

SESIÓN ORAL XII (16:00-17:15). Moderadora: Pilar Gurrea.

43. Systematics of western Mediterranean *Stenalia* Mulsant, 1856 (Coleoptera: Mordellidae).
Conca-Esquembre, A.*; Jurado-Angulo, P.; García-París, M.
44. Female terminalia morphology and phylogenetic relationships among *Pimelia* Fabricius, 1775 (Coleoptera: Tenebrionidae).
Cedeño Panchez, B.*; García-París, M.; Mas-Peinado, P.
45. Testing conflicting taxonomic hypotheses in myrmecophilous *Oochrotus* Lucas, 1852 (Coleoptera: Tenebrionidae).
Gómez-Vicioso, J.; Conca-Esquembre, A.; Jurado-Angulo, P.; García-París, M.
46. Integrative phylogeny and evolution of *Abax* Bonelli, 1810 (Coleoptera: Carabidae: Pterostichini).
Serrano J.; Brandmayr P.; Colombetta G.; López-López A.

COFFEE BREAK: 17:00 -17:30

Biología y funciones ecosistémicas

SESIÓN ORAL XIII (17:30-18:45). Moderadora: Pilar Mier.

47. The Objetivo Polinizadores action plan: pollinators and rural development in La Rioja Biosphere Reserve.
Mazuelas, D.; Parada, A.; Gómez, M.; Alegría, A.; Gómez, S.
48. Characteristics of an orange-nymph mutant in the biological control agent *Orius laevigatus* (Fieber, 1860) (Hemiptera: Anthocoridae).
Rodríguez-Gómez, A.; Donate, A.; Sánchez-Martínez, I.; Balanza, V.; Abelaira, A.B.; Reche, M.C.; Bielza, P.
49. Genetic improvement of Mediterranean populations of *Orius laevigatus* (Fieber, 1860) (Hemiptera: Anthocoridae) for adaptation to low temperatures.
Abelaira, A.B.; Mendoza, J.E.; Sánchez-Martínez, I.; Reche, M.C.; Balanza, V.; Donate, A.; Rodríguez-Gómez, A.; Bielza, P.
50. Pollen as a supplement or partial substitute for *Ephestia kuehniella* Zeller, 1879 (Lepidoptera: Pyralidae) eggs in mass rearing of *Orius laevigatus* (Fieber, 1860) (Hemiptera: Anthocoridae).
Reche, M.C.; Rodríguez-Gómez, A.; Donate, A.; Balanza, V.; Abelaira, A.B.; Sánchez-Martínez, I.; Bielza, P.
51. Optimization of laboratory rearing of *Chelonus inanitus* (Linnaeus, 1767) (Hymenoptera: Braconidae).
Magaña-Guzmán, A.; Morales, I.; Viñuela, E.

ASAMBLEA SPEN y ASAMBLEA AeE: 19:00-20:00

JUEVES 29 DE JUNIO

PLENARIA V (09:00-10:00): Biological control: a nature based solution for controlling insect pests. Manuela Rodrigues Branco.
Presentador: Javier Quinto.

SESIÓN ORAL XIV (10:00-11:00). Moderador: Enrique García Barros.

52. Effect of essential oils on *Myzus persicae* Sulzer, 1776 (Hemiptera: Aphididae) and on its predator *Sphaeroporia rueppellii* Wiedemann, 1830 (Diptera: Syrphidae).
López-Santos-Olmo, M.*; Marcos-García, M.A.; Casas, J.L.
53. Compatibility of *Chrysoperla carnea* (Stephens, 1836) (Neuroptera: Chrysopidae) with plant essential oil nanoemulsions.
Dáder, B.; Viñuela, E.; Pascual, MJ.; Fereres, A.; Moreno, A.
54. Non-toxic effects of anthelmintic phytochemicals on dung beetles (Coleoptera: Scarabaeidae): the case of thymol, carvacrol, cinnamaldehyde and garlic oil as potential alternatives to ecotoxic veterinary medicinal products.
Cortez, V.; Verdú, J.R.; Rosa-García, R.; Ortiz, A.J.; García-Prieto, U.; Lumaret, J.P.; Carmelo García-Romero, C.; Sánchez-Piñero, F.
55. Targeted control of *Drosophila suzukii* Matsumura, 1931 (Diptera: Drosophilidae) using spider venom peptides.
Regalado, L.; Sario, S.; Mendes, R.; Valle, J.; Harvey, P.; Teixeira, C.; Gomes, P.; Andreu, D.; Santos, C.

COFFEE BREAK: 11:00-11:30

SESIÓN ORAL XV (11:30-12:30). Moderador: Fernando Cobo.

56. Identification of *Drosophila suzukii* Matsumura, 1931 (Diptera: Drosophilidae) native predators in Portuguese berry orchards as a powerful first step toward biological control.
Sario, S.*; Gonçalves, F.; Torres, L.; Santos, C.
57. Push-pull strategy for sustainable management of *Philaenus spumarius* (Linnaeus, 1758), the European vector of *Xylella fastidiosa* (Wells *et al*., 1987).
Morente, M.; Ramírez, M.; De las Heras-Bravo, D.; Lago, C.; Benito, A.; Moreno, A.; Fereres, A.
58. Antennal sensilla pattern of the *Anagyrus* Howard, 1896 males (Hymenoptera: Encyrtidae) attacking mealybugs in Eastern Spain.
Soler Feliu, J.M.; Falcó Garí, J.V.
59. Proactive biological control of *Lycorma delicatula* (White, 1845) (Hemiptera: Fulgoridae) in west coast of USA: from classical to conservation?
Gómez Marco, F.; West, M.; Torres, J.B.; Hoddle, M.

SESIÓN ORAL XVI (12:30-13:30). Moderador: Fernando Cobo.

60. The influence of hemispheric shift on the life cycle of the biocontrol agent *Trichilogaster acaciaelongifoliae* (Froggatt, 1892) (Hymenoptera: Pteromalidae).
Nunes, A.S.; López-Núñez, F.A.; Neto Duarte, L.; Marchante, E.; Marchante, H.
61. Antagonistic effects on double infection by plant viruses affects the attraction of the aphid to its host plant.
Garzo, E.; Madolell, P.; Moreno, A.; Fereres, A.
62. Do ivermectin residues modify the volatile chemical composition of dung and influence the attraction of dung beetles (Coleoptera: Scarabaeidae)?
Urrutia, M.A.; Cortez, V.; Rosa-García, R.; García-Prieto, U.; Verdú, J.R.

63. The main pitfalls to translate insect diversity into economic benefit.
Vaca, M., Micó, E.

COMIDA: 13:30-15:00

SESIÓN ORAL XVII (15:00-16:00). Moderador: Artur Serrano.

64. Hard ticks (Ixodida: Ixodidae) in the environment of Tapada Nacional de Mafra (Portugal).
Fernández, N.; Soares, J.; Soares, N.; Sánchez Sánchez, M.; Amor Morón, R.; González Redondo, A.; Olmeda García, A.S.; Valcárcel, F.
65. *Myianoetus muscarum* (Linnaeus, 1758) (Astigmata: Histiostomatidae) hypopi associated to *Synthesiomyia nudiseta* (van der Wulp, 1883) (Diptera: Muscidae).
Saloña-Bordas, M.I.; Ivorra, T.; Abellán, M.; Martínez-Sánchez, A.
66. Foraging food resources by the subterranean termite, *Reticulitermes grassei* (Clemént, 1978) Blattodea: Rhinotermitidae.
Duarte, S.; Duarte, M.; Nunes, L.
67. New data on the relationship between hoverflies and holoparasitic broomrape plants in the Iberian Peninsula (Diptera: Syrphidae; Lamiales: Orobanchaceae).
Aracil, A.; Pérez-Bañón, C.; Juan, A.; Bosquet, A.; Gijón, D.; Kočiš Tubić, N.; Vujić, A.; Rojo, S.

SESIÓN ORAL XVIII (16:00-17:00). Moderador: Artur Serrano.

68. Pre-designed and spontaneous cover crops in citrus: building up complex trophic webs for Conservation Biological Control.
Casiraghi, A.*; Pérez Hidalgo, N.; Urbaneja, A.; Monzó, C.
69. What is the risk associated with the citrus greening disease vector *Trioza erytreae* (Del Guercio, 1918) (Hemiptera: Triozidae) for citrus industry in the Iberian Peninsula?
Godefroid, M.
70. The eradication process of *Vespa velutina* Lepeletier, 1836 (Hymenoptera: Vespidae) in Majorca.
Leza, M., Quetglas, M.; Adelino, J.; Jurado, J.; Herrera, C.
71. CONTROLVESPA: Development of strategies for the control of *Vespa velutina nigrithorax* Buysson, 1905 (Hymenoptera: Vespidae) invasion.
Souto, P.; Capela, N.; Sarmento, A.; Leston, S.; Ramos, F.; Freitas, A.; Batista, R.; Gouveia, B.; Viegas, C.; Chehreh, B.; Sousa, J.P.; Azevedo-Pereira, H.

COFFEE BREAK: 17:00-17:30

MESA REDONDA II (17:30-18:45). Insectos y funciones ecosistémicas: retos y propuestas de conservación.
Modera: Mª Ángeles Marcos-García.
Intervienen: Jean Pierre Lumaret, Estrella Hernández Suárez, Javier Alba Tercedor.

CENA CLAUSURA: 21:00

Relación de pósteres por área temática

Difusión y ciencia ciudadana

1. Unity will make us stronger: The union of the Biodiversidad Virtual platform into Observation.org International. A bet for tomorrow.
Gil Tapetado, D.; Rabadán-González, J.; Sesma, J.M.; Verheul, D.; Ordóñez, A.
2. Citizen science and its role in entomological research: study in Teatinos Campus (University of Málaga).
Colorado-Pedrero L.; Cozano-Pérez, P.; Dueñas-Rojas, A.*; Farfán, M.A.; Javier-Cabrera, C.; Jiménez, A.; Martín-Muñoz, A.; Muñoz-Ruiz, V.; Quesada, M.A.
3. The challenge of monitoring hoverflies (Diptera: Syrphidae) as pollinators: preliminary results of the SPRING project (Horizon Europe) in Spain.
Bosquet, A.*; Gijón, D.; Ferre, T.; Aracil A.; Pérez-Bañón, C.; Rojo, S.
4. Citizen science strikes again: the expansion of sorghum aphid, *Melanaphis sorghi* (Theobald, 1904) (Hemiptera: Aphididae), in the Mediterranean basin.
Casiraghi, A.*; Addelfio, N.; Ardenghi, N.M.G.; Pérez Hidalgo, N.

Biodiversidad, biogeografía y conservación

5. Catalogue of beetles of the Valencian Community (Coleoptera).
Velázquez de Castro, A.J.; Cabrera, R.; Ibáñez Orrico, M.A.; Pérez Onteniente, A.; Teruel Montejano, S.; Montagud, S.
6. First population inventory of the narrow Iberian endemic *Cephalota deserticoloides* (Codina, 1931) (Coleoptera, Cicindelidae) in Saladares del Guadalentín Natural Park (Murcia, Spain).
Sabah-Mazzetta, S.C.; Lencina, J.L.; Muñoz, M.C.; Gallego, D.
7. Endemisms of Sierra Nevada present in the scientific collections of the University of Granada.
Aguayo, D.; Sandoval, P.; Ruano, F.; Tierno de Figueroa, M.; Pascual, F.; Tinaut, A.
8. The entomofauna of Sierra Nevada in the scientific zoological collection of the University of Granada in the context of the Smart Ecomountains project.
Sandoval, P.; Aguayo, D.; Ruano, F.; Pascual, F.; Tinaut, A.
9. Local extinction process of *Coenonympha pamphilus* (Linnaeus, 1758) (Lepidoptera: Nymphalidae) in the east and southeast of the Iberian Peninsula.
Gil Tapetado, D.

10. The rose chafers (Coleoptera: Scarabaeidae: Cetoniinae) of the Gorongosa National Park (Mozambique). A preliminary approach.
Serrano, A.; Boieiro, M.; Martins da Silva, P.
11. Update of the distribution of *Halyomorpha halys* (Stål, 1855) (Hemiptera: Pentatomidae) in the Iberian Peninsula, Balearic Islands and Macaronesia.
Escudero-Colomar, A.; Roca-Cusachs, M.; Tomàs, J.; Torrejón, B.*; Goula, M.
12. Prevalence of chewing lice (Phthiraptera) in Iberian thrushes (Aves: Turdidae). Bernal, I.; Talabante, C.; Viejo, J.L.
13. Exploring the aquatic insect biodiversity of the Canary Islands: The BIOACUANA Project.
Acosta, R.; Fernández-Calero, J.M.; Latron, J.; Gallart, F.; Arribas, P.; Emerson, B.; Llorens, P.; Cid, N.; Bonada, N.; Hermoso, V.; Soria, M.; González, M.; Olcese-Rojas, M., Cañedo-Argüelles, M.
14. Global patterns on the diversity of chalcid wasps (Hymenoptera: Chalcidoidea): resolving gaps on worldwide absent species.
Gómez, J.F.; Gil Tapetado, D.; Nieves-Aldrey, J.L.; Rodríguez, A.
15. Diversity and abundance of terrestrial arthropods as a function of plant community structure.
Miralles, I.; Gallego, D.; Bautista, S.
16. Distribution Atlas of Iberian quadrifid Noctuoidea: state of the art.
Yela, J.L.; Rubio, R.M.; Guerrero, J.J.; Garre, M.; Ortiz, A.S.
17. A preliminary DNA barcode library for Iberian Notodontidae.
Ortiz, A.S.; Rubio, R.M.; Guerrero, J.J.; Garre, M.; Girdley, J.; Yela, J.L.
18. Entomosfera: A website for the southeastern Iberian Lepidoptera.
Ortiz, A.S.; Rubio, R.M.; Lencina, F.; Guerrero, J.J.; Garre, M.; Girdley, J.; Castaño, F.; Yela, J.L.
19. DNA barcoding of the genus *Apaidia* Hampson, 1900 for species delimitation in the Western Mediterranean fauna (Lepidoptera: Erebidae).
Ortiz, A.S.; Rubio, R.M.; Guerrero, J.J.; Garre, M.; Yela, J.L.
20. *Calliphora splendens* Macquart, 1838: an endemic blowfly on laurisilva forest from Canary Islands (Diptera: Calliphoridae).
Martínez-Sánchez, A.; Thomas, A.; Villet, M.; Szpila, K.; Velásquez, Y.; Ståhls, G.; Rojo, S.
21. Preliminary study of the effect of forest fires on springtails (Hexapoda: Collembola) populations in a pine forest of *Pinus nigra* Arn. in the Serranía de Cuenca.
Luciáñez, M.J.; Vega, M.
22. Distribution and diversity of native and exotic species of springtails (Hexapoda: Collembola) in the soils of Deception Island (South Shetland, Maritime Antarctica). Velasco Sanz, I.; Luciáñez Sánchez, M.J.
23. Thermal tolerance in the minute moss beetle genus *Hydraena* Kugelann, 1794 (Coleoptera: Hydraenidae): first data on their acclimation capacity to climate change. Valladares, L.F.; Bilton, D.T.; Villastrigo, A.
24. Adult thermoregulatory behaviour does not provide an adaptive explanation for a reflectance-climate relationship (Bogert's pattern) in Iberian butterflies.
Alamo, M.; García-Barros, E.; Romo, H.
25. Species of spiders associated with the different environments of a Zoo.
García, J.

26. Spiders occupy their place: microhabitat community segregation at small spatial scale.
Gil Tapetado, D.; Morano, E.; Bonal Andrés, R.
27. Including juveniles changes the results of spider community analyses.
Gil Tapetado, D.; Morano, E.; Bonal Andrés, R.
28. Trophic niche breath and overlap in two sympatric species of the genus *Serratella* [*Serratella ignita* (Poda, 1761) and *Serratella albai* González del Tánago & García de Jalón, 1983] (Insecta: Ephemeroptera).
Cobo, F.; Barca, S.; Vieira-Lanero, R.
29. Ground-dwelling arthropod communities along a gradient of anthropogenic pressure in Menorca.
Rosas-Ramos, N.; Asís, J.D.; García-París, M.; Tobajas-Talaván, E.; de Paz, V.; Puerta-Rodríguez, L.; Baños-Picón, L.
30. Larval habitats and diversity of mosquitoes (Diptera: Culicidae) in temperate areas of Galicia (NW Spain).
Martínez-Barciela, Y.; Polina, A.; Garrido, J.

Taxonomía, sistemática y evolución

31. An attempt to discriminate some endemic Pamphagidae species from the Canary Islands based on the chorion features (Orthoptera).
Ubero, N.; López, H.; García, M.D.; Presa, J.J.
32. The importance of scientific illustration in entomological studies in the age of photography and artificial intelligence.
Matos, I.; Barros, J.; Gomes, A.S.; Santos, M.J.
33. Beetles of the East of Spain. Field guide for its identification.
Pérez Onteniente, A.; Argente Simarro, S.
34. The scientific value of private collections. The case of the Carlos Diana's butterfly collection.
Montagud, S.
35. Species of mole crickets (Orthoptera: Gryllotalpidae) in the entomological collection ENV of the University of Valencia.
Barreda Llorens, M.; Gimeno Alpuente, A.; Lis Cantín, A.; López Peña, D; Falcó Garí, J.V.
36. An updated and agreed-upon proposal for the common names of dragonflies and damselflies in Spanish.
Miralles-Núñez, A.; Zaldívar, C.; Prunier, F.; Cabana, M.; Torralba-Burrial, A.; Luque, P.; de Vega, L.; Cordero-Rivera, A.
37. Description of the female of *Labium walkeri* Turner & Waterson, 1920 (Hymenoptera: Ichneumonidae: Labeninae) from Australia.
Royo, J.M.*; Bordera, S.
38. Metagenomic exploration of *Coxiella* (Derrick, 1939) Philip, 1948 endosymbionts diversity in ticks: new insight from phylogenomic analyses.
Santodomingo, A.; Thomas-Sánchez, R.; Ossa-López, P.; García-París, M.; Sánchez, M.; Fernández, N.; Olmeda, A.S.; Valcárcel, F.; Nava, S.; Muñoz-Leal, S.; Uribe, J.E.
39. *Hyalomma* Koch, 1844 (Acari: Ixodidae) phylogeny: A mitogenomic approach.
Uribe, J.E.; Thomas, R.; Santodomingo, A.; Ossa-López, P.; Sánchez, M.; Fernández, N.; Valcárcel, F.; Olmeda, A.S.

40. Dividing the indivisible: first steps towards the morphological characterization of molecular clades within *Synergus* Hartig, 1840 (Hymenoptera: Cynipidae) to describe new genera.
Lobato-Vila, I.; Pujade-Villar, J.
41. Taxonomy and differences in the life cycle of two subspecies of *Musca domestica* Linnaeus, 1758 in Spain (Diptera: Muscidae).
Abellán, M.*; Martínez-Sánchez, A.; Grzywacz, A.; Rojo, S.
42. taxonomist: an R package to accelerate taxonomy.
Moreno-González, V.; Gallego-Clemente, E.

Biología y funciones ecosistémicas

43. Arthropods and ecosystem services: a board game for scientific literacy.
Muñoz, A.B.*; Bermejo A.; Gálvez, R.
44. Biocontrol of *Drosophila suzukii* Matsumura, 1931 (Diptera: Drosophilidae), a pest of red fruits, using the cosmopolitan endoparasitoid *Trichopria drosophila* (Perkins, 1910) (Hymenoptera: Diapriidae): does host preference matter?
Couto, M.; Santos, M.; Sario, S.; Gaião, D.; Lopes, J.; Santos, C.; Mendes, R.J.
45. Population dynamics of *Cybocephalus nipponicus* Endrödy-Younga, 1971 (Coleoptera: Cybocephalidae) in Spanish mango orchards.
del Pino, M.; Wong, M.E.; Bienvenido, C.; Rodríguez, M.C.; Vela, J.M.
46. Community of ants (Hymenoptera: Formicidae) associated with mango orchards in southern Spain.
Wong, M.E.; Tinaut, A.; Bienvenido, C.; del Pino, M.; Rodríguez, M.C., Vela, J.M.; Porcel, M.
47. A snapshot in time: composition of native gall-inducing cynipids and their associated parasitoids and inquilines in contact zones with chestnut trees infested by the invasive *Dryocosmus kuriphilus* Yasumatsu, 1951 (Hymenoptera: Cynipidae).
Gil Tapetado, D.; Polidori, C.; Gómez, J.F.; Nieves-Aldrey, J.L.
48. Present and potential biological control agents of invasive alien plants in Portugal.
Nunes; A.S.; López-Núñez, F.A.; Neto Duarte, L.; Sobral, O.; Claro, A.M.; Roldão Almeida, M.; Martins, S.; Palhas, J.; Marchante, E.; Marchante, H.
49. Selection of plant species to form perimeter hedges in the cultivation of citrus in the Canary Islands.
Montero, N.; Hernández-Suárez, E.; Álvarez, C.; Estévez, J.R.; García, S.; Cartaya, N.; Díaz, C.; Monzó, C.
50. The management of the Asian hornet *Vespa velutina* Lepeletier, 1836 (Hymenoptera: Vespidae) and the protection of assets: the case of vineyards in NW Spain.
Rodríguez Lueje, Y.; Jácome-Pumar, A.; Servia, M.J.
51. Chasing Asian hornets *Vespa velutina nigritorax* Buysson, 1905 (Hymenoptera: Vespidae) to find the nest.
Lagoa, A.*; Villar, I.; Mato, S.; Garrido, J.
52. Acute contact toxicity of biopesticides to adult *Vespa velutina nigrithorax* Buysson, 1905 (Hymenoptera: Vespidae) in laboratory.
Souto, P.; Sarmento, A.; Azevedo-Pereira, H.; Haouzi, M.; Darrouzet, E.; Sousa, J.P.

53. Functional responses to anthropogenic disturbance and the importance of selected traits: a study case using dung beetles (Scarabaeoidea: Scarabaeinae).
Giménez Gómez, VC.; Verdú, J.R.; Casanoves, F.; Zurita, G.A.
54. GREENCATTLE Project: Nature-based solutions for parasite control in extensive livestock farming, restoration of dung insect biodiversity and associated ecosystem services.
Cortez, V.; Verdú, J.R.; Rosa-García, R.; Sánchez-Piñero, F.; Villén-Molina, E.; Ortiz, A.J.; Lumaret, J.P.; García-Romero, C.
55. Development ability and establishment of *Philaenus spumarius* (Linnaeus, 1758) (Hemiptera: Aphrophoridae) on different host plants.
Bernat-Ponce, S.; García-García, R.; Aure, C.M.; Nieves, L.; Monzó, C.; Bouvet, J.P.; Beitia, F.
56. Fungal isolated from the red palm weevil (*Rhynchophorus ferrugineus* Olivier, 1790, Coleoptera: Curculionidae) and its associated mites in northern Portugal.
Matos, I.; Silva, D.; Rangel, L.F.; Santos, M. J.; Ayra-Pardo, C.
57. Searching for functional groups of urban butterflies in the city of Madrid and their use as bioindicators.
Tejeda, A.; López-Collar, D.; Grzechnik, S.; González-Ferreiro, M.; Gil Tapetado, D.; Asenjo, A.; Jiménez, I.; Cabrero-Sañudo, F.J.
58. Species-specific variations in cuticular hydrocarbons profile in response to Urban Heat Island effect in wild bees and a wasp.
Ferrari, A.*; Rodríguez León, D.S.; Schmitt, T.; Polidori, C.
59. Application of remote sensing to the quantification of defoliation caused by *Lymantria dispar* (Linnaeus, 1758) in the "Los Alcornocales" Natural Park (Cádiz, Spain) (Lepidoptera: Erebidae).
Bernal, I.; Sánchez-Martínez, L.J.; Zambrano-Martínez, S.; Viejo, J.L.
60. Mass-rearing and biology of the almond moth *Cadra cautella* (Walker, 1863) (Lepidoptera: Pyralidae) under laboratory-simulated food storage conditions.
López-Peña, D.; Gimeno-Alpuente, A.; Jiménez-Peydró, R.; Falcó-Garí, J.V.
61. Another silent invasion: *Xyleborus bispinatus* Eichhoff, 1868 (Coleoptera: Curculionidae: Scolytinae) in Iberian Peninsula and Balearic Islands.
Gallego, D.; di Sora, N.; Molina, N.; González-Rosa, E.; Mas, H.; Knizek, M.

Artrópodos y salud

62. Discovering a tiny unknown: REGAVIVEC results for biting midges in Galicia, NW Spain.
Polina, A.*; Martínez-Barciela, Y.; Pereira, J.M.; Íñiguez, E.; Pousa, A.; Otero, J.C.; Garrido, J.
63. A review of the biology of *Chrysomya megacephala* (Fabricius, 1794) in SE Spain, and its role in forensic science (Diptera: Calliphoridae).
Roberts, L.C.*; Martínez-Sánchez, A.; Rojo, S.
64. Sarcosaprophagous Calliphoridae species along an altitudinal gradient in Southeastern Iberian Peninsula (Insecta, Diptera).
Pérez-Marcos, M.; Ruíz-Franco, L., López-Gallego, E.; García, M.D.; Arnaldos, M.I.
65. Corpse hiding strategy: does the vegetation covering affect the faunal succession?
Arnaldos, M.I.; Higueras, P.; Maeso, F.J., García, M.D.

66. Could the benthic macroinvertebrate communities be used as indicator of microplastic pollution in rivers?
Gutiérrez, D.; Villar, I.; Martínez-Barciela, Y.; Polina, A.; Álvarez-Troncoso, R.; Soto, B.; Mato, S.; Garrido, J.

67. Exploring natural repellents: a laboratory study of the efficacy of seven essential oils as surface repellents against wild ants of *Lasius* Fabricius, 1804 genus (Hymenoptera: Formicidae).
Manzanares-Sierra, A.*; Gómez, C.; Abril, S.; Monsonis, E.; Moreno-Gomez, M.

Relación de moderadores de sesión

Sesión: área temática	Día (jun. 2023)	Hora	Moderador/a
I: Difusión y Ciencia Ciudadana/ Biodiversidad, Biogeografía y Conservación	26	17:30-18:30	Antonio Ricarte Sabater
II: Biodiversidad, Biogeografía y Conservación	26	18:30-19:30	Antonio Ricarte Sabater
III: Biodiversidad, Biogeografía y Conservación	27	10:00-11:00	Marta Goula Goula
IV: Biodiversidad, Biogeografía y Conservación	27	11:30-12:30	Marcos Méndez Iglesias
V: Biodiversidad, Biogeografía y Conservación	27	12:30-13:30	Marcos Méndez Iglesias
VI: Biodiversidad, Biogeografía y Conservación	27	16:10-17:10	José Luis Nieves Aldrey
VII: Biodiversidad, Biogeografía y Conservación/ Artrópodos y Salud	27	17:40-18:25	José Luis Viejo Montesinos
VIII: Artrópodos y Salud	27	18:25-18:55	José Luis Viejo Montesinos
IX: Taxonomía, Sistemática y Evolución	28	10:00-11:00	Javier Quinto Cánovas
X: Taxonomía, Sistemática y Evolución	28	11:30-12:30	José Vicente Falcó Garí
XI: Taxonomía, Sistemática y Evolución	28	12:30-13:30	José Vicente Falcó Garí
XII: Taxonomía, Sistemática y Evolución	28	16:00-17:15	María del Pilar Gurrea Sanz
XIII: Biología y Funciones Ecosistémicas	28	17:45-18:45	Pilar Mier Durante
XIV: Biología y Funciones Ecosistémicas	29	10:00-11:00	Enrique García Barros
XV: Biología y Funciones Ecosistémicas	29	11:30-12:30	Fernando Cobo Gradín
XVI: Biología y Funciones Ecosistémicas	29	12:30-13:30	Fernando Cobo Gradín
XVII: Biología y Funciones Ecosistémicas	29	15:00-16:00	Artur Serrano
XVIII: Biología y Funciones Ecosistémicas	29	16:00-17:00	Artur Serrano

La Estación Biológica de Torretes-Jardín Botánico de la Universidad de Alicante

La Estación Biológica de Torretes nació en el año 2003, gracias a un convenio de colaboración entre el Excmo. Ayuntamiento de Ibi y la Universidad de Alicante, a través del Centro Iberoamericano de la Biodiversidad (CIBIO). Este espacio está ubicado en el municipio de Ibi (Alicante), y constituye un importante centro de investigación, conservación de la biodiversidad y divulgación científica, además de ser un corredor biológico que conecta las llanuras centrales de la provincia con las comarcas montañosas del norte. Todo un laboratorio vivo de ecosistemas típicamente mediterráneos y modelo de referencia para contribuir a la construcción de ambientes habitados más racionales y sostenibles en los entornos urbanos. En la estación, se reservan espacios a las especies protegidas y se realizan labores de divulgación y concienciación de los visitantes sobre la mejora medioambiental y el cambio climático.

La Estación Biológica de Torretes alberga el Jardín Botánico de la Universidad de Alicante que consta del Jardín Andalusí Abu-S-Salt Umayya, el Jardín de la Mujer y el Jardín Medieval Hildegarda de Bingen, entre otros. El arbolado es una parte importante del patrimonio natural de la Estación Biológica-Jardín Botánico, habiendo algunos árboles singulares por su edad, tamaño o su identidad botánica, como El Pino "Abuelo" o el Chopo “Templario” que allí se pueden observar.

Además, la Estación Biológica de Torretes es “Reserva Entomológica”, por la Asociación española de Entomología, desde 2019.

Para más información, visite:

https://torretes.es/

https://www.ibi.es/es/turismo/naturaleza/jardin-botanico-de-la-estacion-biologica-torretes/jardin-1

https://www.entomologica.es/torretes

La Estación Biológica de Torretes-Jardín Botánico de la Universidad de Alicante, en Ibi, Alicante (Foto: Eduardo Galante).

El Museo de la Biodiversidad de Ibi

El Museo de la Biodiversidad de Ibi (MUBIO), situado en el casco urbano de este municipio, se constituyó mediante un acuerdo entre el Ayuntamiento de Ibi y la Universidad de Alicante, a través del Centro Iberoamericano de la Biodiversidad (CIBIO). El MUBIO tiene como objetivo sensibilizar, concienciar y capacitar a distintos colectivos sociales, sobre la importancia de adoptar conductas responsables y respetuosas con el medio ambiente, para contribuir a crear un entorno mejor conservado y más sostenible. A través de diversas salas, donde se pueden observar la fauna y flora de distintos ecosistemas, se pretende concienciar a la sociedad sobre la importancia de conservar la biodiversidad, los beneficios ambientales que nos aporta y los graves problemas que está provocando la desaparición de miles de especies. Mantener el museo como un espacio expositivo vivo, dinámico y participativo, es el principal objetivo marcado por el MUBIO, y para ello se llevan a cabo, a lo largo del año, Exposiciones Temporales y Exposiciones Itinerantes. En todas las salas se trata de proporcionar formación al visitante, pero una de las salas más singulares y representativas del museo es la dedicada al tráfico ilegal de especies. En ella se muestra la grave amenaza que esta actividad ilícita supone para la supervivencia de miles de especies y en la que los países más afectados son los económicamente más desfavorecidos, ya que implica la destrucción de sus ecosistemas y la extracción de miles de ejemplares de fauna y flora que acaban en el mercado negro internacional. Además, en el museo, se pueden visitar otras exposiciones permanentes: Biodiversidad Mediterránea, la Selva Tropical Iberoamericana y la Sabana Africana.

Para más información, visite: https://museodelabiodiversidad.com/

El Museo de la Biodiversidad de Ibi (MUBIO), Alicante (Foto: Eduardo Galante).

Resúmenes de las conferencias plenarias

PLENARIA I:
Becoming a mindful entomologist: towards a more productive, creative and happier scientific life

Pineda, Ana

I focus and write, CEO, www.ifocusandwrite.com, ana@ifocusandwrite.com
CIBIO, Universidad de Alicante, guest researcher

Being a scientist is one of the most beautiful professions out there. But it can be hard. Especially in the current situation, the world is in. Mindfulness is a stage of being present on whatever we do, and without judgment. We achieve it by practicing different mindful techniques, such as meditation or yoga. Although the benefits of these techniques are well known, we mostly associate them with our free time. However, mindful approaches can also be extremely useful at work. In this talk I'll share how you can implement a mindful approach to your scientific life, to boost your productivity, creativity, and happiness. I will share three aspects of each category that are having the strongest impact on the students and the audience of "I focus and write", a personal project where I coach academics. You´ll learn: 1) a holistic approach to the work-life "puzzle"; 2) research as a creative process and the effect of stress; 3) how practicing mindfulness can improve our productivity and mindset around being a scientist.

Keywords: soft skills, mindfulness, productivity, creativity, scientific writing.

PLENARIA II:
The role of biodiversity and insects in planetary health

Valladares, Fernando

Museo Nacional de Ciencias Naturales, CSIC, Madrid & URJC Madrid Spain

Although there are many initiatives to conserve biodiversity, the public continues to perceive flora and fauna as something alien, and their conservation as something not very urgent and even esoteric. Even more so when instead of tigers or eagles we are talking about insects. Insects show a great global decline due to a worrying interaction: historical climate warming and the intensive use of agricultural land. This interaction leads to reductions of nearly 50% in abundance and 27% in numbers of insect species relative to those in less disturbed habitats with lower rates of historical climate warming. These patterns are especially evident in the tropics, while some positive biodiversity responses to climate change occur in certain natural habitats in non-tropical regions. High availability of nearby natural habitats mitigates reductions in insect abundance and richness associated with agricultural land use and substantial climate warming, but only in low-intensity agricultural systems. In such systems, where high levels (75% cover) of natural habitat are available, abundance and richness were reduced by 7% and 5%, respectively, compared with reductions of 63% and 61% at sites with lower natural habitat presence (25% cover). When an altered ecosystem with a lack of species hits us with a zoonosis such as COVID or reduces pollination of our crops or does not purify the water or air as it had been doing until then, we wonder if biodiversity will be more than the object of passion of plant and animal lovers.

Keywords: biodiversity, ecological services, ecological functions, goods and services, planetary health.

PLENARIA III:
Exploring morphological diversity within a clade of Coleoptera

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Recent advances in systematics have been followed by a new set of analytical tools that allow to explore the relationship between morphological disparity, species richness and clade age. In this talk we will use the recent developments in the systematics of Meloidae and related families within Tenebrionoidea, to discuss different aspects of morphological evolution, from morphological change during the speciation processes, to the effect of extinction on intraclade morphological disparity. Some of the most striking patterns include the astonishing homoplastic evolution of maxillae in a nectar-feeding lineage, the close relationship between genetic phylogroups and morphological differentiation in non-phoretic parasitoids, the particular lack of correspondence between morphological change and the development of elaborate courtship in desert taxa, and the effect of dramatic changes in life histories on species richness. While morphological change during the speciation process is not consistent across lineages and seems largely taxon-dependent, stochasticity and contingency seems to drive intraclade morphological evolution, resulting more often than expected in evolutionary dead-ends. The results shown in this presentation are mostly part of the doctoral theses of E.K. López-Estrada, P. Mas-Peinado and A. Sánchez-Vialas and financed by the project PID2019-110243GB-I00/AEI/10.13039/501100011033 (Ministerio de Ciencia, Innovación y Universidades, Spain).

Keywords: Systematics, Evolution, Phylomorphospace, Disparity, Meloidae, Tenebrionoidea.

PLENARIA IV:
How micro-computed tomography (micro-CT) is revolutionising entomological understanding. A powerful tool beyond the purely anatomical

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High resolution micro-CT despite it is not a new technique, nowadays it is being used routinely in science. Mostly it is being used as a substitute to microscopy to look at/for external and internal structures. However, it can be used to clarify non-answered questions, and also for educational purposes. And in many cases simply it represents itself, Art.
Throughout the presentation, it will be explained in general terms what microtomography is and the differences with scanning electron microscopy. Different ways of preparation prior to fix the samples for scanning, and the visualization of the rendered images and how to proceed to visualize/separate the different structures/organs with different colors, either by their differentiation according to the degree of x-ray opacity (what it is possible by adjusting the color (red, green, blue) transfer functions curves into the volumetric software, or by a manual outline segmentation prior to get the rendered images.
The talk will include examples of different anatomical and functional studies, and details of how the speaker uses a high resolution Skyscan 1172 microtomograph to unveil “mysteries” beyond the nowadays known horizon, and will be illustrated with high resolution images, and videos to demonstrate how thanks to micro-CT it is possible to do amazing trips inside the insects and their surroundings environment. “Real” entomological models can be obtained to visualize with mobile devices (smartphones and tablets), permitting rotations, cuts, etc.…, in an easy and interactive mode. Resulting very attractive for the students, and thereafter very promising for educational purposes. In any case, many of the obtained results have a nice visual artistic appearance (In fact, it has made it possible to collaborate with the film Blade Runner 2049, and with Aida, the robot artist.).
In essence, attendees will understand why Micro-CT represents a tool that straddles scientific research, art and education.

Keywords: Micro-CT, Methodology, Functional anatomy, Art, Entomological Education.

PLENARIA V:
Biological control: a nature-based solution for controlling insect pests

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The vast majority of insect species are regulated by top-down mechanisms keeping their population at low levels. The disruption of these mechanisms may result from the removal of natural enemies, the loss of habitat and resources due to intensive agriculture and simplification of these ecosystems, and the ecological release of invasive species from their natural enemies. Such disturbances are the major factors in the origin of insect pest outbreaks by negatively disrupting top-down regulation. In an era in which we aim at reducing the usage of pesticides, restoring regulation by natural enemies is to a great extent part of the solution. Biological control is certainly one of the most promising strategies that could help to scale up the reduction of the dependency on pesticides in the context of the European Green Deal. This keynote aims at reviewing the existing biological control strategies with an emphasis on their scope, constraints, and benefits. It will be provided insights into research opportunities and needs for improved policies in the context of enhancing biological control strategies.

Keywords: Biological control, insect pest, population regulation.

Resúmenes de las comunicaciones orales

El contenido de los resúmenes de las comunicaciones orales es de exclusiva responsabilidad de su autor o autores y no necesariamente refleja la opinión científica del comité organizador ni del comité científico del congreso.

1. Jan van Kessel the Elder (1626-1679), painter of insects, birds and flowers

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Cabinets of curiosities, or *Kunstkammers*, the ancestors of the modern museum, flourished in Renaissance Europe. These encyclopedic collections of natural objects and works of art were considered a microcosm of the world, and Jan van Kessel's detailed and realistic depictions of insects, flowers, and plants fit this style of collection and display. The artist's paintings were highly sought after by collectors during his lifetime. His tiny still life pictures were often produced in pairs; some originally formed part of a series of plaques that could decorate the front of the small drawers of the furniture in which a collector kept his copies. Van Kessel belonged to a famous dynasty of Flemish painters, and his style and technique are similar to those of his grandfather, Jan Brueghel the Elder. Jan van Kessel the Elder was born in Antwerp. He was the son of Hieronymus van Kessel the Younger and Paschasia Brueghel (the daughter of Jan Brueghel the Elder). Thus, he was a grandson of Jan Brueghel the Elder, a great-grandson of Pieter Brueghel the Elder, and a nephew of Jan Brueghel the Younger. His direct ancestors in the van Kessel family line were his grandfather Hieronymus van Kessel the Elder and his father Hieronymus van Kessel the Younger, both painters. He was the father of Jan van Kessel the Younger, a painter based at the court of Carlos II, in Madrid. In this communication some aspects of the work of Jan van Kessel are presented, especially those related to the representation of insects, based on works deposited in the following art galleries: Prado Museum (Madrid), National Gallery (London), The Metropolitan Museum of Art (New York), Louvre Museum (Paris), Alte Pinakothek (Munich), Musées Nationaux Recovery, Custody Foundation (Paris), Thyssen-Bornemisza National Museum (Madrid) and private collections.

Keywords: Jan van Kessel the Elder, Flemish painters, still life study of insects.

2. Flebocollect App: citizen science for the monitoring of phlebotomine sand flies in schools

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Citizen science has received special attention in recent years, both in scientific and educational communities. This alternative to traditional research promotes the democratization of science by integrating the contribution of citizens in scientific research activities. The citizen science group "Flebocollect" emerged in response to the demand for innovative solutions to reduce the impact of vector-borne diseases. The philosophy of the project is based on the development of "Do it yourself" (DIY) traps for the capture of phlebotomine sand flies with recycled materials as an alternative strategy for the control of leishmaniasis. Currently, the project seeks to develop a sandfly density map from the captures made with the DIY traps that are being manufactured in the workshops held in schools and in the National Museum of Natural Sciences in Madrid Thus, it is intended to monitor the risk of new outbreaks of leishmaniasis in Spain. For this, an application has been developed that allows participants to record the installation of each trap and the catches they make. The user must indicate the unique number assigned to the trap and the location by activating the GPS of the device, and must also upload a photo of the placed trap to know the sampling environment. After collecting the traps, the data on the captures of sandflies or other dipterans of sanitary interest, such as culicids, is also recorded in the App by users. The samples are also sent to the research team and will be validated by expert entomologists. Didactic material is being prepared for setting up traps and identifying catches, to provide the necessary knowledge for citizens to set up DIY and to identify sandflies or other dipterans of medical and veterinary interest.

Keywords: citizen science, sand flies, leishmaniosis, DIY traps, App, Flebocollect.

3. Blackflies (Diptera: Simuliidae) from the Huebra river hydrographic basin

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As a result of the studies carried out in Spain in the last decade, knowledge about blackflies (Diptera: Simuliidae) has experienced a significant increase. However, although in some regions of the country, its record is exhaustive and detailed, in other ones it is still succinct or even non-existent. The present communication, developed within the framework of the grant CIAPOS/2021/116 (Generalitat Valenciana), offers a detailed study of the sampling conducted in 1996 by members of the University of Salamanca in the Huebra river basin (Salamanca, western Spain). A total of 26 species belonging to 4 genera (*Metacnephia* Crosskey, 1969, *Prosimulium* Roubaud, 1906, *Simulium* Latreille, 1802 and *Urosimulium* Contini, 1963), 5 *Simulium* subgenera (*Boophthora* Enderlein, 1921, *Eusimulium* Roubaud, 1906, *Nevermannia* Enderlein, 1921, *Simulium* Latreille, 1802 and *Wilhelmia* Enderlein, 1921) and 5 species-groups (*bezzii* group, *equinum* group, *hirtipes* group, *ornatum* group, and *vernum* group) have been identified. This review has revealed the presence of 7 species recorded for the first time in the province of Salamanca, leading to a significant increase in the information on this family of dipterans in the country regarding its faunistic and ecology. In addition, it should be noted that some identified species, such as *S.* (*W.*) *equinum* (Linnaeus, 1758), *S.* (*B.*) *erythrocephalum* (De Geer, 1776), *S.* (*S.*) *intermedium* Roubaud, 1906, *S.* (*W.*) *lineatum* (Meigen, 1804), *S.* (*S.*) *ornatum* Meigen, 1818, and *S.* (*W.*) *pseudequinum* Séguy, 1921, exhibit blood-sucking habits, a condition that categorizes them as of great interest, not only from a public health perspective, but also in the field of animal welfare, both for livestock and wildlife. The results of this study contribute significantly to the increase in knowledge of blackflies in the study area, both in terms of their bioecology and geographical distribution, shedding light on their documentation and understanding.

Keywords: Simuliidae, Huebra river, abiotic and biotic factors, species richness, biodiversity, biogeographic distribution, bioecology, western Spain.

4. Preliminary results of insect community monitoring in a suburban stretch of the Manzanares river (Madrid)

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The work was developed within the project "Recovery of the fluvial ecosystem Manzanares-Gavia-Bulera. Green and blue infrastructure Metropolitan Forest of Madrid" which has the support of the Biodiversity Foundation of the Ministry for Ecological Transition and the Demographic Challenge in the framework of the Recovery, Transformation and Resilience Plan (PRTR), funded by the European Union - NextGenerationEU. The group responsible for the project is formed by the Madrid City Council, the Centre of Studies and Experimentation of Public Works (CEDEX) and the Conama Foundation. The objective of this project is the recovery of the fluvial, ecological, and hydrological continuity of a section of the Manzanares River as it passes through the municipality of Madrid. This is a stretch 2.5 km long, very altered as it is located at the transition from the municipality of Madrid to the municipality of Getafe, between the crossroads of the M-40 and the M-45. The project actions include the monitoring of a series of indicators that allow the assessment of the effects of the recovery of the continuity of the river and its riparian forest. With this objective, the structure of the insect community in the river environment is being studied, through the analysis of composition and abundance of the community, of pollinators, and of certain insect orders. In this communication, the results of the first sampling campaigns, corresponding to the spring of 2023, are presented. The sampling method consists of an insect collector installed on the roof of a vehicle, with which we travel along the project stretch up to 10 km, on a concrete road located about 15 m away on the left riverbank. Additionally, 2 foot transects of 1x10 m located next to the future actions on spillways were performed.

Keywords: entomofauna community, Manzanares River, river ecosystem restoration, ecological status indicators.

5. Historical factors shape the intraspecific genetic diversity in an endemic dragonfly

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Biological and historical factors have been proposed as the main drivers of genetic diversity, however the relative importance of each kind of factors is highly controversial. In temperate zones, climatic events such as Quaternary glaciations strongly shaped phylogeographical patterns, while in climatic refuges biological factors may come to the forefront. *Onychogomphus cazuma* Barona, Cardo & Díaz, 2020 is the only dragonfly endemic to the Iberian Peninsula. To date, it has been reported in only 13 localities clustered into three geographic groups: northern, central and southern, that are 50 and 100 km apart, respectively. This relictual distribution range of 7,500 km^2 in Eastern Spain is considered a Pleistocene refugium, with no geographical barriers that can prevent dispersion – therefore gene-flow – of a flying insect. Consequently, we expect populations of *O. cazuma* to have similar haplotype frequencies, without geographic structure. To assess this hypothesis, we reconstructed the phylogeographic history of *O. cazuma* building a TCS haplotype network based on the mitochondrial gene COII of 39 specimens from nine populations. Unexpectedly, we identified seven haplotypes clustered in two apparently isolated population groups: north-central, and southern. A predominant haplotype is present in seven of the nine evaluated populations, and the limited number of mutations between haplotypes may be suggesting that minoritarian haplotypes have evolved recently after a strong bottleneck due to Pleistocene climatic changes that extirpated most of the genetic diversity. The low genetic diversity within the north-central group suggests that current populations are likely the result of recolonization by the predominant haplotype in source-sink dynamics. Our results show that this scarce, endemic and relict dragonfly, unknown until 2020, has an unexpected intraspecific phylogeographical structure. This might be pointing out that historical factors have strongly influenced its phylogeographic pattern even though it is distributed in a climatically stable area.

Keywords: Odonata, Gomphidae, *Onychogomphus cazuma*, mitocondrial phylogeography, evolutionary biology.

6. Effect of landscape context on invertebrate abundance and species richness at wildflower compensation areas in Schleswig Holstein, Germany

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Wildflower compensation areas (WCAs) in agricultural ecosystems are becoming increasingly common methods to attempt to conserve wildlife in the landscape. However, little research has been done to determine what factors influence their effectiveness for invertebrate conservation and ecosystem services. In theory, the quantity of semi-natural habitat and the degree of habitat fragmentation may influence whether insects, including pollinators such as bees and hoverflies (Syrphidae) and ground dwelling species (such as orthopterans, spiders and carabid beetles) can colonise and utilise wildflower compensation areas. In the summers of 2021 and 2022 we performed field sampling at 41 WCAs across Schleswig Holstein, northern Germany with yellow pan traps (for pollinators), pitfall traps (for carabid beetles and arachnids) and Audiomoth bioacoustic detectors (for orthopterans). This was combined with high-resolution spatial data on the quantity of semi natural habitats and modelling of habitat fragmentation (using the clumpy, mesh and connectance indexes), and on-site botanical surveys to assess wildflower community composition. Our results indicated a significant positive relationship between bee species richness and both semi-natural habitat percentage and the mesh index at WCAs. We have not yet detected a significant relationship between semi-natural habitat habitat fragmentation metric for the richness or abundance of hoverflies, carabid beetles, spiders or orthopterans. During the summer of 2022, we applied a recent eDNA method for detecting insects visiting wildflower heads (following a promising prototype in 2021 and the initial work of Thomsen & Sigsgaard 2019) which we hope will inspire future research using this method, and allow us to detect which wildflower species are most effective (analysis ongoing). We will also present our convolutional neural network-based system for automatically classifying orthopteran calls detected by bioacoustic recorders.

Keywords: landscape ecology, eDNA, pollinators, bioacoustics, wildflower compensation areas.

7. All they need is research: a four-year study of Dyschiriini (Coleoptera: Carabidae) in the Iberian Peninsula

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The family Carabidae (Adepahaga, Coleoptera) has been studied in the Iberian Peninsula for decades, resulting in a relatively good state of knowledge. However, study effort has been unequal among its taxa. No comprehensive studies have focused on the tribe Dyschiriini (Carabidae, Scaritinae) yet, of which 2 genera and 34 species have been recorded in the territory so far. The aim of the present oral communication is to introduce a project whose main objective is to perform a specific study of the Ibero-Balearic representatives of Dyschiriini. The project has a wide scope, integrating taxonomy, biogeography and autoecology of the species, and it is being developed in the frame of a doctoral thesis. Current problematic and gaps of information on the studied group are identified. Structure and specific objectives of the project are presented. Methodology is described, which includes seasonal samplings and the study of abundant collection material deposited in different entomological collections. First results, both already published and in press, are discussed: revision and interpretation of available data, analysis of publication dynamics through time, distribution patterns of taxa, first records of a species in the territory and description of a new taxon. On-going and next works for publication are summarized. Finally, it is expected that this oral communication will promote collaboration with colleagues, since multidisciplinary approaches are needed to solve remaining questions regarding this singular group of ground beetles.

Keywords: *Dyschirius*, *Reicheiodes*, autoecology, biogeography, taxonomy.

8. Right in time, right in space: how *Monoctonia pistaciaecola* Stary, 1962 (Hymenoptera: Braconidae: Aphidiinae) parasitism affects the development of Fordini galls (Hemiptera: Aphididae)

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Galling aphids of Fordini tribe living on *Pistacia terebinthus* L. suffer attacks from parasitoids and predators. During two consecutive years a study was carried out to: (i) know the specific parasitoid, (ii) whether parasitism shows different rates among host species and (iii) how the parasitism affects the size of the galls and their development. A total of 35,737 galls from El Bierzo (León, Spain) were analyzed. The parasitoid species was identified through molecular and morphological analysis as *Monoctonia pistaciaecola* Starý 1962 (Hymenoptera: Braconidae: Aphidiinae), which parasitizes the fundatrix and the fundatrigeniae in the first nymphal instar, just after hatching from the egg and before gall induction. The highest rates of parasitism occur in the galls of *Forda marginata* Koch, 1857 (5.92 ± 0.55%), followed by those of *Geoica utricularia* Passerini, 1856 (3.75 ± 0.06%) and *Paracletus cimiciformis* von Heyden, 1837 (3.30 ± 0.07%) and is almost non-existent in those of *Baizongia pistaciae* Linneaus, 1767 (0.03 ± 0.01%) and *F. formicaria* von Heyden, 1837 (0.02 ± 0.02%). We even observed that parasitism influences the final size of the galls. Thus, the parasitized galls of *G. utricularia* are 5.67 times smaller than the normal ones and those of *P. cimiciformis* and *F. marginata* 2.6 and 2.07 times, respectively.

Keywords: galling aphids, Iberian Peninsula, parasitoid, *Forda formicaria*, *Forda marginata, Paracletus cimiciformis*, *Geoica utricularia*, *Baizongia pistaciae*.

9. Interannual diversity shifts in spider assemblages of tree hollows

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Tree hollows are considered a key microhabitat in Mediterranean forests for many arthropods. The Order Araneae is an abundant and diverse predator group in these saproxylic environments, but it is also very sensitive to environmental variations. Therefore, environmental alterations in the tree hollows may threat spider assemblages. Given the current climatic context, the objectives of this research were to analyze the temporal changes in the taxonomic and functional diversity of tree hollow spiders in three forest types (*Quercus pyrenaica*, *Quercus ilex* and *Fraxinus angustifolia*) of the Cabañeros National Park (Ciudad Real, Spain), and to study which functional traits could help to explain possible dissimilarities. To this purpose, spiders were collected monthly from the hollows of each forest (Pyrenean oak, holm oak and ash forest) with emergence traps for two years (2009 and 2021). For the functional metrics we included 3 morphological and 4 ecological traits. For each forest type, several taxonomic (richness and abundance) and functional (richness, divergence, regularity and redundancy) diversity indices were calculated. Moreover, differences in taxonomic and functional composition at the spatiotemporal level were analyzed, as well as the behavior of the different functional traits in each year and forest type. A total of 111 spider species belonging to 30 families were identified. The results showed that taxonomic diversity increased after 11 years, but not at the functional level. In contrast, both the taxonomic composition and the functional space of spider assemblages changed spatiotemporally. Finally, differences were found in the behavior of some morphological and ecological traits of spiders, probably related to climate change. This work shows the importance of long-term studies including functional approaches to better understand the response mechanisms of entomofauna to natural changes.
The research has been partially funded by the Ministry of Science and Innovation projects CGL2008-04472 and Grant PID2020-115140RB-I00 funded by MCIN/AEI/ 10.13039/501100011033. This research is part of Gerard Martinez-Devesa's PhD studies granted by Ministry of Universities (FPU21/00249).

Keywords: Araneae, climate change, functional space, Mediterranean forest, National Park, temporal diversity, tree cavities.

10. The temporal succession of saproxylic springtails populations in Mediterranean oak forests of the El Rebollar Natural Area (Salamanca, Spain)

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This work focuses on the study of land springtails (Collembola, Hexapoda) in a saproxylic habitat type: dead wood arranged on the floor of mature oak groves of *Quercus pyrenaica* Willd. as well as the spatial and temporal distribution of recorded species. The study was carried out in three locations in the El Rebollar Natural Area located in the southwest of the province of Salamanca dominated by Mediterranean oak trees: Villasrubias, the pasture of Posadillas (El Sahugo) and the forest of La Genestosa (Navasfrías). Emergency traps were set in each of these areas, and they were reviewed monthly for a year (from May 2017 to April 2018). In total, 1429 individuals, belonging to 26 different species were collected. La Genestosa forest is the place with the highest diversity and richness being *Entomobrya albocincta* (Templeton, 1835) the most abundant species. Villasrubias is the second point with the greatest diversity, although with the least richness, and finally, the oak grove of Posadillas is the forest with the least diversity, but the second one in terms of richness. In these last two sampling areas, the dominant species was *Entomobrya multifasciata* (Tullberg, 1871). The data analysis from the different springtail communities indicated that there are significant variations between the three localities and within each of them throughout the year, in terms of diversity and their specific composition. This is due to differences in the insolation degree of the samples and the level of decomposition of the dead wood on the ground from which the specimens were collected.

Keywords: Collembola, saproxylic communities, *Quercus pyrenaica*, El Rebollar Natural Area (Salamanca, Central Spain), temporal succession.

11. How might trophic guild and microhabitat use affect morphological dispersal traits of saproxylic beetles?

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Dispersal patterns of the species are conditioned by environmental factors and by their own body condition, taking on particular importance in population dynamics and species extinction risk. Therefore, the study of dispersal traits is important to improve conservation strategies, especially for assemblages whose survival is threatened by environmental changes and habitat fragmentation, such as saproxylic beetles. According to theory, microhabitat specialisation could have relevance for species dispersal patterns. We empirically tested theories that assume that species inhabiting long-lived microhabitats (i.e., tree hollows) are disperse poorly compared to those relying on more ephemeral microhabitats (i.e., deadwood on soil). The study was carried out in Mediterranean oak forests located the western of Iberian Peninsula. Tree hollows and deadwood on soil were sampled using emergence traps. We analysed the effect of feeding strategy and microhabitat on three traits traditionally related to beetle dispersal: wing loading, body length and abdomen-elytra ratio. Microhabitat specialization of species was estimated by multinomial model based on the estimated relative abundance, which allows a classification of microhabitat specialists and generalists. The results showed that morphological traits such as body length and abdomen-elytra ratio were predictors of microhabitat type, while wing loading showed no differences between microhabitat types and among microhabitat specialist assemblages. Trophic guilds were also predicted in different ways by the studied traits. We conclude that although the type of microhabitat affects traits, it does not determine a beetle assemblage with a higher or lower dispersal ability.
Financial support was provided by the 'Ministerio de Economía, Industria y Competitividad' (grant CGL2016-78181-R) and Grant PID2020-115140RB-I00 funded by MCIN/AEI/ 10.13039/501100011033. This research is part of Sandra Martínez Pérez's PhD studies granted by 'Ministerio de Economía, Industria y Competitividad' (BES-2017-080278).

Keywords: dispersal ability, body length, wing loading, abdomen-elytra ratio, tree hollows, deadwood on soil, feeding strategy.

12. On how saproxylic interaction patterns change over time

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Assessing the fragility of saproxylic communities is key to improve forest management and conservation, especially in the current context of global environmental change. The study of interaction patterns can help to infer the vulnerability of saproxylic communities inhabiting tree hollows in Mediterranean forests, however, little is known about how the structure of saproxylic networks evolve with the seasons and over time. We assessed interannual (2009-2010 vs. 2021-2022) and intra-annual (spring-summer-autumn of 2009 and 2021) variation in network and co-occurrence patterns in the tree hollow-saproxylic interaction. We focused on the saprophagous/saproxylophagous guild, considering both Syrphidae (Diptera) and Coleoptera. The study was conducted in the three representative Mediterranean forest types in Cabañeros National Park (Spain). Preliminary results showed a general interannual and intra-annual decrease in the degree of nestedness, connectivity and density of interactions (less interconnected networks), together with a shift towards modularity. This striking shift in the pattern of interactions indicates relevant temporal changes in environmental conditions (ecological alteration), suggesting higher vulnerability of saproxylic communities in the long-term. Nonetheless, contrasting responses in network and co-occurrence patterns were found among forests types across years and seasons over time, which imply spatio-temporal variation in the vulnerability of saproxylic networks. The study of spatio-temporal patterns in saproxylic networks provide useful information to enhance forest management and conservation strategies.
Financial support was provided by the 'Ministerio de Economía, Industria y Competitividad' (grant CGL2016-78181-R) and Grant PID2020-115140RB-I00 funded by MCIN/AEI/ 10.13039/501100011033.

Keywords: co-occurrence patterns, Coleoptera, interannual changes, Mediterranean forests, network patterns, seasonal changes, saproxylic communities, Syrphidae.

13. Impact of body size on distribution patterns of phoretic mites in the multi-symbiont host *Rhynchophorus ferrugineus* (Olivier, 1790) (Curculionidae: Coleoptera)

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Phoretic mites use *Rhynchophorus ferrugineus* (Olivier, 1790), or red palm weevil (RPW), as an attachment site for dispersal. The patterns of attachment site distribution remain unknown. This study is the first that investigated RPW-associated phoretic mites in Portugal, with focus on Northern Portuguese districts of Viana do Castelo, Braga, Porto, and Aveiro (macrohabitat), and examined the distribution patterns of mites on different body parts of the RPW (microhabitat). At the macrohabitat level, in all four studied-districts, seven mite taxa were found to attach to RPW. However, their relative abundance (species evenness) varied between districts. Additionally, we observed differences in species diversity across the different districts. This provides the first documentation of phoretic mites in association with RPW in Portugal. All observed weevils carried mites, and there were no significant differences in prevalence of different taxa between districts or between male and female weevils. *Centrouropoda* sp. was the dominant taxon, as revealed in its high mean abundance and degree of aggregation. On the other hand, *Acarus* sp. and *Curculanoetus rhynchophorus* were considered common subordinate taxa, while *Uroovobella* sp., *Mesostigmata*, *Nenteria extremica* Kontschán *et al*., 2014 and *Dendrolaelaps* sp. were observed less frequently, and classified as sparse taxa. At the microhabitat level, we observed all mite taxa on all body parts of the RPW, with highest abundance found in the inner surface of the subelytral space. Analysis of niche overlap indicated that the distribution patterns of phoretic mite taxa on the RPW were non-random. Furthermore, in the subelytral space, coexistence of different mite species increased with the difference in body size, particularly in relation to the dominant *Centrouropoda* sp. We conclude that the distribution patterns of RPW-associated phoretic mites show body size dependent effects. These effects lead to the displacement of similar-sized taxa by the dominant taxon and the acceptance of co-habitation with taxa with which there is a significant size difference.

Keywords: red palm weevil, phoresis, macrohabitat, microhabitat, interspecific interactions.

14. Faunistics of the Ibero-Balearic butterflies (Lepidoptera: Papilionoidea): present geographic gaps

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After more than 200 years of faunistic studies on the butterflies of the Iberian Peninsula and Balearic Islands, a relevant body of chorologic information has become available. In order to facilitate the design of future work on this subject, we analyzed the available information with the primary aim of identifying the less intensively prospected areas. We relied on the provisional data compiled for the preparation of the "Atlas y Libro Rojo de las mariposas españolas" and, using the 10 km MGRS grid, we estimated cell completeness from a) accumulation curves and b) multiple regression modelling. We found that, even when the amount of information experienced a relevant increase along the last 20 years, less than 30% of the 10 km cells in the area can be certified as reasonably well prospected (e.g., with values of completeness above 75%). In addition to identifying the cells that remain completely devoid of data (ca. 200 squares, i.e. about 3% of the total area), we ranked the area units after their estimated completeness and mapped these results. We intend that this and similar prospective studies provide a guide, perhaps also as motivation, to redirect some efforts to study less known areas.

Keywords: Lepidoptera, Papilionoidea, butterfly, faunistics, Spain, Portugal, chorology, completeness.

15. Flying towards extinction: the impact of climate change on mountain butterflies of the genus *Erebia* Dalman, 1816 (Lepidoptera: Nymphalidae)

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The vulnerability to climate change of animals living in mountainous regions has been analysed using a genus of butterflies typical of the mountainous areas of the Iberian Peninsula, the genus *Erebia* Dalman, 1816. This genus comprises 19 species in the study area, seven of which are endemic to the Iberian Peninsula. Consensus species distribution models were created to predict the potential areas for the species under different climatic future scenarios at a resolution of 10x10 km an 1x1 km in the Military Grid Reference System (MGRS). The results at 10x10km resolution showed a drastic reduction in the number of climatically favourable areas for all 19 species, highlighting the vulnerability of the Iberian *Erebia* butterfly species to climate change, with 16 of them predicted to disappear completely under the most extreme scenario by 2070. Only three species, including the two endemics *Erebia palarica* Chapman, 1905 or *Erebia hispania* Butler, 1868 would still present some climatically favourable areas in this scenario, but in the fine scale model (1x1 km) they suffer similar losses. Other endemic species such as *Erebia zapateri* Oberthür, 1875 and *Erebia sthennyo* Graslin, 1850 have hardly any pixels predicted as favourable in any model, year, scenario or scale. Conservation measures including population and habitat monitoring, restoration of ecological diversity and global reduction of greenhouse gas emissions are suggested.

Keywords: Lepidoptera, *Erebia,* climate change, conservation, potential distribution models, endemism, mountains, Iberian Peninsula.

16. New Atlas and Red book of the Spanish Butterflies

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Butterflies are a group of insects that are well known for their importance as pollinators and bioindicators. Due to the relevance of this taxa, having an accurate knowledge of the status of butterfly species is essential to be able to develop research projects involving them. The Entomology Laboratory of the Universidad Autónoma de Madrid is leading a project to publish a new Atlas and Red Book of the Spanish Butterflies. Our aim is to widen the information collected for the previous Atlas published by García-Barros et al. (2004) to update the distribution of the 230 Peninsular and Balearic species described in it (using the MGRS system) and to include the species that were not present in that version from the Canary Islands and Ceuta and Melilla (making a total of 258 species). The number of records of butterflies has increased from near 300,000 from the first Atlas to around 850,000, and we expect to surpass one million records. To achieve this goal, we are combining records from collections, publications and fieldwork not only compiled by us but also by the 100 contributors that have joined to date. In the next two years, fieldwork will follow two different goals. The first one, to complete the information from those areas in Spain without butterfly records. The second one, to separate the distribution of cryptic species that is blurred in overlapping areas. At the end, the Atlas will provide information about phenology, demographic trends, altitudinal range, threat category and the potential distribution of the species modelled under the climatic change scenarios. This will lead to a reviewed Red List of the Spanish butterflies. With this project, we expect to provide an essential reference book for every lepidopterologist that aims to work with the butterflies present in Spain.

Keywords: butterflies, distribution, Red Book, Atlas, conservation, climate change, distribution models.

17. Tracking the pieces of the *Adesmia* Fischer de Waldheim, 1822 puzzle within the arid tribe Adesmiini (Coleoptera: Tenebrionidae)

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The tribe Adesmiini Lacordaire, 1859 (Tenebrionidae: Pimeliinae) constitutes a great example maximizing thermal tolerances with many desert-specified adaptations. Adesmiine species live in one of the warmest and driest environments on Earth throughout African and Western Palearctic areas. First phylogenomic hypothesis of the tribe based on 529 protein-coding genes across 43 species, including 10 of 11 Adesmiini genera, rejects the monophyly of five genera, including the genus *Adesmia* Fischer von Waldheim, 1822. Only this species-rich genus occurs in North Africa, and due to the current scarce taxon sampling, it's phylogenetic relationships still remain obscure. Through this International Project, we will study the phylogenetic relationships within Adesmiini, establish an evolutionary time frame of diversification, conduct biogeographic reconstructions to estimate ancestral areas of origin, vicariant and/or dispersal events, explaining its current disjunct distribution, and colonization patterns on desert biomes. To achieve this objective, it is mandatory to first include a general sampling of the Adesmiini genera to solve the higher-level taxonomy of the group reflecting the evolutionary history of the lineages. Here, we present first catalogue data of current 235 Adesmiini species. Some distribution areas of Adesmiini, especially in the genus *Adesmia*, cover various areas where conducting sampling field campaigns are currently difficult (e.g. Iraq, Yemen, Syria etc.). To complete this gap and include possibly extinct species, the inclusion of material from historical entomological collections from Museums and personal collections with DNA extractions-amplifications will be necessary. Therefore, the search for historical material worldwide is in progress.

Keywords: phylogenomic, desert-adaptations, biogeography, historical material.

18. Contrasting taxonomic and molecular approaches to assess the hidden biodiversity of Trichoptera and Chironomidae in the Pyrenees (NE Spain)

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Vulnerable species are expected to show a significative decline due to global change, especially in isolated ecosystems, such as high mountain streams. Biodiversity of Trichoptera and Chironomidae (Diptera) in these streams is only partially known and many species could disappear before being described. Most biodiversity assessment studies of aquatic insects often focus on larvae because their large population sizes and their easier sampling in comparison to adults, although taxonomic identification to species level of larvae is usually very limited. In this study, our aim was to explore the biodiversity of Trichoptera and Chironomidae species in 17 headwaters streams in the southern Pyrenees covering an extension of 200 km (0.16 °W to 2.3°E) combining traditional taxonomic with modern molecular approaches. We sampled larvae (kick net), Chironomidae pupal exuviae (drift net) and adults (light trap and entomological net). Specimens were identified using taxonomic and molecular methods (metabarcoding and barcoding). While traditional taxonomy identified 100 Chironomidae and 50 Trichoptera species, metabarcoding assigned 90 and 53 species respectively. Our results showed the advantages, disadvantages, and complementarity of different identification methods. Overall, these findings provide valuable information to guide future conservation actions in highly vulnerable ecosystems.

Keywords: Pyrenees, metabarcoding, barcoding, high mountain streams, caddisflies, nonbiting midges.

19. Haplotypic differentiation in wide-ranging species, with cuckoo wasps (Hymenoptera: Chrysididae) as a case study

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The geographic distribution of a species is an area where optimal or at least biologically tolerable characteristics are met by individuals. Regions with these characteristics may not be continuously distributed so gene exchange between geographically distant localities might be reduced. Limited gene flow between populations may lead to spatial heterogeneity in allele frequency. A large number of species of the family Chrysididae, a family of metallic-colored wasps with parasitoid habits, have large geographical distributions that cover most of Europe, but very little information is available on their population genetic structure. This work aims to identify levels of differentiation between mtDNA haplotypes of Iberian populations and haplotypes of other European populations retrieved from GenBank. If geographic distance plays a role in the geographic structuration of alleles in chrysidids we would expect a remarkable differentiation between the haplotypes present in pairs from distant populations. To test for this hypothesis, we compared the sequences of a fragment of cytochrome oxidase I (COI) of individuals from Iberian populations with sequences from other European areas, mainly Baltic. Our results show that sequences from some of the species represented in both data sets, such as *Chrysis tristicula*, Linsenmaier 1959, *Hedychrum nobile* (Scopoli 1763) and *Hedychrum rutilans* Dahlbom 1854, differ in 1 to 10 base pairs. This would suggest that the initial hypothesis can be rejected and leads us to think that dispersal across large geographic areas is highly effective in some species of parasitoid wasps. This pattern is however not general. This study will allow us to advance our understanding of how speciation occurs in large parasitoid wasps.

Keywords: distribution, cuckoo wasps, speciation, evolution, differentiation, phylogeography.

20. Contrasting phylogeographic patterns and ecological distribution models in Iberian *Forficula* Linnaeus, 1758 (Dermaptera: Forficulidae)

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Habitat suitability models are a widely used tool to explain the distribution of species, and the projection of these models into past and future conditions helps to estimate how the distribution has changed and how it will change. One of the limitations of this method is that it does not consider the demographic history of the species, a critical factor for understanding geographic ranges. Phylogeography solves this problem and is key to inferring the evolutionary history of species. The species complex of *Forficula auricularia* (Forficulidae, Dermaptera) includes a set of cryptic or poorly morphologically differentiated species: *Forficula auricularia* Linnaeus, 1758, *Forficula aeolica* González-Miguéns & García-París, 2020, *Forficula dentata* Fabricius, 1775 and *Forficula mediterranea* González-Miguéns & García-París, 2020, of which the last two are widely distributed throughout the Iberian Peninsula. The objective of this work is to combine (I) phylogeographic analyses, based on a fragment of the mitochondrial cytochrome oxidase 1, to analyse how Iberian populations of the *F. auricularia* complex have interacted at the intraspecific level, and (II) ecological niche models, based on environmental characteristics, to examine the effects of historical conditions on the persistence and distribution of species in the geographic space. Results reflect opposite phylogeographic patterns and therefore opposite evolutionary histories, suggesting that *F. dentata* is a long-time established species in the peninsula while *F. mediterranea* is now expanding. The comparison of the *F. mediterranea* model during the Last Glacial Maximum (LGM) and the present also suggests the expansion of the species, whereas the past projected potential distribution model (LGM) of *F. dentata* reflects a much wider potential area than the current predictions.

Keywords: biogeography, cryptic species, earwigs, ecological distribution models, geographic distribution, phylogenetic networks.

21. Phylogeographic structure of endemic species of the central zone of the Iberian Peninsula affected by agricultural intensification

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Until a decade ago, the steppe areas of Mediterranean Europe had high levels of biodiversity and generated landscapes of high biological value in which traditional agricultural systems were incorporated. However, the recent intensification of agriculture has led to a current loss of biodiversity. In the case of insect, these changes are generating growing social concern in the face of their alarming decline in agricultural systems. Coleoptera of the Tenebrionidae family are one of the most unique groups in arid and semi-arid Iberian zones and, as they frequently associated with plateau agroecosystems, they could constitute a study model of particular interest. In this study the patterns of genetic structure of tenebrionid species of frequent presence in traditional dryland crops of the interior zone of the Iberian Peninsula (Pimeliinae, *Tentyria*) are analyzed. Through phylogenetic analysis, the age of the population of *Tentyria* Latreille, 1802 in the centre of the peninsula will be determined. In addition, through phylogeographic analysis, the geographical structure of the genetic variability of the species *Tentyria castiliana* Koch, 1944, *Tentyria aragonica* Koch, 1944 and *Tentyria sublaevis* Kraatz, 1865 will be determined and, with it the degree of isolation of the different phylogroups to see if the limitation of gene flow between populations is due to historical isolation or is a response to environmental conditions.

Keywords: agroecosystems, agricultural intensification, Iberian Peninsula, phylogeography, Tenebrionidae, *Tentyria*.

22. Multi-year phenology modelling of bark beetles (Coleoptera: Curculionidae: Scolytinae) under Mediterranean conditions

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Bark beetles (Coleoptera: Curculionidae: Scolytinae) are a significant agroforestry insect pest which represent an agroforestry disturbance worldwide, affecting human well-being and the environment. Bark beetles cause damage through perforation and are associated with pathogenic fungi that increase the likelihood of killing trees, reducing agroforestry productivity, and causing economic losses during outbreaks. Global change and climate warming can disrupt current associations between these herbivores and their forest hosts. For this reason, assessing which climatic and landscape parameters determine the activity and phenology of bark beetles represents a valuable tool to anticipate insect outbreaks in a context of global change. We sampled bark beetle insects from three *Pinus halepensis* Mill., 1768 plots in Mallorca (Spain) during four years (April 2011 to December 2015) and we assessed the phenology for the most commonly species trapped: *Hylurgus ligniperda* Fabricius, 1787, *Orthotomicus erosus* Wollaston, 1857, *Crypturgus mediterraneus* Eichhoff, 1871 and *Hylastes linearis* Erichson, 1836. The relationship between species activity and climatic and landscape predictors was examined using Generalised Additive Mixed Models (GAMM) fitted with a quassi-Poisson distribution. Activity curves of bark beetles throughout the year presented bimodal pattern with two main peaks observed, one in the spring and other in summer/autumn, highlining the spring peak as the largest in almost all species. Phenology models indicate that a decrease on normalized difference vegetation index and total evapotranspiration increase bark beetle species activity, meanwhile daytime land surface temperature had varying effects depending on the species. Our results have important implications for the colonization of healthy trees since flight of beetles increases the risks of attack, and should be integrated in comprehensive assessments of future outbreak risks.

Keywords: bark bettles, Scolytinae, phenology, *Hylurgus ligniperda*, *Orthotomicus erosus*, *Crypturgus mediterraneus*, *Hylastes linearis*.

23. Boring beetles (Coleoptera: Curculionidae: Scolytinae) in *Pinus pinea* L. pine forests in the Llobregat Delta (prov. Barcelona, Catalonia, Spain)

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In order to verify assess the presence abundance of *Tomicus destruens* (Wollaston, 1865) and delve into its biology and effects on *Pinus pinea* in the Llobregat delta, biweekly samplings were carried out between June 2021 and May 2022. ECONEX pheromone traps were used in 4 plots close to the coast, taking a sample in the pine forest and another on the forest edge. Nearly 10,500 individuals were collected, of which almost 8,500 were scolitines. In total, 21 families of Coleoptera were identified. *Orthotomicus erosus* (Wollaston, 1857), with 6350 individuals, was the most abundant species. Far behind were *Carphoborus pini* Eichhiff, 1881, (674), *Hylurgus mickltizi* Wachtl, 1881, (623) and *T. destruens* (593). Fifty individuals of the predatory beetle *Thanasimus formicarius* (Linnaeus, 1758) were captured. While *O. erosus* has its main activity peak in spring, and a minor one in November, *T. destruens* has an "opposite" pattern; as it flies from October to April. The predator *T. formicarius* is autumnally active, with a maximum peak in October-November. The plot with the lowest population of scolitines was the one with the best forest management. Taking the 4 plots together, the insects were located preferably on the edge of the pine forest. The ecophysiological study of the pines carried out in parallel by another research team indicated that the pines on the edge are the ones that grow the most and those that suffer the greatest water stress in summer, being therefore more susceptible to attack by the pest. These preliminary results allow advice in relation to the management practices of the pine forests of the Llobregat Delta. A prudent felling that avoids exposing a greater front of the forest is recommended, since that, the pines in the edges are the ones that are going to weaken the soonest and therefore become more susceptible to the attack of the drillers.

Keywords: pine woods, pine pests, boring beetles, forest management, summer drought.

24. Climate change as a driver of insect invasions: Dispersal patterns of a species colonizing a new region

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The dragonfly *Trithemis kirbyi* Sélys, 1891 recently colonized Western Europe from North Africa. Since its first record in the Iberian Peninsula in 2007, the species has been spreading northward and has become naturally established in the central and eastern Iberian Peninsula, the Balearic Islands and southern France. Despite its wide African distribution, its rapid colonization of the western Mediterranean area occurred only very recently. We found that the dispersal and recent establishment of *T. kirbyi* in southwestern Europe strongly depends on increasing temperatures, particularly summer temperature peaks, which has allowed this species to disperse farther and more effectively than during years with average summer temperatures. The most important variable in the suitability models is the minimum temperature of the coldest month, which, in recent decades, has become less of a limiting factor for ectotherms. According to the models, suitable areas for the species are currently found throughout the eastern Mediterranean parts of Europe, and it is likely that it can naturally colonize these areas as it did in the Iberian Peninsula. *Trithemis kirbyi* is a model of how climate change and observed rising temperatures have turned previously inhospitable regions into suitable areas for exotic species, which may successfully colonize them naturally if they can reach these promising lands on their own. However, this study serves as a warning that such species can also colonize these new regions with a little help from unsuspecting 'friends', which are often responsible for the increasingly common presence of invasive, noxious taxa in Europe.

Keywords: *Trithemis kirbyi*, species distribution model, exotic species, Odonata, Anisoptera, temperature anomaly.

25. Mesovoid shallow substratum (MSS): habitat mapping and entomofauna in Portugal

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The colluvial mesovoid shallow substratum (MSS) is a subterranean habitat composed of air-filled spaces between rocky fragments which accumulate on steep slopes. It can be a biogeographic corridor, a permanent habitat and/or a climatic/reproductive refuge for some species. This last ecological function is especially important in the context of global changes. The Portuguese MSS habitats are protected by legislation under the Natura 2000 network, considering their geological properties and plant communities. However, colluvial MSS are not mapped in detail in any geological map, with the current habitat detection method being in situ visual scouting. Here, we present a method that allows remote habitat detection, mapping, and extent estimation, using a combination of knowledge about the geological formation of these habitats in karstic regions, geological maps, and geographic information systems. Portuguese legislation completely neglects the faunal communities of colluvial MSS. Therefore, there is a need to study and characterize MSS fauna in order to establish protection and conservation measures that accommodate these unknown yet very important fauna. Portuguese MSS habitats detected with this novel mapping method are inhabited by invertebrate communities dominated by arthropods, especially insects, similar to other European MSS communities. We found that the Portuguese MSS acts both as a permanent habitat for chordeumatidan millipedes and as a climatic refuge for orthopterans and most beetles. Contrary to other European countries, in Portugal, the highest arthropod abundance was registered during winter, highlighting its importance as a climatic refuge. The combined effects of anthropic destabilization, habitat destruction and lack of knowledge about habitat distribution and faunal composition place this ecologically important habitat under threat, emphasizing the need for studies that contribute to improve its conservation measures.
This work was supported by the Portuguese National Funds through “Fundação para a Ciência e a Tecnologia” (FCT) within the cE3c Unit funding UIDB/00329/2020, CESAM (UIDP/50017/2020, UIDB/50017/2020, LA/P/0094/2020), PhD grant (2021.04868.BD), and by the VILLUM FONDEN (research grant 15471).

Keywords: shallow subterranean habitats, subterranean ecosystems, scree slopes, subterranean fauna, arthropod fauna.

26. Mediterranean university campuses enhance butterfly (Lepidoptera) and beetle (Coleoptera) diversity

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Human population growth is causing an expansion of urban areas, a phenomenon known to deeply impact on the Earth's biodiversity. Therefore, it is key to understand how to conceal urban development with biodiversity conservation. In this context, university campuses can play an important role as they usually present a large array of different environments and green areas, crucial aspects for promoting urban biodiversity as well as human-nature interactions. Several studies have analysed the biodiversity of university campuses, however, there are still important taxonomic (e.g., insects) and geographical biases (e.g., Mediterranean hotspot) in our current understanding of these urban areas. Insects are fundamental in many ecosystems as pollinators, prey, pest controllers or decomposers among others. This further increases the need to study this group in the urban context. In this study, we have investigated diurnal Lepidoptera and ground-dwelling Coleoptera in three university campuses and three non-campus areas of the city of Granada (Spain). We used spatial and temporal replicates for each area in order to explore whether university campuses hold higher levels of insect biodiversity than other nearby urban areas. In addition, we investigated the potential influence of several predictors on insect diversity such as type of land cover, vegetation origin, management intensity, and distance to the outskirts. Our results suggest that Lepidoptera species and Coleoptera families are more diverse in university campuses than in other urban areas, showing also a positive association with the proportion of bare soil and herbaceous cover. Furthermore, they also seem to be benefited from low vegetation management intensity whereas Coleoptera are favoured by native vegetation providing clear management recommendations in order to promote such animal groups in cities. Our study indicates that university campuses are important urban areas to preserve insect biodiversity but also highlights the heterogeneity of response among insect groups.

Keywords: biodiversity, diurnal Lepidoptera, ground-dwelling Coleoptera, university campus, urbanization.

27. Urban arthropods: a meta-analysis

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Urbanization is known to have an important negative effect on biodiversity. However, this general statement is mainly based from the study of some groups like vertebrates that are clearly overrepresented in the urban ecology literature. In contrast, other groups like arthropods (e.g. insects, spiders, crustaceans) are much less studied despite their wider distribution, higher diversity (i.e. they represent more than 50% of all global Eukaryotes diversity), economic importance (e.g. disease transmission, crop pests) and ecological relevance (e.g. pollination, nutrient recycling, trophic network regulation). Arthropods are a key group to understand the impact of urbanization on biodiversity but only 27.3% of urban ecology studies have been focused on this animal group. Furthermore, no literature review on urban arthropods has been published in the last 22 years clearly highlighting the need for an updated study at this respect. We have performed a detailed literature review of published literature on the topic and carried out meta-analytic approaches to investigate the effect of urbanization on arthropods. We identified 6444 published papers from Africa, America, Asia, Europe and Oceania suggesting no large-scale geographic bias. However, the spatial representation of these studies is clearly aggregated within each continent indicating important geographic bias at the regional/continental level. We also found an important taxonomic bias as most of these studies focused on insects (e.g. bees, butterflies, beetles), followed by spiders and other taxonomic groups. In our presentation, we will discuss the results of our meta-analysis, additional biases and their implication for our understanding of urban biodiversity. We will also provide future directions and recommendations that could be useful for ecologists and city planners among others.

Keywords: arthropods, meta-analysis, systematic review, urbanization.

28. Forensically important arthropods associated with aquatic environments in Malaysia

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Terrestrial forensic entomology has been well-studied in different parts of the world; however, on the contrary, the fundamental of aquatic forensic entomology is extremely scarce and outdated, particularly in tropical countries such as Malaysia. A total of four different aquatic habitats were chosen for this study, namely stream, lake, seaside, and mangrove. Rabbit carcasses were employed as model animals, using three carcasses designated to each type of aquatic habitat. Animal carcasses were kept in anti-scavenging cages and placed under the water touching the bottom to attract arthropods (e.g., terrestrial, or aquatic insects) for feeding or searching for temporary shelters. All decomposition stages, the rabbit carcasses' weight, and the weather data (i.e., temperature, relative humidity, and precipitation) were recorded throughout the study with two observations per day for 10 consecutive days (i.e., 9 am and 4 pm). Insect collections from and around the rabbit carcasses were conducted using the D-aquatic net or hand net (for aquatic and terrestrial insects, respectively), and forceps for immature stages, to determine the forensically important arthropods species and diversity. The results indicated that the decomposition rates were shorter in lentic habitats (i.e., lake and mangrove) than in lotic habitats (i.e., seaside and stream). No aquatic insects were found except a few midge's larvae (Diptera: Chironomidae) in one rabbit carcass in the stream; meanwhile, the most abundant terrestrial insects were *Chrysomya megacephala* (Fabricius, 1794), followed by *Chrysomya rufifacies* (Macquart, 1842) (Diptera: Calliphoridae) in all carcasses. These results may lay the foundation for future forensic entomological research in aquatic environments in Malaysia, and therefore, assist the police in forensic investigations.

Keywords: aquatic forensic entomology, Malaysia, Diptera, Chironomidae, Calliphoridae.

29. The use of volatile pyrethroids as spatial repellents for protecting humans by disrupting host-seeking behavior

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Vector-borne diseases continue to pose a significant global public health challenge despite improving control efforts, highlighting the need for new products and programs to shift vector control paradigms. While the importance of modifying vector behavior has been recognized for decades, it has not received enough attention from the public health community. This study aims to explore the potential benefits of using spatial repellents at sublethal doses to promote public health on a global scale and, to propose new methods for evaluating insecticides for general use. Two field experiments were conducted to evaluate the effects of the pyrethroid transfluthrin on *Aedes albopictus* mosquitoes, one assessing human protection levels and the other mosquito knockdown and mortality rates. The results showed that even when mosquito mortality had declined to zero after one hour, the percent protection remained high (>80%) at five hours for the same transfluthrin dose and application method. Despite the promising outcomes, indicating that sublethal doses of insecticides may provide a fresh method for managing disease-transmitting species even when mosquito mortality is absent, additional research is necessary to determine the appropriate balance between regulatory constraints, usage contexts, and benefits for human and environmental health.

Keywords: sublethal effects, field test, mosquitoes, vector-borne disease, bite inhibition, repellence, pyrethroids, human protection.

30. Assessing the efficacy of three essential oils as surface repellents against the German cockroach *Blattella germanica* (Linnaeus, 1767) (Blattodea: Blattellidae)

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The German cockroach, *Blattella germanica* (Linnaeus, 1767), is considered a source of allergens and pathogens. In recent years, the use of repellents has received attention to keep these insects away from their hiding places, such as kitchen and cupboards. The aim of this study was to assess the effect of three essential oils (EOs), thyme, peppermint, and sweet orange oils, as surface repellents against adult German cockroaches. The method used was a choice test consisting of a test arena with two shelters, one treated with the oils and the other without being treated, both shelters contained food attractant. The bottom surface of the treated shelter was covered with 64 mg/cm^2 grams of an alcoholic solution with 0,5% of EOs. This dose was calculated based on those that are considered appropriate for commercial use. For each EO, ten replicates were performed. Negative and untreated controls run in parallel. The repellence effect was checked just after application and then, after 24h and 48h after its application. The parameters recorded were the amount of bait consumed and the distribution of the roaches in both treated and not treated shelters. The results were compared with the untreated control groups. All EOs showed more than 80% repellence just after application. After 24 hours, thyme oil showed 64.6% repellence, peppermint and sweet orange oils did not showed significative differences compared with the control tests. After 48h, none of the EOs showed repellence. In fresh application, the food consumption was significantly lower in the treated shelters. However, no significant differences were observed after 24h and 48h of evaporation. This study indicates that essential oils, applied as a surface treatment at commercial doses, do not provide a long-lasting repellent effect. Further research on the residual effect of EOs against insects is needed to incorporate them into highly effective commercial products.

Keywords: essential oils, repellence, low-risk biocide, cockroach, German cockroach, surface repellent.

31. First description of the immature stages of species of *Pelecocera* Meigen, 1822 hoverflies (Diptera: Syrphidae)

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The genus *Pelecocera* Meigen, 1822 (Eristalinae: Rhingiini) has 11 described species distributed in the Holarctic and Oriental regions. Although larvae of *Pelecocera* have been found feeding on *Rhizopogon* Fr., 1817, fungi in Japan, the immature stages' morphology of *Pelecocera* has not been found investigated yet. Following the findings in Japan, larvae of *Pelecocera* were found in Denmark (Europe) and they are described in detail here. Larvae were also collected in *Rhizopogon* species, and they were reared until adult stage, to confirm that two species, *Pelecocera lugubris* Perris, 1839 and *Pelecocera tricincta* Meigen, 1822, were involved. *Pelecocera lugubris* is associated with sandy heathlands and pine plantations close to coasts, and it is regarded as Near Threatened in the IUCN European Red List of Hoverflies. *Pelecocera tricincta* is associated with open conifer forest and it is widely distributed in Europe, unlike *P. lugubris*. Immature stages' morphology was studied by using both stereomicroscope and scanning electron microscope (SEM) techniques. The Japanese and Danish records suggest that the larvae of this genus might all be mycophagous.

Keywords: chaetotaxy, Denmark, early stages, fungi, hoverfly, puparium.

32. Microtomographic study of the larval anatomy of the hoverfly *Sphaerophoria rueppellii* (Wiedemann, 1820) (Diptera: Syrphidae)

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Laboratory-reared 3rd stage larvae were sacrificed by immersing them in KAAD liquid (1-part paraffin, 7-9 parts 95% alcohol, 1-part glacial acetic acid and 1-part dioxane). They were then submerged in 100% ethanol with 2% iodine for 1 week and were stored in an Eppendorf tube with water for immediate scanning. They were scanned on a Skyscan 1172 microtomograph with a voxel size of 0.67µm. The images were reconstructed with NRecon software, and after processing and cleaning with CTanalyzer, they were segmented and visualised with Amira and CTvox. Here will be presented details of external and internal structures (musculature, nervous, digestive, excretory, fat bodies, etc). Throughout the presentation, different images and videos will be presented that allow to see the anatomy from different perspectives.

Keywords: hoverfly larva, anatomy, micro-CT, Insecta.

33. Sexual conflict in Lepidoptera, the case of the Cornuti Caltrop in *Peridea anceps* (Goeze, 1781) (Lepidoptera: Notodontidae)

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Lepidoptera genitalia are one of the most variable morphological structures in insects and are recognised as a standard key character for taxonomic discrimination. Both male and female genitalia of Lepidoptera structures suggest a rapid and divergent evolution. Cornuti are spine like structures associated to the endophallus of the male genitalia. The cornuti depending on the species may be deciduous or non-decidous. Deciduous cornuti break off and remain inside the female tract after copulation. Among the deciduous cornuti there is a particular and bizarre case called cornuti caltrop (hereafter CC). CC are star-shaped, composed of several (at least 4) spines radiating from a central stalk. Each endophallus contains a CC stock ranging in number from a few to several. The CC has been reported in more than 400 species belonging to a few unrelated families: Sphingidae, Nolidae, Geometridae but notably the family Notodontidae is where this character is more common and also more sophisticated. Their exact function is unknown, but there are some hypotheses that we may consider. In order to investigate in detail these CC we have studied the case of the species *Peridea anceps* (Goeze, 1781) (Lepidoptera, Notodontidae) with specimens from the field, museums and captive breeding. Here we present the results of studying the intra and interindividual variation of the CC relative to the morphology, distribution number and number of spines. Moreover, correlations between the number of CC and different genital and body structures were done with no significant results. The most feasible functional hypotheses are reviewed including breaking off the spermatophore, endophallus blocking and corpus bursae piercing. The hypotheses are not exclusive but without doubt reveal a sexual conflict and all lead to the reduction of the sperm competition.

Keywords: cornuti, sexual selection, sperm competition, male genitalia, captive breeding, reproductive strategy.

34. DNA barcoding as a tool for taxonomic delimitation of Iberian moths at the specific level

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Although the Lepidoptera of the Iberian area have received considerable taxonomic attention, overlooked new species, subspecies and evolutionary significant units continue to be discovered, as well as taxonomic rank revised and invader species recorded. A DNA barcode reference library for Noctuoidea and other lepidopteran taxa has been developed and is being applied to identify groups whose patterns of sequence variation suggest the need of further taxonomic study. Based on 2,874 records from 915 nominal species, DNA barcodes were obtained with up to 95% success, thanks to the collaboration of the worldwide initiative The International Barcode of Life Project (iBOL) and the Center for Biodiversity Genomics (University of Guelph, Canada). We have also been able to discriminate between conspecific populations, sister and cryptic species, distant congeneric species, etc. combining morphology, genetics, reproductive behaviour, and life cycle by 'integrative taxonomy'. Species previously unknown from the Iberian Peninsula and the description of a new endemic species involve the systematic rearrangement of some Iberian genera of different lepidopteran families as Noctuidae, Erebidae, Notodontidae, Euteliidae, Brahmaeidae, Geometridae, Pyralidae and Crambidae as well as the preliminarily reassessment of the taxonomic status of species of some intricate genera such as *Arctia* Schrank, 1802, *Setina* Schrank, 1802, *Apaidia* Hampson, 1900, *Ocneria* Hübner, 1819, *Orgyia* Ochsenheimer, 1810, *Craniophora* Snellen, 1867, *Metopocera* Guenée, 1850, *Thaumetopoea* Hübner, 1820, *Nychiodes* Lederer, 1853, *Eucosma* Hübner, 1823, *Gymancyla*, *Psorosa* Zeller, 1846, etc.

Keywords: Barcode Index Numbers, operational taxonomic units, species delimitation, integrative taxonomy, Iberian Peninsula, Noctuoidea.

35. Highly toxic venoms in the clade Araneae

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Venom plays a fundamental role in the predatory behaviour in the order Araneae. There is a great variability in composition, proportion of components, and mechanisms of venom action among spider clades. While most lineages present specific cocktails suited to kill insect-sized prey, it is puzzling why some lineages have evolved Highly Toxic Venoms (HTVs), capable of killing prey orders of magnitude larger than those they usually consume. Venom is a very energetically expensive weapon that should have been strongly molded and optimized through the evolutionary history of each clade. Therefore, the evolution of HTVs in certain lineages of spiders must respond to specific ecological contexts. Here, we present a literature review of the clades with HTVs in the order Araneae and identify four ecological contexts for its potential evolution (1) the spectrum of prey consumed, (2) lifestyle, (3) habitat productivity and (4) potential risk of predation. We have identified 16 genera with HTV. Six of them are medically relevant for humans. HTV has evolved independently in different lineages. We found a partial match between the presence of HTV lineages and the four ecological contexts, suggesting that further factors are needed to fully understand the evolutionary history of HTVs.

Keywords: evolutionary ecology, predatory behaviour, spiders, venom composition.

36. Molecular and morphological characterization of the *Kalotermes dispar*-complex (Blattodea: Kalotermitidae) from the Canary Islands

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The Canary Islands is a Macaronesian volcanic archipelago with a depauperate community of three species of Kalotermitidae, including *Kalotermes dispar* Grasse, 1938. A total of 42 *Kalotermes* Hagen, 1853 colonies were collected from Gran Canaria, Tenerife, La Gomera, La Palma and El Hierro islands. Soldiers and imagos were morphologically examined and sequenced for four mitochondrial markers. Although morphological differences could not be detected, Bayesian analysis of both cox1/tRNA/cox2 and rrnL markers reviled two distinct clades, one of *K. dispar* and a second cryptic new species of *Kalotermes*. Time tree estimation of the diversification of Canary *Kalotermes* ranged between 12 Mya and 7 Mya, while divergence between the two clades was reconstructed at about 2.6 Mya and 4.6 Mya. *Kalotermes approximatus* Snyder, 1925 from the southeastern Nearctic constitutes a sister to the Canary *Kalotermes* while the Palaearctic *Kalotermes flavicollis* (Fabricius, 1793), *Kalotermes italicus* Ghesini & Marini, 2013, and *Kalotermes phoenicae* Ghesini & Marini, 2015 form a separate clade. It is hypothesized that a faunal exchange of *Kalotermes* from the Nearctic to the Canary Islands occurred via transoceanic rafting during the mid-Miocene.

Keywords: drywood termites, cryptic species, transoceanic dispersal, oceanic islands, diversification.

37. A review of the genus *Eumerus* Meigen, 1822 (Diptera: Syrphidae) from the Canary Islands, Spain

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The Canaries is a volcanic archipelago of seven main islands in the Macaronesia, near the coast of north-western Africa. High levels of biodiversity and endemism are reported from these islands, especially in the invertebrate fauna. Regarding the hoverflies (Diptera, Syrphidae), 35 species of 20 genera are found on the different islands, with *Eumerus* Meigen, 1822 being the most speciose genus (10 species, of which seven are endemic to the archipelago). The first monograph on the genus *Eumerus* dates from 1982 and included the descriptions of four new species as well as identification keys to all species. Except for the proposal of *Eumerus terminalis* Santos Abreu, 1924 as junior synonym of *Eumerus amoenus* Loew, 1848 and a few faunistic additions on other species, no studies have been undertaken on the Canarian *Eumerus* since 1982. Recent fieldwork and examination of specimens from different collections have resulted in a better knowledge of the *Eumerus* diversity from this Spanish archipelago, including the discovery of a new species allied with *Eumerus purpureus* Macquart in Webb & Berthelot, 1839. An integrative approach was used to study the species taxonomy of Canarian *Eumerus*. Relations and possible origin of the Canarian *Eumerus* with the African fauna are also discussed.
Financial support for this study was provided by the 'Fauna Ibérica' project (PGC2018-095851-A-C65), the 'Vicerrectorado de Investigación y Transferencia de Conocimiento' of the University of Alicante (Ref. UATALENTO17-08) and an A-base research grant to Jeffrey H. Skevington from Agriculture and Agri-Food Canada (AAFC).

Keywords: Merodontini, Macaronesia, volcanic island, endemicity, taxonomy, nomenclature.

38. Monograph on the Ibero-Balearic Eristalinae (Diptera: Syrphidae): A 'Fauna Ibérica' Project

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The Research Project 'Fauna Ibérica' started in 1988 and together with 'Flora Ibérica' and 'Flora Micológica' is part of the so-called 'Programme for Biodiversity of the Iberian Peninsula'. There have been twelve editions of this project resulting in 44 high-standard zoological monographs. All editions were led by Mª Ángeles Ramos Sánchez (Museo Nacional de Ciencias Naturales, Madrid), who passed away on March 2023. With the leader vanished and no replacement, 'Fauna Ibérica' enters an unclear period with pending monographs to be published from the last (XII) edition of the project. The results of one of the subprojects (PGC2018-095851-A-C65) from this last edition (2019-2022) are to be presented in this talk. During the project 'Monografía de los sírfidos Eristalinae (Diptera: Syrphidae) ibero-baleares', cryptic and hidden biodiversity of hoverflies has been explored in many Iberian-Balearic localities, with eight new species discovered in the genera *Cheilosia* Meigen, 1822, *Eumerus* Meigen, 1804, *Melanogaster* Rondani 1857, and *Orthonevra* Macquart, 1829, and the intraspecific (phenotypic and genetic) variability of *Cheilosia* species assessed. The larvae of two hoverfly species have been described in detail for the first time. The distribution of many species is better understood as a result of this project, with uncovered taxa that were unknown to occur in Spain (eg, *Mesembrius* Rondani, 1857, found in Menorca). Two PhD theses about integrative taxonomy of hoverflies are ongoing in the framework of this project, one to revise the Iberian species of *Cheilosia* and the other devoted to revise *Eumerus*. The monograph is being written and will include scientific drawings of the habitus of 100+ species. In a framework of global change, we defend the continuity of the Project 'Fauna Ibérica' to avoid underestimations of biodiversity loss in this species-rich part of Europe.

Keywords: hoverfly, Eristalinae, *Eumerus*, *Cheilosia*, taxonomy, cryptic biodiversity, larva, scientific illustration.

39. Updating the knowledge of the genus *Cheilosia* Meigen, 1822 (Diptera: Syrphidae) in the Sierra Nevada National Park: implications for conservation

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With over 20,000 species of invertebrates, Sierra Nevada is a unique ecosystem in southern Europe having a wide altitudinal range, from 300 to 3478 m asl at the Mulhacén, which is the highest peak on the Iberian Peninsula. This ecological uniqueness is acknowledged by the fact that 850+ km^2 of its extension are protected as a national park. Syrphids (Diptera: Syrphidae) are one of the most important groups of invertebrate pollinators in Europe, and the trophic diversity of their larvae has prompted them to be used as bioindicators of different ecosystem processes. *Cheilosia* Meigen, 1838 is the largest syrphid genus in the Palaearctic Region (almost 500 species described), with a high complexity of taxa with phytophagous larvae. The Iberian species of *Cheilosia* have not been revised yet, and many Iberian areas are still unexplored. In the Iberian Peninsula, there are records of 57 species, only one, *Cheilosia urbana* (Meigen, 1822), from Sierra Nevada. With the present study, knowledge of the *Cheilosia* diversity in Sierra Nevada is updated and substantially increased to 13 species, three of them undescribed. Two of these three species are endemic to Sierra Nevada. The new species' concepts were defined both from morphological and molecular characters. The implications of the new findings for the species and habitat conservation are discussed under the light of 'Syrph the Net, the database of European Syrphidae' and the recent IUCN European Red List of Hoverflies.
This research is part of Iván Ballester-Torres' PhD and belongs to the Fauna Ibérica project (PGC2018-095851-A-C65) of the Spanish Ministry of Science, Innovation and Universities, as well as to the UATALENTO17-08 of the "Vicerrectorado de Investigación y Transferencia del Conocimiento", University of Alicante.

Keywords: Syrphidae, *Cheilosia*, Sierra Nevada, Iberian Peninsula, taxonomy, conservation.

40. Towards a systematic revision of the subgenus *Iberomelia* Mas-Peinado et al., 2018 (*Pimelia*: Tenebrionidae)

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The large morphological complexity of the speciose genus *Pimelia*, which includes around 324 species, presents a clear taxonomic challenge. The subgenus *Iberomelia* Mas-Peinado, Buckley, Ruiz & García-París, 2018 endemic to the Iberian Peninsula and the Balearic Islands, includes currently seventeen recognized species. The taxonomic status of some species is still doubtful and the limits between them diffuse. In this context, we will evaluate the current taxonomic structure of the subgenus *Iberomelia* by (i) providing a phylogenetic hypothesis based on two mitochondrial genes (*cox1* & *16S*) and two nuclear genes (*ITS1* & *ITS2*), and by (ii) including phylogeographic analyses of the widely distributed species. Preliminary results suggest that the subgenus is composed of four parapatric lineages currently distributed throughout the Iberian Peninsula: the southeast (Carthaginian lineage), east (Balearic lineage), southwest (Lusitanian lineage), and center (Castilian lineage). These lineages radiated since the Middle Miocene. According to these results, we will try to identify patterns of morphological variation between and within species toward the completion of a systematic revision of *Iberomelia*.

Keywords: Iberian Peninsula, lineages, phylogeny, phylogeography, taxonomy.

41. Current state of knowledge of Iberian cynipids (Hymenoptera: Cynipidae), with citations of new or interesting species, new evidence on heterogonic cycles of some species hitherto known by a single generation and the resulting synonymies

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The state of knowledge of Iberian cynipids (Hymenoptera: Cynipidae) is updated, as the Iberian Peninsula and the Balearic Islands cynipid catalog is raised to 146 species. New, doubtful or little-known species of Iberian cynipids are cited while new data about the heterogonic cycles of some species associated with *Quercus* are discussed and new synonymies are subsequently established. *Cecconia valerianellae* (Thomson, 1877) and *Liposthenes glechomae* (Linnaeus, 1758) (Cynipidae, Aulacideini) are recorded for the second time in Spain, while *Diplolepis spinossisimae* Giraud, 1859 is recorded for the first time in Aragón. *C. valerianellae*, which was known from a single adult record from the centre of Spain, has now been recorded in Andalucía (south of Spain), based on collected galls and larvae, while *L. glechomae*, previously recorded only from Val de Aràn (Pyrenees) is now found in sites within La Rioja (north-eastern Spain). The terminal-instar larva of these two species of herb gall wasps is described for the first time. The presence in the Iberian Peninsula of the oak gall wasp *A. superfetationis* (Giraud, 1859) (Cynipini), which was previously questioned by authors, is confirmed with its first record from Spain, as are new records of *Andricus crispator* Tschek, 1871 and *Andricus fidelensis* Kieffer, 1901, two rare species inducing galls on the cork oak, from the autonomous regions of Andalucía, Galicia and Cantabria. Molecular evidence has confirmed the cyclical parthenogenetic life cycles of these two species, demonstrating that *A. crispator* is the sexual generation of *A. superfetationis* while *A. fidelensis* is the alternate generation of an undescribed taxon close to but distinct from *Andricus gemmeus* (Giraud, 1859). Finally, molecular analysis also synonymizes *Andricus floridus* Tavares, 1918 with the sexual generation of *Andricus glandulae* (Hartig, 1840) (=*xanthopsis*).

Keywords: oak gall wasps, herb gall wasps, larvae, *Andricus*, new records, life cycles, synonymies.

42. Is national taxonomic entomology declining? Spain as a case study

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Limitations in the ability to describe species and map their distribution are known as the Linnean and Wallacean shortfalls, respectively. In entomology, strong scientific communities at a national level are essential to bridge these two shortfalls, especially given the decline of the world's entomofauna. However, there is a general perception that taxonomic entomology has lost traction in recent decades. Here, we studied the wealth of the Spanish taxonomic entomology and its ability to bridge the Linnean and Wallacean shortfalls, by examining temporal changes in the number of Spanish entomological societies and journals from 1900 to 2020. We included data from 17 societies and 58 journals. We found an increase in the number of entomological societies, with either increasing or stable membership in the recent times. In addition, the number of journals edited increased with time up to the early 1980s. Temporal changes in the filiation and nationality of authors showed a stable trend or an increase in academic and international authorship. The decline reported in other countries was not so clear in Spain. After a steady growth of societies, membership, journals and articles since the early 1970s, research policies during the 1980s partially curtailed this development and influenced in the disappearance of national journals, especially those edited by universities. A plateau in journals edited and membership of the main entomological societies suggests signs of stagnation. In addition, we are aware that human power and a robust structure of local societies and journals is not enough to meet the challenges of the

Linnean and Wallacean shortfalls. Lack of academic incentives and replacement of an aging community of expert taxonomists is a big source of concern and distress.

Keywords: entomological societies, internationalization, Linnean shortfall, scientific journals, Wallacean shortfall.

43. Systematics of western Mediterranean *Stenalia* Mulsant, 1856 (Coleoptera: Mordellidae)

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Mordellidae is a family of the order Coleoptera (superfamily Tenebrionoidea) distributed worldwide that includes more than 2300 species in 115 genera. Within this family, the genus *Stenalia* Mulsant,1856 is easily recognisable by the colour of the elytra (dark brown to brownish-yellow), the presence of hairs on the lower part of the eye, etc. The 40 species of the genus are mainly distributed in warm and dry climate zones, associated with steppes and grasslands of the Afrotropical and southern Palaearctic Regions. In the Palaearctic Region the genus includes a total of 28 species. According to the catalogue of Palaearctic Coleoptera, three species are present in Spain: *Stenalia hispana* Schilsky 1895 endemic to Spain, *Stenalia testacea* Fabricius 1787 widely distributed in the Mediterranean region and *Stenalia stipae* Chobaut 1924 in northern Africa and Spain. The aim of this work is to find out what processes have led to the speciation of *Stenalia* and try to determine what factors have influenced its diversification. To this end, genetic and morphological studies have been performed using specimens from the Iberian Peninsula and Morocco. The study was carried out by sequencing and analysing the mitochondrial cytochrome oxidase 1 (COX1) and nuclear carbamoyl-phosphate synthetase (CAD) genes. In addition, differences in morphological characters commonly used to differentiate species such as the size and shape of the pygidium, antennae, distance from the eyes to the facial margin or the structure of the maxillary palps were studied. Preliminary results showed the presence of four distinct clades with no internal geographical structure, as well as sympatry of species throughout the Iberian Peninsula. There are currently three species reported in Spain, which points to the presence of a new species.

Keywords: Mordellidae, speciation, Palaearctic region, phylogenetics, morphology, taxonomy.

44. Female terminalia morphology and phylogenetic relationships among *Pimelia* Fabricius, 1775 (Coleoptera: Tenebrionidae)

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The genus *Pimelia* Fabricius, 1775 is the largest representative of the tribe Pimeliini in the Mediterranean region. It consists of approximately 324 species distributed mainly in xeric environments of the western Palaearctic region, north of the tropical African region and even in deserts of the West Indomalayan region, with the highest concentration of endemic species in North-western Africa and the Iberian Peninsula. According to the most recent phylogenetic approach, the genus *Pimelia* is classified into 14 subgenera. Its morphological diversity with high inter- and intraspecific variability and the existence of conserved morphologies among divergent species that diverged 30 mya ago, has made its taxonomic classification difficult. Here, (i) we study and describe the morphology of the female genitalia of species representative of different subgenera of *Pimelia*. The description and comparative study of the female terminalia aims (ii) to locate characters that reinforce the subgenera boundaries described in Mas-Peinado et al. (2018), and (iii) explore the evolution of selected ovipositor characters, by the reconstruction of their ancestral states in the phylogeny.

Keywords: Pimeliini, phylogeny, subgenera, ovipositor, diversity, morphology, evolution.

45. Testing conflicting taxonomic hypotheses in myrmecophilous *Oochrotus* Lucas, 1852 (Coleoptera: Tenebrionidae)

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Myrmecophilous insects tend to have fairly homogeneous morphologies. This is why they generate great taxonomic debates, with some authors interpreting small morphological variations to define new species or subspecies and others opting to unify all individuals into a single taxon. This is the case of the beetles of the genus *Oochrotus* Lucas, 1852, a group of small, apterous tenebrionids that usually inhabit ant nests. The beetles of this genus have only minor variations in the structure of their aedeagus and ovipositor. For many years, the specimens of this taxa have been classified in two species, *O. unicolor* Lucas, 1852 and *O. glaber* Demaison, 1904. In 1961, Canzoneri attempted to reflect the diversity that could be found in these beetles, describing up to eight subspecies within *O. unicolor*. However, in 2000, Soldati & Soldati synonymised many of these subspecies, claiming that none of the differences found by Canzoneri were significant. Thus, there are two competing taxonomic hypotheses to explain the morphological diversity within the genus. The aim of our work was to test these hypotheses using a molecular approach, in order to clarify the taxonomic relationships within the genus *Oochrotus*. For this purpose, sequencing of the nuclear gene ITS2 and the mitochondrial gene Cytochrome b was carried out on individuals from North Africa, Italy and the Iberian Peninsula, followed by phylogenetic analyses based on Bayesian inference. Preliminary results suggest that there are three highly differentiated lineages. The diversity found allows to restructure the taxonomy of the genus; as well as raising new questions about how the populations of these beetles are related to each other, especially considering their interaction with ants.

Keywords: molecular data, morphology, myrmecophily, systematics, Tenebrionidae.

46. Integrative phylogeny and evolution of *Abax* Bonelli, 1810 (Coleoptera: Carabidae: Pterostichini)

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The genus *Abax* Bonelli, 1810 is a member of the large tribe Pterostichini that includes 18 species mostly found in temperate forests and grasslands of Central Europe. Present distribution, morphological homogeneity and ecological preferences suggest that *Abax* is a "young" lineage that radiated during Middle Miocene. Phylogenetic analysis of *Abax* is thus of interest to highlight the evolution of taxa linked to European temperate forests. We have sequenced fragments of the mitochondrial *cox1* and the nuclear *28S* genes of 16 species of Abax, 1810. Our results partially agree with relationships suggested by morphological characters, as it happens with the subgenera *Abacopercus* Ganglbauer, 1891 and *Pterostichoabax* Schauberger, 1927. However, the larger and heterogeneous subgenus *Abax* was found to be polyphyletic and should be rearranged. To this aim, a number of morphological characters should be re-examined, namely the carinate 7th elytron interval, the setulose 5th tarsomere of hindleg, the umbilicate series of setae on 8th interval and the length of the terminal shaft of male aedeagus. These are currently used in morphological keys but are of equivocal phylogenetic value. It is postulated that ancestral *Abax* were originated in the Carpathians and colonized temperate forests of Europe towards the West across the Alps and the Pyrenees at the onset of Middle Miocene (Tortonian), giving rise to a present core area of taxa between north Italy, Switzerland, and Slovenia. Secondary colonization events likely originated taxa inhabiting low-altitude grasslands or alpine meadows in large areas of Central Europe.

Keywords: Carabidae, *Abax*, evolution, integrative phylogeny.

47. The Objetivo polinizadores action plan: pollinators and rural development in La Rioja Biosphere Reserve

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In 2010, the 'Dirección General de Calidad Ambiental y Agua de la Consejería de Medio Ambiente' of La Rioja carried out an R&D&I project in the field of beekeeping where, among other objectives, it highlighted the beekeeping potential in the La Rioja Biosphere Reserve or the influence of climate change on honey production. One of the conclusions collected warned about the importance and the lack of knowledge of wild pollinators throughout the region. In 2021, the study was resumed and, among other works, an action plan was carried out with wild pollinators in the Biosphere Reserve. The action plan comprises three sections or phases: knowing the existing pollinating species, working together with agricultural producers to improve productivity, and conserving pollinating insects and their habitats. This action plan is known as 'Objetivo Polinizadores'. In 2023, the first phase is being carried out: the inventory of pollinators. Initially, the proposed study groups are wild bees and bumblebees (Anthophila), butterflies (Papilionoidea) and hoverflies (Syrphidae). The La Rioja Biosphere Reserve is very extensive and presents a great diversity of habitats. For this reason, pending results, it is expected that it could be a peninsular benchmark in terms of pollinating insects.

Keywords: bees, butterflies, hoverflies, pollinators, Biosphere Reserve, La Rioja.

48. Characteristics of an orange-nymph mutant in the biological control agent *Orius laevigatus* (Fieber, 1860) (Hemiptera: Anthocoridae)

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Orius laevigatus (Fieber) (Hemiptera: Anthocoridae) is one of the main thrips predators used in biological control programs. In 2021, a strain of this important biological control agent was established from a single orange nymph found in a wild population. The normal coloration of this predatory insect in its different nymphal instars is normally yellowish, but the established mutant population visibly had an orange body coloration. Genetic analysis revealed that the mutation (ambar) that gave this distinctive color was controlled by a single autosomal recessive allele. In order to understand better the characteristics of this new established orange strain, some biological studies were carried out comparing it with a normal population. Body size, starvation tolerance and predation capacity were lower in the orange strain, however longevity, fecundity and fertility were similar in both populations. The mutant strain could be useful as a visible genetic marker in reproductive behavior and population dynamics for biological and ecological studies, as well as to compare the establishment and biocontrol services of different populations of this important natural enemy.

Keywords: *Orius laevigatus*, mutation, body color, orange, autosomal recessive allele, genetic marker.

49. Genetic improvement of Mediterranean populations of *Orius laevigatus* (Fieber, 1860) (Hemiptera: Anthocoridae) for adaptation to low temperatures

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In greenhouse crops, the use of biological control agents (BCA) as a tool to combat pests allows an early response to immigration and their outbreaks. However, BCAs are sensitive to environmental fluctuations, being temperature the environmental factor that most influences, causing repercussions on the establishment and reproduction rate. In the greenhouse, the temperature threshold of *Orius laevigatus* Fieber, 1860 is higher than that of its prey, the thrips *Frankliniella occidentalis* (Pergande, 1895) (Thysanoptera: Thripidae), favouring the development of the pest in winter, generating a lack of control in these months. Therefore, obtaining cold-tolerant strains would allow earlier releases to achieve biocontrol in periods of low temperature. For this reason, the variability of 25 Mediterranean wild populations in their fecundity at 15°C and 26°C was studied, as well as the fecundity of 5 commercial populations. Subsequently, these populations were selected based on their response to low temperatures, establishing two lines known as 'Frío I' and 'Frío II'. A study of the selection process was initiated in order to obtain cold-tolerant strains to allow optimal control of thrips in winter, avoiding successive releases of the insect. After several years of selection, strains better adapted to low temperatures were obtained, showed an increase on fecundity at 15°C.

Keywords: anthocorids, thrips, cold tolerance, genetic improvement, selective breeding, artificial selection.

50. Pollen as a supplement or partial substitute for *Ephestia kuehniella* Zeller, 1879 (Lepidoptera: Pyralidae) eggs in mass rearing of *Orius laevigatus* (Fieber, 1860) (Hemiptera: Anthocoridae)

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Orius laevigatus (Fieber, 1860) is the main biological control agent for the thrips *Frankliniella occidentalis* (Pergande). For its use, it is massively bred in biofactories for distribution and released in greenhouses. Breeding is done using *Ephestia kuehniella* Zeller, 1879 eggs, but the difficulties of raising this moth mean that its price is high. To reduce the cost of rearing *O. laevigatus*, it is interesting to explore the possibility of reducing feeding in some periods of its development without a negative impact on its performance. Since *O. laevigatus* can feed on pollen when prey is absent, we hypothesize that there are less critical phases of biological development that may be fed a suboptimal diet, in our case pollen, or make limited use of eggs of *E. kuehniella*, without significantly affecting rearing performance. The alternating diet between *E. kuehniella* eggs and pollen at certain stages of development would mean a decrease in the final cost of production. We have called this strategy "regulated deficit feeding". To validate this strategy, an optimal diet during the entire nymphal development was compared with the alternation of the optimal diet and a suboptimal diet in different nymphal phases. These strategies were studied in commercial populations and strains genetically improved for elevated tolerance to pollen feeding. Results of development, survival and size were obtained; and fecundity, fertility and longevity of females. Deficit feeding in the early nymphal stages was the most critical for survival. However, when the deficit feeding was in the last nymphal stages, the development time and survival were similar to that of the treatment with the optimal feeding during the entire nymphal stage.

Keywords: *Orius laevigatus*, *Ephestia kuehniella*, pollen, mass rearing, controlled deficit feeding, survival, fecundity.

51. Optimization of laboratory rearing of *Chelonus inanitus* (Linnaeus, 1767) (Hymenoptera: Braconidae)

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Chelonus inanitus (L.) is a natural enemy of *Spodoptera littoralis* (Boisduval), pest that causes significant damage to pepper crops throughout the world. This parasitoid offers potential for the control of this pest and for other lepidopteran pests if its mass rearing is optimized. The objective of this work was to optimize the laboratory rearing of *C. inanitus* as a first step for the creation of a mass rearing of the parasitoid. As this braconid can also parasitize eggs of *Ephestia kuehniella* Zeller, which is frequently used in entomology laboratories, we evaluated by means of choice tests if the females of *C. inanitus* preferred the eggs of the natural host *S. littoralis* or the factitious host *E. kuehniella* in order to discern if the instinct to parasitize its natural host is greater than on the factitious host. Once verified that *E. kuehniella* is a good factitious host for mass rearing, we wanted to research the optimal age of the eggs for parasitization: young (1 day old) or mature (4 day old). The effect on the offspring of the parasitoid was also observed when introducing a greater number of females parasitizing a greater mass of eggs. The results indicate that the females of *C. inanitus* did not significantly choose *E. kuehniella* or the natural host *S. littoralis* to oviposit, and there were not differences in neither the time of choice nor the time of parasitism. Therefore, the factitious host seems to be suitable for massive rearing of the parasitoid, with the advantage that it is more easily reared in the laboratory on this host than on natural hosts. The results obtained show that mature eggs seem to be more convenient because they increase the percentage of the offspring and shorten the life cycle, which would allow obtaining more parasitoids in less time.

Keywords: biological control, natural enemies, IMP, greenhouses.

52. Effect of essential oils on *Myzus persicae* Sulzer, 1776 (Hemiptera: Aphididae) and on its predator *Sphaeroporia rueppellii* (Wiedemann, 1830) (Diptera: Syrphidae)

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Aphids are dangerous pests in Mediterranean crops due both to direct damages and very relevant indirect effects because they are vectors of several plant viruses. Chemical control based on phytochemicals has been the usual way to control this pest in Mediterranean cultures. However, the restrictions in use of different active ingredients, in addition to the numerous problems derived of the extensive use of synthetic insecticides, has led to the need to find nature-based solutions that may be compatible with Integrated Pest Management. We therefore investigate the use of essential oils as natural insecticides. We selected three plant species from different families: rosemary (*Salvia rosmarinus* Spenn) (Lamiaceae), laurel (*Laurus nobilis* L.) (Lauraceae) and cypress (*Cupressus sempervirens* L.) (Cupressaceae), collected from the Biological Station from Torretes (Ibi, Alicante). Essential oil extraction was carried out by hydrodistillation for 3 h. Each oil was dissolved in acetone and applied in different doses in toxicity bioassays, on the pest aphid *Myzus persicae* Sulzer, 1776, and on its predator, the hoverfly *Sphaerophoria rueppellii* Wiedemann, 1830, a natural enemy of aphids and a pollinator, in order to know what oils and in what doses can be used to control the aphid, without negatively affecting the hoverfly. The highest concentration of essential oil used caused a mortality of 85%, with rosemary being the most toxic. At lower concentrations, mortality values remained high, reaching 77% with cypress. In hoverfly larvae, we obtain very low mortality values at higher concentrations, with 20% with cypress and laurel, and only 6.7% at lower concentrations. The results suggest that essential oils are very promising as natural product capable of combating aphid pests and being able to offer farmers effective tools for Integrated Pest Control.
This work has been developed within the framework of AGROALNEXT/2022/052 project.

Keywords: aphids, biopesticide, cypress, integrated pest control, natural insecticides, laurel, rosemary, hoverflies.

53. Compatibility of *Chrysoperla carnea* (Stephens, 1836) (Neuroptera: Chrysopidae) with plant essential oil nanoemulsions

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Biopesticides are natural materials derived from plants, animals, bacteria or minerals used for pest control. Essential oil (EO) in water nanoemulsion of botanical active substances are promising formulations that include entities in the nanometer size range, therefore enhancing stability and biological activity. Side-effects of four nanoemulsions + 1% Tween 20 (0.5% anise, lemon EO, farnesol or mix of the aforementioned) were studied on the predator *Chrysoperla carnea* Stephens, 1836, a model species for non-target effects of pesticides under registration. Bioactives were compared with distilled water + 1% Tween 20 nanoemulsion (control) and three synthetic pesticides at Spanish maximum field recommended concentration: deltamethrin (IRAC mode of action 3A, sodium channel modulator), flubendiamide (IRAC 28, ryanodine receptor modulator) and dimethoate (IRAC 1B, acetylcholinesterase inhibitor). In the first experiment, newly molted L3 larvae were left to choose between a nanoemulsion-treated and a control-treated pepper disk inside a Petri dish (40 replicates per bioactive). In the second set of experiments, L3 larvae were exposed to insecticides *via* 1) contact with treated pepper leaves for 72 hours (fresh and 1-day-old residue) (5 replicates of 10 larvae each), and 2) ingestion of treated *Ephestia kuehniella* Zeller,1879 eggs for 72 hours (4 replicates of 10 larvae each). Acute mortality was annotated. Surviving larvae were fed until pupation. Emerging adults originated from treated larvae after compound exposure were coupled. Sublethal effects on fecundity and fertility were studied for seven days. Results showed that *C. carnea* was significantly attracted to anise disks and significantly deterred by farnesol or mix disks. Larvae did not show any significant response for lemon disks. There was no significant mortality of the predator when contacted or fed with bioformulations. Sublethal effects of bioactives on pupae developmental period and reproductive traits will be discussed at the meeting.

Keywords: biological control, chrysopid, biopesticides, non-target effects.

54. Non-toxic effects of anthelmintic phytochemicals on dung beetles (Coleoptera: Scarabaeidae): the case of thymol, carvacrol, cinnamaldehyde and garlic oil as potential alternatives to ecotoxic veterinary medicinal products

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Ecotoxic synthetic pharmaceutical anthelmintics threat the environment because their residues can negatively affect non-target organisms such as dung beetles. The phytochemical anthelmintics may provide an alternative to these ecotoxic anthelmintics. Therefore, in this study the following alternative phytochemicals were analysed to assess their suitability as true alternatives (without side effects for the dung beetle fauna) to the synthetic anthelmintics: thymol (THY), carvacrol (CVR), cinnamaldehyde (CIN) and garlic oil (GAO). Additionally, we used two commercial products which contain a combination of THY and CVR and other with a combination of CIN and GAO. This study includes the first ecotoxicity tests for these alternative phytochemicals which examined both the physiological sub-lethal symptoms and the pre-lethal consequences after somatic paralysis. were examined by exposing a model dung beetle species (*Ateuchetus cicatricosus* (Lucas, 1846); Coleoptera, Scarabaeidae) to different concentrations of the phytochemical anthelmintics. The chemical analysis showed the practically non-existent presence of chemical residues in cattle excrement after the consumption of commercial formulations as a food supplement reinforces the suitability of this type of phytochemical compounds. Also, that none of the phytochemical compounds have ecotoxic effects, even at extremely high concentrations, including those almost 1000 times higher than what it is most likely to be found in dung susceptible of being ingested by dung beetles. Taking into account the results obtained in the analysis of residues in the excrement, we can highlight that we have used in the ecotoxicological tests concentrations almost 1000 times above. Thus, we can conclude that the four selected phytochemical compounds meet sufficient requirements to be considered reliable alternatives to ecotoxic veterinary medicinal products, such as ivermectin.
Financial support was provided by the projects PID2019-105418RB-I00 (MCIN/AEI /10.13039/501100011033) and TED2021-130304B-I00 (MCIN/AEI /10.13039/501100011033 and European Union NextGenerationEU/ PRTR).

Keywords: ecotoxic anthelmintics, phytochemical anthelmintics, ecotoxicity tests, dung beetles.

55. Targeted control of *Drosophila suzukii* Matsumura, 1931 (Diptera: Drosophilidae) using spider venom peptides

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Insect pests are a major problem dating from the beginning of agriculture. The evolving climate change magnifies the emergence of new insect pests, while trade globalization fosters their evolution and spread. One of the most threatening plant insect pests worldwide is *Drosophila suzukii* Matsumura, 1931 (Diptera: Drosophilidae), also known as spotted-wing drosophila (SWD). SWD is a polyphagous species and benefits from a highly serrated ovipositor to lay its eggs on healthy and undamaged fruits of economically important crops, namely blueberry, raspberry, blackberry, and strawberry. The eggs hatch, and the resulting larvae will scour the fruit, invalidating its consumption and commercialization. Current control measures highly rely on the application of broad-spectrum insecticides, which consequently are toxic to non-target insect species, as the so important pollinators. Additionally, the occurrence of *D. suzukii* insecticide-resistant individuals has further highlighted the urgency of exploring new control strategies to curb this pest. In the last years, spider venom peptides (SVPs) have been gaining special attention as green control strategies for pest management. This is due to their good stability at high temperatures and extreme pH values, but also to neurotoxicity specific to the target neuronal receptors or ion channels. In this study, the efficacy of two SVPs against *D. suzukii* was explored. Peptides J-atracotoxin-Hv1c and μ-theraphotoxin-Hhn2b were orally administered in concentrations up to 223 μM for different periods (2 to 48 h). Flies' survival and longevity were monitored on a daily basis, and the gene expression of key cellular pathways was evaluated to disclose the biological response of *D. suzukii* to these peptides. Results suggest that SVPs' activity is hampered by defense mechanisms triggered in response to xenobiotics and oxidative stress. Controlled delivery of these peptides may both increase their bioavailability and activity, and make them more target-specific, improving biosafety to non-target arthropods.

Keywords: gene expression, J-atracotoxin-Hv1c, neurotoxic peptides, insect pest control, spotted-wind drosophila, stress-related pathways, μ-theraphotoxin-Hhn2b.

56. Identification of *Drosophila suzukii* Matsumura, 1931 (Diptera: Drosophilidae) native predators in Portuguese berry orchards as a powerful first step toward biological control

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Drosophila suzukii Matsumura, 1931 (Diptera: Drosophilidae), or Spotted-Wing Drosophila (SWD), is a highly polyphagous pest of soft-skinned fruits such as small berries, cherries, or grapes. Its invasion success is closely associated with the lack of specialized natural enemies in the invaded areas, and SWD is now present in almost all continents, causing severe fruit damage and economic losses to producers affected by this pest. Current control management practices rely heavily on using insecticides, which are ineffective and broad-spectrum, affecting beneficial arthropods. Biological control (BC) constitutes a sustainable and eco-friendly management strategy, namely conservation BC (CBC), focused on identifying native predators and promoting their communities in infested areas. Therefore, this study aimed to identify native predators of SWD in Portugal as a first step toward implementing BC strategies. Arthropods were collected by aspiration and pitfall traps and identified morphologically at the order/family level. Upon identification of potential predatory taxonomical groups, predation of SWD was assessed based on molecular-gut content analysis through PCR with SWD-specific primers. Among the potential predatory groups, it was possible to confirm the predation of SWD by Chrysopidae (Neuroptera), Miridae (Hemiptera), Carabidae (Coleoptera), Formicidae (Hymenoptera), and Araneae, all previously identified as SWD predators. Additionally, it was possible to detect for the first time SWD DNA in Opiliones and Hemerobiidae (Neuroptera) individuals, therefore constituting new potential BC taxa. Spider families were further grouped according to their functional guild, and predation was confirmed in the space web weaver and orb web weaver families. Of the latter, spiders from the family Uloboridae (Araneae) were recorded for the first time in SWD-infested orchards. This study highlights the importance of identifying native predators in the field to better implement CBC strategies or augmentative BC instead of introducing new predatory species solely based on laboratory assays.

Keywords: biological control, conservation biological control, spotted-wing *Drosophila*, native predators, molecular gut-content analysis.

57. Push-pull strategy for sustainable management of *Philaenus spumarius* (Linnaeus, 1758), the European vector of *Xylella fastidiosa* (Wells *et al*., 1987)

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The outbreak of *Xylella fastidiosa* (Wells et al., 1987) in Europe in 2013 killing thousands of olives in southern Italy has led to investigate new ways to manage the disease. As there is no cure for infected plants, management of vector populations is one of the most effective strategies to contain the spread of *X. fastidiosa* in infected areas. Our main goal was to create ecological infrastructures by selecting plant species that could be used to reduce the population size of *Philaenus spumarius* (L., 1758) (Hemiptera: Aphrophoridae), the main vector of *X. fastidiosa* in Europe. We conducted a series of antixenosis and antibiosis assays to assess the nymph's settling preference under non-choice and multiple-choice conditions and the developmental and mortality rate of ten candidate plant species. In addition, we monitored the egg masses and the number of eggs laid by adults on the leaf litter of the selected plant species. Results showed that *Anthriscus cerefolium* L. and *Diplotaxis tenuifolia* L. had a lethal and repellent effect on *P. spumarius* nymphs, while *Sinapis alba* L. could be used as an attract and kill (dead-end) trap plant. On the contrary, *Taraxacum officinale* L. and *Lavandula angustifolia* (Miller) (*X. fastidiosa*-susceptible) were the most preferred species for nymphs. Furthermore, adults oviposited preferably on *Centaurea cyanus* L., *Sonchus oleraceous* L., *T. officinale* and *A. cerefolium* whilst *D. tenuifolia* and *S. alba* were the least preferred plant species for oviposition. In conclusion, *D. tenuifolia*, A. *cerefolium* and *S. alba* could be intercropped as ground cover vegetation in olive groves to provide ecological infrastructures under a push-pull strategy for sustainable management of *P. spumarius* populations. Furthermore, *T. officinale*, *L. angustifolia* and *C. cyanus* should be avoided on *X. fastidiosa*-susceptible crops because they will increase the population of *P. spumarius* in the field.

Keywords: ecological infrastructures, trap-plants, cover crops, ground cover, olive.

58. Antennal sensilla pattern of the *Anagyrus* Howard, 1896 males (Hymenoptera: Encyrtidae) attacking mealybugs in Eastern Spain

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Insect antennae have several types of sensory organs, like hairs or pegs, for detecting physical and chemical cues from the environment. These structures allow insects to perform a number of behaviours related to, for example, touch, smell, taste, colonization of appropriate habitats, orientation and recognition, courtship and mating, and avoidance of predators and other threats. Female parasitoid wasps display antennal sensilla to locate the hosts, while male parasitoids usually use these sensory receptors to locate the specific females. The species of the genus *Anagyrus* Howard & Ashmead, 1896, (Hymenoptera, Chalcidoidea, Encyrtidae) are solitary koinobiont endoparasitoids of mealybugs (Hemiptera, Pseudococcidae). It is known that both females and males use kairomonal cues in host and mate location and the types of sensory receptors found on these wasps are trichoidea, placodea, basiconica and chaetica sensilla for olfaction, contact chemoreception and general mechanoreception. But a scale-shaped type sensilla are present only in the males: they are distributed along the ventral side on the male apical flagellomeres (F6 and club) and they actually represent the release sites of epidermal glands, which produce secretions that act as a contact pheromone necessary to mating behaviour. Eight *Anagyrus* species have been found in the agricultural ecosystems of citrus, ornamental and fruit trees from Eastern Spain. Females are easily identified by the colour pattern of the antennae flagellomeres. Males show a more uniform habitus so it is difficult their specific assignation. Present communication offers the structural organization of the antenna of these eight *Anagyrus* males and provides information about the number and distribution of the scale-shaped sensilla in each of these species in order to facilitate the identification of the *Anagyrus* males of interest in mealybugs biological control.

Keywords: parasitoid, biological control, encyrtids, diversity, antenna, chemoreception, ultrastructure.

59. Proactive biological control of *Lycorma delicatula* (White, 1845) (Hemiptera: Fulgoridae) in west coast of USA: from classical to conservation?

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Spotted lanternfly, *Lycorma delicatula* (White, 1845) (Hemiptera: Fulgoridae), native to China, is a polyphagous invasive pest of ornamental and forest trees and several specialty crops, including grapes. *Lycorma delicatula* is rapidly spreading on the east coast of the US, and it is anticipated that this pest will invade the western US and possibly European countries as well, in a manner similar to that observed for brown marmorated stink bug, *Halymorpha halys* Stål, 1855. In response to this anticipated invasion, a proactive biological control program targeting *L. delicatula* is being developed in California. Host range test results of the principal biocontrol agent candidate, an egg parasitoids, *Anastatus orientalis* Yang & Choi, 2015 (Hymenoptera: Eupelmidae), native to China, indicated that this parasitoid has a very wide host range, attacking hosts in at least two orders (Hemiptera and Lepidoptera) and at least seven families. A new approach to *L. delicatula* biological control is now underway - an assessment of levels of naturally occurring biotic resistance that *L. delicatula* could experience upon establishing in California. We investigated if *Anastatus* spp. native to California can parasitize *L. delicatula* eggs. We tested three native *Anastatus* species against *L. delicatula* egg masses for their ability to successfully parasitize eggs of this pest. In addition, intraguild competition of the native *Anastatus* species and *A. orientalis* was investigated. An improved understanding of the biocontrol function that native *Anastatus* species could have on *L. delicatula* will help determine if resident parasitoid species will provide appreciable levels of naturally-occurring biological control against this invasive pest.

Keywords: biotic resistance, *Anastatus orientalis*, parasitoids, *Anastatus*, spotted lanternfly.

60. The influence of hemispheric shift on the life cycle of the biocontrol agent *Trichilogaster acaciaelongifoliae* (Froggatt, 1892) (Hymenoptera: Pteromalidae)

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Acacia longifolia (Andrews) Willd. is one of the most widespread invasive plant species along Portuguese coastal areas. The biocontrol agent *Trichilogaster acaciaelongifoliae* (Froggatt, 1892), an Australian bud-galling wasp, was introduced in 2015 in Portugal and is now established along the coast. When transported to the northern hemisphere, the agent had to synchronize its life cycle with the seasons and phenology of the host-plant. This work aims to better understand how *T. acaciaelongifoliae* has adapted its year-round life cycle in the northern hemisphere. Two sites were selected (Pataias and São Jacinto Dunes Natural Reserve) and monitored monthly, from November 2021 to October 2022, to: i) characterise life cycle stages of *T. acaciaelongifoliae* inside the galls, by collecting and analysing galls; ii) observe the development of galls on *A. longifolia* marked branches in the field; and iii) characterise the life cycle stages since oviposition by collecting branches and dissecting the buds. *Trichilogaster acaciaelongifoliae* took approximately one year to complete the life cycle, with eggs dominating from April to June, larvae from February to April, pupae from May to June. Peak emergence of adults occurs between June and July. Reproductive galls dominated in almost all months. The life cycle seems to be more advanced in Pataias, the site located further south, where earlier emergence of adults was observed. The results suggest that *T. acaciaelongifoliae* in the northern hemisphere has a univoltine life cycle, but the generations are not completely synchronized at the different sites and even within each site. The work has contributed to advancing the knowledge of the life cycle of *T. acaciaelongifoliae* in the northern hemisphere, but alerts to the need to better understand the (co)existing generations of *T. acaciaelongifoliae* and the beginning of each stage. The results are also relevant for the management of *A. longifolia*, as they contribute to better planning of new releases of *T. acaciaelongifoliae* in new places.

Keywords: *Acacia longifolia*, biological control, cycle of life, northern hemisphere, *Trichilogaster acaciaelongifoliae*.

61. Antagonistic effects on double infection by plant viruses affects the attraction of the aphid to its host plant

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The cotton/melon aphid, *Aphids gossypii* Glover, 1877, is a major pest in melon crops due to its role as the primary vector for cucumber mosaic virus (CMV, Cucumovirus) and cucurbit aphid-borne virus (CABYV, Polerovirus). Melon plants are commonly infected by both viruses in the field. The aim of this work was to evaluate whether the volatiles emitted by melon plants infected with CMV and CABYV, either in single or mixed infection could influence aphid behavior. We conducted dual-choice preference bioassays using a Y-tube olfactometer with melon plants that were either tolerant or susceptible to CABYV infection. Our results showed that *A. gossypii* preferred those plants infected with CMV, but no significant differences were observed with respect to CABYV infection compared to healthy controls in either virus-tolerant or susceptible plants. When we evaluated the effect of double infection (CABYV+CMV) with a tolerant melon cultivar, we observed an antagonistic effect, because aphids were no longer attracted to CMV volatiles when plants were infected with both viruses (CABYV+CMV). Thus, double infected plants showed no attraction to aphids under our experimental conditions. This study discusses the epidemiological implications of the different responses of *A. gossypii* to the volatiles emitted by plants infected with these two viruses.

Keywords: aphid, melon, virus, olfactometer, volatiles.

62. Do ivermectin residues modify the volatile chemical composition of dung and influence the attraction of dung beetles (Coleoptera: Scarabaeidae)?

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Dung beetles are attracted to dung by olfactory cues and their selection depends on the volatile organic compounds (VOCs) emitted by this resource. The effects of ivermectin (IVM) residues on the volatile chemical composition of dung and how this could modify its attraction to dung beetles have been debated for years, with no clear consensus. In this work, we analysed for the first time the possible effects of IVM on the VOCs emitted by dung and the attraction of the dung beetle *Ateuchetus cicatricosus* (Lucas, 1846) using behavioural bioassays. The results in this study showed that the chemical composition of dung from untreated cattle, dung from treated cattle with IVM (200 µg/kg b.w.; collected at 7 and 14 days post-administration) and dung spiked with IVM (100 and 500 µg/kg) are not significantly different. We detected a total of 52 VOCs in the different treatments of dung. Congruently with these results, the olfactometer assays showed no significant difference in the rates of attraction to the treatments, with only a slightly higher attraction to cattle-treated dung collected at day 14 versus day 7. Further alternatives are discussed to fully explore the possibility of an indirect effect of ivermectin in prompting an alteration in the attraction by dung beetles.
This work has been funded by the MCIN/AEI /10.13039/501100011033 and the European Union Next Generation EU/PRTR (projects PID2019-105418RB-I00 and TED2021-130304B-I00), the project AICO/2020/031 (Generalitat Valenciana), and the pre-doctoral scholarship GRISOLIAP/2021/185 (Dirección General de Ciencia e Investigación, Consellería de Innovación, Universidades, Ciencia y Sociedad Digital, Generalitat Valenciana).

Keywords: ivermectin residues, dung beetles, VOCs, food attraction, olfactometer.

63. The main pitfalls to translate insect diversity into economic benefit

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Insects are essential agents of important ecosystem services that maintain life on earth and contribute to the conservation of nature. Recent decades have witnessed a worrying loss of biodiversity, partly caused by anthropogenic factors, which is causing the decline of insect populations. Biodiversity of living organisms and the ecosystem services they provide are disappearing at an unprecedented rate and scale, with catastrophic consequences for economies and livelihoods. The benefits provided by ecosystem services and their economic valuation are not questionable, but the economic quantification of their value is still poorly understood. The globalized society is based on a market economy, governed by the law of supply and demand. Therefore, every good or ecosystem service has an economic value that is determined by the quantity of product on offer and its price, determined by the balance between the products offered and demanded. Therefore, everything that is not part of the market is "invisible" for society and consequently for the public Administration; its importance is not understood, and it is not protected. At the end of the last century, ecosystem services and natural capital began to be monetized economically with the aim of having a tangible value of the free services provided by nature. The research objective is to review economic valuation studies of ecosystem services mediated by insects and the valuation given to insects by the society. The preliminary results show a strong asymmetry between the ecosystem services evaluated, indicating that research should be expanded towards the less studied and equally important ecosystem services, such as control of insect populations or nutrient recycling, and their interrelationships. In addition, valuation methodologies require further efforts to achieve a standardized globalized and sustainable economic model that measures the economic cost of the use of natural resources, the loss of biodiversity and its regeneration.
Funded by 'Ministerio de Universidades', "Unión Europa-Next generation EU", 'Universidad Miguel Hernández de Elche' (UP2021-028).

Keywords: ecosystem services, insects, pollination, decomposition of organic matter, biologic control, economic valuation of ecosystem services, ecosystem services value estimation methods.

64. Hard ticks (Ixodida: Ixodidae) in the environment of Tapada Nacional de Mafra (Portugal)

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Tapada Nacional de Mafra is a natural reserve located in the west cost of Portugal with mild temperature and dry summers. Different wild animal species coexist, such as fallow and red deer, wild boar or rodents which can act as hosts of hard ticks. The climate change has provoked milder and drier winters and there may be variations in the range or number of hard tick species. To verify whether changes related to tick populations have developed, four different areas were chosen and sampled in spring (SP), summer (SU), and late autumn-early winter (AU-WI), using the tick dragging method. 2,613 ticks were collected. *Ixodes ricinus* (L., 1758) was the most abundant (73.33 %) followed by *Haemaphysalis punctata* Canestrini & Fanzago, 1878, *Hyalomma lusitanicum* Koch, 1844, *Haemaphysalis inermis* Birula, 1895, *Rhipicephalus sanguineus* (Latreille, 1806), *Dermacentor reticulatus* (Fabricius, 1794) and *Dermacentor marginatus* (Sulzer, 1776) (17.68%, 4.67%, 4.09%, 0.11%, 0.08% and 0.04%, respectively). Most of ticks were sampled in AU-WI and SP and not many in SU (63.76%, 20.93% and 15.31%, respectively), I. ricinus preferred AU-WI and SP; *H. inermis*, *D. marginatus* and *D. reticulatus* were mainly collected in AU-WI; *H. punctata* and *H. lusitanicum* in SU; and *R. sanguineus* only in SP. Weather conditions influenced tick collection. *D. marginatus* and *D. reticulatus* only were collected in cloudy days; *I. ricinus*, *H. inermis*, *R. sanguineus* and *H. punctata* were found in all climatic conditions while *H. lusitanicum* was mainly collected on sunny days. *Pinus*, scrub and gorse were the most favourable vegetation for tick collection, having been identified higher percentages of 26.7% (*I. ricinus*), 33.7% (*H. punctata*), 36.5% (*H. inermis*) and 41.8% (*H. lusitanicum*). These results suggest that biotic and abiotic factors should be considered to get a more accurate interpretation of the seasonal hard tick patterns since the amount and variety of ticks are closely related with vegetation, climatic conditions and season.

Keywords: ticks, climate, vegetation, environment, ecology, sampling.

65. *Myianoetus muscarum* (Linnaeus, 1758) (Astigmata: Histiostomatidae) hypopi associated to *Synthesiomyia nudiseta* (van der Wulp, 1883) (Diptera: Muscidae)

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Mites have limited displacement capabilities but are adapted to attach to other species to move efficiently and colonise new environments. They use appendages and specific structures to firmly attach to the carrier. During the transport, mites remain inactive being the interaction known as phoresy and the phoront transported by the host. Astigmata adapt a specific instar to this purpose, the deutonymph, known as *hypopus* (pl. *hypopi)*. The *hypopus* usually goes into starvation and gets firmly attached to the host with suckers and hooks. These structures are discriminant for the identification of the species. Myianoetinae is a subfamily of Histiostomatidae characterised by having only 2 big suckers in the attachment plate. They are usually transported by flies. The species *Myianoetus muscarum* (L., 1758) is strictly associated with muscid flies. We collected and important amount of *M. muscarum* attached to specimens of *Synthesiomyia nudiseta* (van der Wulp, 1883). Flies were sampled inside the campus at the University of Alicante (38.386374º, -0.519827º; Spain) using Wind Oriented Traps baited with fresh sardine as bait. During a year, three replicates (R1-R3) with 20 m of separation within them, collected material during three days each month; then, all specimens collected were killed by freezing (-20ºC) and preserved in ethanol 70%. During the process, hypopi detached from the flies but got stored together with the flies. Flies were collected from September 2020 to November 2021 except in January and February, when the fly is not active. All sampled months had hypopi, so the annual activity of the fly coincides with the presence of the mites on it. This observation could have implications in the analysis of forensic evidence, due to *S. nudiseta* is usually reported in human corpses. The question is, which are the conditions required by this mite to attach on adults of *S. nudiseta*?

Keywords: *Myianoetus muscarum*, *Synthesiomyia nudiseta*, phoresy, mites, annual activity, forensic entomology.

66. Foraging food resources by the subterranean termite, *Reticulitermes grassei* (Clemént,1978) Blattodea: Rhinotermitidae

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Subterranean termites, despite their essential role as decomposers on natural ecosystems, are voracious pests of wood in service, and may cause damage to wood in buildings and economic losses associated with treatments and repair costs. In-ground baiting stations are one of the most used techniques for subterranean termites' control, as it involves the use of small amounts of targeted biocides mixed with an adequate cellulose matrix. Termites should find the stations and feed on the bait with biocide, which will then be spread by trophallaxis within the termite colony. The efficacy of this method relies on the ability of the termites to find, and feed, on the baits. Termites may be attracted to cellulosic food sources according to different signals and cues, such as wood chemicals components, or other substances, released by the decaying wood. The objective of this study was to investigate possible attractive substances acting on the subterranean termite, *Reticulitermes grassei* Clément. Termites were submitted to choice tests between a control (extracts of sound maritime pine wood (*Pinus pinaster* Ait) and: 1) simple sugars - sucrose, xylose, glucose (2%), and 2) cold water extracts of maritime pine wood decayed at four different levels, by a white rot, and a brown rot. Termites showed significant preference for the substances tested. Regarding the extracts of decayed wood, termites also showed significant preference for them, except the higher level of degradation by white rot. Higher consumption rates were associated to xylose and to the two lower levels of degradation of brown rot. The differential behaviour of *R. grassei* towards simple sugars and extracts may be explained by the production of smaller molecules (and gradients) along the wood degradation process, which may act as repellent or attractive for the subterranean termites during their foraging activities.

Keywords: subterranean termites, wood decay fungi, foraging behaviour.

67. New data on the relationship between hoverflies and holoparasitic broomrape plants in the Iberian Peninsula (Diptera: Syrphidae; Lamiales: Orobanchaceae)

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Virtually all species of Syrphidae visit flowers as adults, however, insect-plant interaction also exists during larval development in a wide variety of species. Unfortunately, there are large gaps concerning the complete life cycle of many species, and this situation is particularly relevant regarding larval biology and morphology. This is the case for most of the species of the genus *Eumerus* Meigen 1822, with approximately 180 species known from the Palaearctic region and with the highest diversity in the Mediterranean basin. *Eumerus* forms, together with the strictly phytophagous species of *Merodon* Meigen 1803, a well-defined monophyletic evolutionary lineage. However, based on the available biological information, it is incredibly diverse and polyphagous compared to *Merodon*. Thus, larvae have been reported to feed on a wide range of host plant families with both saprophagous species feeding on decaying plant matter and true phytophagous species. In this paper we review the relationship between the genus *Eumerus* and holoparasitic broomrape plants of the genus *Cistanche* Hoffmanns et Link in the Iberian Peninsula. New data are presented on their annual activity, life cycle, biology and larval morphology, and their relationship to the systematics and phylogenetic position of this group of hoverflies.

Keywords: *Cistanche*, *Eumerus*, insect-plant, life cycle, phytophagy, saprophagy

68. Pre-designed and spontaneous cover crops in citrus: building up complex trophic webs for Conservation Biological Control

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The late season period (from summer to the end of winter) in Mediterranean citrus growing areas can be critical for natural enemies: the lack of prey and alternative food resources can be detrimental for the nutritional sustenance of predators and parasitoids. Under this situation, natural enemies leave the orchards unprotected in early spring, a critical period for pest biological control. Cover crops are known to offer alternative food resources and shelter and, through well-managed, may represent a sustainable tool to avoid this undesirable biocontrol imbalance. In two commercial young citrus orchards, three types of the sown cover crop were tested in a randomized complete block design: forbs, grass, and alternate strip plots of forbs and grass. The species composition of sown and spontaneous plants, relative abundance and coverage of the cover crops was characterized. Natural enemies and potential alternative preys were counted and identified. A monthly sampling of each plot replication was carried out from the beginning of summer 2022 to spring 2023 using a suction device. Our results evidence that different cover crop designs host distinct arthropod communities, including a valuable number of predatory taxa and alternative prey throughout the critical periods of the year, thus supporting complex trophic webs inside the orchard. The selection of specific plant species combinations and the presence of target spontaneous plants would consequently allow the maintenance of more stable and resilient natural enemy assemblages in citrus orchards.

Keywords: predators, ecological infrastructures, aphids, flower strips, grass strips, parasitoids.

69. What is the risk associated with the citrus greening disease vector *Trioza erytreae* (Del Guercio, 1918) (Hemiptera: Triozidae) for citrus industry in the Iberian Peninsula?

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The African citrus psyllid, *Trioza erytreae* (Hemiptera: Triozidae), is a vector of citrus greening (Huanglonbing - HLB), a bacterial citrus disease caused by *Candidatus Liberibacter* spp. Native to Africa, *T. erytreae* was detected in the Canary Islands and Madeira in the early 2000s and then in northwestern Spain in 2014. Since then, *T. erytreae* has become established along the Atlantic coastal areas of the Iberian Peninsula. Therefore, an accurate assessment of the potential long-term establishment of *T. erytreae* in major citrus-growing regions of Europe and the world is urgently needed to design adapted control strategies. I calibrated correlative species distribution models to understand the bioclimatic characteristics that determine the distribution of *T. erytreae*, and to assess the climatic suitability of the world's major citrus-growing regions for the psyllid under current and future climate conditions. I calibrated the models using only distribution data from Africa (its native range), the Canary Islands, and Madeira, and evaluated them using available data from the invaded area in continental Europe. This approach aims to avoid spurious good measures of model accuracy arising from spatial autocorrelation between the calibration and evaluation datasets. The models identify mild summer and winter temperatures and high levels of precipitation as optimal conditions for long-term psyllid establishment, consistent with its physiology. In Europe, models predict only the Atlantic coastal regions of the Iberian Peninsula as highly climatically suitable, a spatial pattern that corresponds exactly to the area currently invaded by the psyllid. Models predict that most of the important citrus-growing areas in the world are, and will remain in the future, poorly adapted to *T. erytreae* except in case of future physiological adjustments. These results are crucial for the design of appropriate pest management strategies and are timely for Europe where the African citrus psyllid has been detected.

Keywords: citrus greening disease, vector-borne disease, risk assessment, biological invasions, species distribution models.

70. The eradication process of *Vespa velutina* Lepeletier, 1836 (Hymenoptera: Vespidae) in Majorca

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Vespa velutina nigrithorax (Hymenoptera: Vespidae), is an alien invasive species (AIS) that feeds mainly on bees, but also on other pollinators and insects. As a result, the establishment of this pest has a negative impact on biodiversity, pollination, and the economy. Different methods were investigated with the aim of eradicating this species on the island of Mallorca (Balearic Islands) since we found it in 2015: trapping of adults; the use of citizen science for adult detection; active nest searching using triangulation techniques; and nest removal using mechanical methods. The progression of the number of secondary nests found was 1 (2015), 9 (2016), and 20 (2017), with no nests located in 2018, 2019, and 2020, and only one embryonic nest in 2018. More than half of the nests (58%) were detected thanks to citizen science data. The last hornet found in the traps was in June 2018. In November 2020, the competent authority on the management of invasive alien species, declared *V. velutina* eradicated in the island in 2020. Despite having been declared eradicated, the team did not stop raising awareness about this species since if it has invaded once, it could be detected again. Indeed, the following year (2021) a new nest was detected in Mallorca. Based on genetic analyses, we have concluded two independent introductions of this invasive hornet in Mallorca in two different moments from two different European regions: Italy (2015) and Mainland Spain (2021). Now, we developed a surveillance plan that included a trapping network for *V. velutina*, and an Early Detection and Rapid Response (EDRR) system. Shortly after implementing it at the archipelago level, we reported the introduction of a new species not previously detected, demonstrating its effectiveness in preventing and eradicating IAS.

Keywords: IAS, yellow legged hornet, eradication, biosecurity measures, EDRR.

71. CONTROLVESPA: Development of strategies for the control of *Vespa velutina nigrithorax* Buysson, 1905 (Hymenoptera: Vespidae) invasion

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Vespa velutina nigrithorax Buysson, 1905 (Hymenoptera: Vespidae), known as Asian hornet, is an invasive species accidentally introduced in France in 2004 and since then has spread throughout Europe. The hornet's high reproductive capacity and voracity makes it an important threat for native insects, especially honeybees, causing high losses in apiculture and potentially in agriculture due to loss of pollinators. Given their high expansion rate, they are also commonly found in urban areas, thus becoming a public health problem due to their aggressive behaviour when people are near their nests. Control strategies have been implemented but are mainly focused on nest destruction or active-trapping. Setting up traps in spring and late autumn to catch foundresses is frequently done by municipalities and beekeepers in Portugal, where the species entered in 2011, but it's clearly insufficient even to minimize its expansion. Elimination of active nests is one of the most prevailing strategies, but due to the typically found nest locations (canopies of high trees or tall buildings), intervention is mainly done in autumn (when leaves fall, and nests are visible) or in winter. By this time, this intervention might not be effective, as fertilized foundresses may already have left the nests. Besides, nest destruction is normally done by using pesticides, which might cause environmental constrains. Also, early nest detection is one of the tools that can help in elimination and control. However, the solutions being developed have limitations on mobility and effectiveness (e.g. large human and financial investment). CONTROLVESPA is developing a drone platform that can fly with a multispectral sensor and/or a VHF receiver to detect active nests, as well as assessing for the first time the efficacy of selected pesticides on the nests. The project will contribute to the improvement of the detection and elimination techniques currently used, resulting in a more effective and environmental conscious control.

Keywords: asian hornet, ecotoxicological tests, invasive alien species, remote nest detection, yellow-legged hornet.

Resúmenes de los pósteres

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1. Unity will make us stronger: The union of the Biodiversidad Virtual platform into Observation.org International. A bet for tomorrow

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Citizen science has revolutionized data acquisition for different disciplines, such as biology, being especially relevant to biogeography with the incorporation of new species records based on georeferenced pictures of specimens. With the rise of the Internet, different platforms based on photo-sharing developed, allowing specialists to identify *a visu* species appearing in photographs, exponentially increasing the number of species records in the last decade. Also, these platforms have been growing and evolving since their creation, some disappearing or becoming part of others. All of them are dependent on the one hand on the funds they receive to maintain their servers active on the Internet and other different fees. On the other hand, they rely on the dedication of a community of users (both academics and amateurs). Ultimately, the constraining factors of these platforms are their community and funding. Here, we present the joining of two citizen science platforms in the Iberian area: Observation.org and Biodiversidad Virtual. Both platforms have signed an agreement for Biodiversidad Virtual to become part of Observation.org International, combining experiences, management teams, and communities of both parties in a strong alliance for studying the biodiversity of the Iberian Peninsula. Furthermore, such platforms have a remarkable impact on arthropod records, helping to complete species inventories and distribution. To illustrate this, we provide data about both platforms and how much they together contribute to biodiversity knowledge, as well as different examples of works done using data from these citizen science platforms.

Keywords: citizen science; citizen science platform; big data; species distribution; digital photography.

2. Citizen science and its role in entomological research: study in Teatinos Campus (University of Málaga)

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Climate crisis implies large-scale accelerated changes which research groups can't tackle on their own. That's why citizen science has become a tool with the potential to generate useful data that helps to reduce uncertainty about these dynamics. Citizen science is the scientific research that includes the collaboration of the non-specialized public, along with scientists and professionals. This research compares data obtained through citizen science with other experimental ones to verify their quality to be used in entomological biogeographic studies. Experimental data was obtained through seasonal sampling in different areas of the Teatinos Campus from University of Málaga, identifying the entomofauna at the family taxonomic rank. Citizen science data was obtained through the participation of the university community using the iNaturalist platform. Citizen science is limited by the size of the organisms and the quality of the photographs. The statistical test showed that no significant differences were found between the abundance data obtained experimentally and those that have the contribution of citizen science. However, Citizen Science provided interesting data in the presence/absence study that was not obtained with the experimental one. This can be very useful in detecting the presence of invasive species.
The HortSost II project is financed by the II Plan Propio Smart-Campus of the University of Malaga.

Keywords: citizen science, open science, biogeography, entomofauna, entomology, biodiversity, Málaga.

3. The challenge of monitoring hoverflies (Diptera: Syrphidae) as pollinators: preliminary results of the SPRING project (Horizon Europe) in Spain

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In June 2021, the SPRING project started ("Strengthening Pollinator Recovery through INdicators and monitorinG"). Its main aim is to support the preparation of the implementation of the EU Pollinator Monitoring Scheme (EUPoMS) and testing the scheme on a pilot scale in all 27 EU countries. The project will provide a set of valid indicators that aim to detect significant changes in the abundance of key pollinators (i.e., bees, bumblebees, butterflies, and hoverflies). Specific objectives of SPRING here presented include: a) to develop the capacity of citizen science networks on pollinators across Europe (particularly in southern and eastern Europe, there is currently comparatively little citizen science capacity); b) to organise advanced taxonomic training for the next generation of taxonomists in Europe, with a focus on wild bees and syrphids (achieving a minimum self-identification capacity, with support from research centres and experts); and c) pilot a Minimum Viable Scheme (MVS) for syrphids by monitoring several locations, using standardised transects and pan traps among other methodologies. In this context, the National Programme for the improvement of the knowledge of pollinating insects has also recently been launched in Spain. The results of the SPRING project will be used to optimise the implementation of the Spanish EUPoMS in alignment with the rest of the EU countries. This poster presents some of the preliminary results of the project and proposals for future work related to the role of syrphids as pollinators in Spain.

Keywords: EUPoMS, pollination, flies, minimum viable scheme, citizen science.

4. Citizen science strikes again: the expansion of sorghum aphid, *Melanaphis sorghi* (Theobald, 1904) (Hemiptera: Aphididae), in the Mediterranean basin

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In the last few years, citizen science has proven to be a very powerful tool for monitoring and contributing to new data on biodiversity from every corner of the world. Social networks such as Facebook (in its groups dedicated to gardening or nature lovers), iNaturalist or Biodiversidad Virtual (mainly in Spain) have allowed the identification of new records of invasive species. An observation accompanied by a photograph of an aphid colony taken on November 4th, 2022, in Florence and uploaded to the iNaturalist.org platform, has made it possible to locate a new species of exotic or invasive aphid once again. After that, the search for the species in the Iberian Peninsula allowed its location in Spain. This way, the sorghum aphid *Melanaphis sorghi* (Theobald) was recorded for the first time in mainland Italy (Florence, Tuscany region, Italy) and in the Iberian Peninsula (Vinalesa, Valencian Community, Spain) on *Sorghum halepense* (L.) Pers. Data on its biology, worldwide distribution and notes on its pest behaviour are given. *Melanaphis sorghi* had previously been recorded from Greece (in 2008), Cyprus, Israel and probably Turkey. The genus *Melanaphis* contains around 25 species of palearctic distribution associated with Poaceae and only a few shows alternating host behaviour between Pyroideae (their primary host) and Poaceae (the secondary host). Four species, *M. donacis* (Passerini), *M. elizabethae* (Ossiannilsson), *M. luzullella* (Hille Ris Lambers) and *M. pyraria* (Passerini,), are present on European territories. Two others, originated in Southeast Asia, *M. bambusae* (Fullaway) and *M. sorghi* (Theobald), have been introduced in Europe (Mediterranean basin and south) and other parts of the world. In Italy and Spain three of them (*M. pyraria, M. donacis, M. bambusae*) were well known and are widely distributed until the date, making *M. sorghi* the fourth species of this genus in both peninsulas.

Keywords: alien species, pest, Italy, Iberian Peninsula.

5. Catalogue of beetles of the Valencian Community (Coleoptera)

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Valencian beetles have been an important object of study since the beginning of the 20th century, in which prominent figures in Spanish entomology contributed to the knowledge of the diversity of this group. Emilio and Federico Moróder, Luis Báguena and Juan de Torres Sala deserve special mention. However, all the information from their works, as well as that of subsequent specialists, is dispersed in many scientific publications, without having a work that offers an overall vision of its diversity in the Valencian Community. Recently, around the extinct Torres Sala Entomological Foundation located in Valencia, a study group on Valencian beetles was organized, and began to work on a general catalogue of Coleoptera of this region. This catalogue would establish the initial knowledge to incorporate the new species that were being recorded in the territory, as well as to detect and highlight those of reduced distribution, endemic, or species protected in national and international catalogues. This information is the starting point for any initiative aimed to the species conservation, including their habitats. Up to now, the information of 25 families that include 1525 species of Coleoptera has been finished. They belong to 10 superfamilies, of which 5 are already completed: Bostrichoidea (106 species), Buprestoidea (104), Elateroidea (95), Chrysomeloidea (354) and Curculionoidea (427). Other superfamilies are still being worked: Cleroidea (Cleridae, 16 species), Cucujoidea (Cryptophagidae + Monotomidae, 23), Tenebrionoidea (Ptinidae, 40), Hydrophiloidea (Histeridae, 56) and Staphylinoidea (Hydraenidae + Silphidae + Staphylinidae, 306). For each of them, the presence in each province of the Community is indicated. We present in this communication the methodology used to approach this project, as well as the results obtained to date and the conclusions that can be derived from this study.

Keywords: fauna, Iberian Peninsula, Spain**.**

6. First population inventory of the narrow Iberian endemic *Cephalota deserticoloides* (Codina, 1931) (Coleoptera: Cicindelidae) in Saladares del Guadalentín Natural Park (Murcia, Spain)

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Cephalota deserticoloides (Codina, 1931) has only been recorded in a few sites in Murcia and southern Alicante (southeastern Spain). This species inhabits patches of saline steppe soils with halophytic vegetation, located in a narrow subcoastal strip that extends from the surroundings of Elche (Alicante) to the south of Alhama de Murcia (Murcia). We present the first fine inventory of population distribution of *C. deserticoloides* in the Saladares del Guadalentín Natural Park (Murcia). We conducted visual inventories from May to the end of October 2022 and our observations indicate that *C. deserticoloides* prefers areas with open halophytic vegetation over moist, but not flooded, silty soils covered by fine salt crystals. Two populations of this tiger beetle have been detected, located to the North and South of the Natural Park, with no apparent connection. Both populations have a nucleus where many individuals were recorded throughout the survey period, being the rarest observations when moving away from their nucleus. We identified vehicle traffic along some trails and the expansion of irrigated crops around the protected area as the main threats to these populations, due to the change in water conductivity and increased exposure to pesticides.

Keywords: tiger beetles, saline soils, saline steppe, endangered species.

7. Endemisms of Sierra Nevada present in the scientific collections of the University of Granada

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In the almost 50 years of existence of the Scientific Collection of the University of Granada (CCZ-UGR), arthropods have been incorporated from a wide range of research projects, many of them focused on the study of the entomofauna of the Sierra Nevada. In the last 12 years, this material has been recorded in a database that today includes 129.612 specimens, 28.537 records and about 3.150 species. Among them are a good number of species catalogued as endemic to Sierra Nevada. In a first bibliographic review of the arthropod fauna cited for Sierra Nevada, a total of 169 endemic species were established for this massif, which are the starting point for this work. In order to provide a detailed description of the contents and importance of this collection, we have studied in detail which species are truly endemic to the Sierra Nevada and what is their current state of endemicity and interest. At the moment in this process of revision of the Sierra Nevada endemic material in our collections we can confirm the presence of more than thirty species, of which we will present a taxonomic list.
This work has been carried out as one of the actions included in the Smart Ecomountains (Lifewatch-ERIC) project (Ref.: LifeWatch-2019-10-UGR-01-WP-1).

Keywords: scientific collections, endemisms, arthropod fauna, Sierra Nevada.

8. The entomofauna of Sierra Nevada in the scientific zoological collection of the University of Granada in the context of the Smart Ecomountains project

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The Scientific Collection of Zoology (CCZ-UGR) of the University of Granada (Spain) has its origin in the 70s from the material obtained in the sampling campaigns of the different projects and research work developed in the Department of Zoology. Since 2010, we have been carrying out a management and registration plan of all the material in a database, sharing them through our own website (https://ccz.ugr.es/) or biodiversity data platforms such as GBIF. In 2021 we became part of the Smart Ecomountains research project (LIFEWATCH-ERIC Mountain Ecosystems Thematic Center), as part of WP1-Biological Collections (REF: LifeWatch-2019-10-UGR-01-WP-1), with the task of digitizing the zoological collections and specifically the specimens of Sierra Nevada. In this communication we will focus on two of the objectives of the project; firstly, the creation of a reference database on the entomofauna of the southern Iberian Peninsula mountains, especially Sierra Nevada and, secondly, the realization of periodic sampling campaigns in order to complete absent or poorly represented groups in the collections to have a better geographical and taxonomic coverage. As a result of this work of integration in the Smart Ecomountains project, a database has been created by filtering those records belonging to Sierra Nevada and adding those obtained in the sampling campaigns of the last two years (2022-2023). The result yields a total of 6.714 records corresponding to 48.791 specimens and about 900 high quality photographs of most of the species. In addition, from field sampling, 2.376 specimens (1.201 records) have been added to the collection, bringing the total number of species of the entomological fauna of Sierra Nevada to 665.

Keywords: entomofauna, Sierra Nevada, Spain, smart ecomountains, lifewatch.

9. Local extinction process of *Coenonympha pamphilus* (Linnaeus, 1758) (Lepidoptera: Nymphalidae) in the east and southeast of the Iberian Peninsula

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The species *Coenonympha pamphilus* (Linnaeus, 1758) (Lepidoptera, Nymphalidae) is a diurnal butterfly considered a common, generalist and polyvoltine species in southern Europe. We have analyzed more than 80,000 records in the Western Palearctic and more than 3,000 for the Iberian Peninsula, obtaining that there has been an exponential increase in the records of this species in the last decade. However, the number of records has decreased in the southeastern part of the Iberian Peninsula. Therefore, we developed species distribution models to explore and explain this change in its current distribution. Species distribution models have been developed using a consensus of 600 individual models from 6 different algorithms (GLM, GAM, ANN, CTA, RandomForest and MaxEnt). We use bioclimatic variables and the aridity index to model the potential distribution of this butterfly in the Iberian Peninsula considering all its available current records. The analyses carried out indicate that aridity has a limiting and negative effect on the distribution of *C. pamphilus*, causing it to retreat in the last decade towards the center and west of the peninsula. The effect of this variable is probably because, being a polyvoltine species, with more generations at low altitudes, *C. pamphilus* would not find its resource (different species of Poaceae) available in the most arid areas, as the vegetation becomes parched in the summer months, making the development of second and successive generations impossible. This study has been possible due to the large increase in data from citizen science that serve to detect and monitor the phenomena of change in the distribution of species.

Keywords: bioindicator; citizen science; climatic change; species distribution model, voltinism.

10. The rose chafers (Coleoptera: Scarabaeidae: Cetoniinae) of the Gorongosa National Park (Mozambique). A preliminary approach

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The emblematic Gorongosa National Park (GNP) (Mozambique) has had as its main objective since the end of the civil war (1992) the recovery of megafauna (large herbivores and carnivores).The biodiversity of insects in GNP was studied sporadically, either in the colonial period or after the civil war, especially in the Chitengo area and the Pungwe River valley, a region connecting the coast to inland of the country, a fact that is evident in the literature of the entomofauna of Mozambique. The Ecoassess project (PTDC/BIA–CBI/29672/2017) made possible not only to carry out an ecological analysis of the key role of edaphic and epigeal invertebrates, but also to carry out a preliminary faunal survey of the Cetoniinae. Rose chafers were sampled through chromatic yellow traps baited with banana (CT) and complemented with direct observation (daytime) on vegetation (herbaceous and tree plants) (DO) and light trapping (LT). Sampling took place from the end of October to the beginning of December 2019 (extraction of the material from the chromatic traps every 5 days), encompassing the transition between the dry season (1st to 5th extractions) and the wet season (6th to 10th extractions) (total of 10 extractions). This methodology was applied in the Chitengo complex. Moreover, the Cetoniinae entomologic collection of the Eduard Wilson laboratory (LGNP) was studied. About 35 species/subspecies were identified (CT-16, DO-14, LT-5, LGNP-18). Most were sampled during the rainy season. A total of 9 species/subspecies sampled were exclusive to the CT, 7 to the DO and 5 to the LT. The LGNP collection presents 7 species not sampled during Ecoassess project. Incala maculipennis (Moser, 1916) is a new faunistic record for Mozambique. Anatonochilus platycephalus platycephalus (Westwood, 1857) is confirmed for Mozambique. All the species/subspecies identified are new records for the Gorongosa National Park.

Keywords: rose chafers, biodiversity, new records, Gorongosa, Mozambique.

11. Update of the distribution of *Halyomorpha halys* (Stål, 1855) (Hemiptera: Pentatomidae) in the Iberian Peninsula, Balearic Islands and Macaronesia

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Updated information is provided on the distribution of the invasive brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål, 1855), in both the Iberian Peninsula and Macaronesia. The species was first found in Catalonia (NE Iberian Peninsula) in 2016. Since then, the number of municipalities reporting the insect's presence in the Catalonia autonomous community has increased exponentially. On the other hand, over the last five years, reports have been received from various regions of Spain about its presence. In addition, scientific information on its spread in Portugal and Macaronesia was published. The information presented was gathered from a variety of sources, including reports from authorities, reports from citizen science projects, data from traps baited with commercial aggregation pheromones, and those published in scientific literature. The results showed that the species is widespread in Spain, Portugal and Macaronesia. In addition, its presence in a number of new host plants and crops, some of which have already experienced significant harm, is reported.

Keywords: BMSB; invasive species; Iberian Peninsula; Macaronesia; citizen science; geographic distribution; host plants; crops damage.

12. Prevalence of chewing lice (Phthiraptera) in Iberian thrushes (Aves: Turdidae)

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Chewing lice (Phthiraptera) are obligate ectoparasites mainly of birds, which carry out their complete life cycle on their host. In Spain, despite the large number of lice records, there are still many species to be recorded for the Spanish fauna. One of the possible factors that can affect the lice load is the phenology of birds. In the Iberian Peninsula, the True Thrushes (Aves: Turdidae) are represented by sedentary and migratory species. Therefore, it can be an interesting bird genus to study the phenology of birds and their relationship with lice load. In the present study, the preliminary results on the prevalence of this group of ectoparasites on the Iberian True Thrushes species are analyzed. The plumage of a total of 44 birds was checked in search of lice, between 2020 and 2023. The study was carried out in the center of the Iberian Peninsula and four Thrushes species were analized: Redwing *Turdus iliacus* L., 1758, Eurasian Blackbird *Turdus merula* L., 1758, Song Thrush *Turdus philomelos* Brehm, 1831, and Mistle Thrush *Turdus viscivorus* L., 1758. In addition, four species of chewing lice of the suborder Ischnocera were recorded: *Brueelia jacobi* (Eichler, 1951), *B. matvejevi* (Balát, 1981), *Guimaraesiella amsel* (Eichler, 1951) and *G. haftorni* (Balát, 1981). The species *G. haftorni* is recorded for the first time in the Iberian Peninsula and the Eurasian Blackbird is the species with the greatest richness of lice, parasitized by *B. jacobi* and *G. amsel*. The results suggest that sedentary species of True Thrushes present a higher prevalence and richness of chewing lice species, compared to migratory species.

Keywords: Phthiraptera, Ischnocera, Philopteridae, chewing lice, Turdidae, *Turdus*, redwing, Eurasian Blackbird.

13. Exploring the aquatic insect biodiversity of the Canary Islands: The BIOACUANA Project

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The Canary Islands are a biodiversity hotspot, including particularly high levels of endemism related to a combination of geological, geographical, and climatological factors that promote speciation. However, most conservation and research efforts have been directed towards marine and terrestrial biodiversity, neglecting freshwater habitats. The first studies on the aquatic insects that inhabit the small streams of the islands date back to the 1980's and 1990's. After that only a few studies focusing on specific taxonomic groups were conducted. This lack of knowledge is worrying because freshwater biodiversity is globally disappearing at alarming rates and that the streams in the Canary Islands are subjected to very strong hydrological stress due to climate change and water abstraction. To help filling this gap of knowledge and guide future conservation efforts, the BIOACUANA project explores the communities of aquatic insects in the streams of Tenerife, La Palma and La Gomera. The main objectives of the project are to: i) produce basic information on the taxonomic and genetic diversity of aquatic insects and ii) determine the vulnerability of these species to global change. We sampled aquatic insects (larvae and adults) from 17 undisturbed stream reaches, both outside and inside of protected areas. Here, we will show preliminary results from the first sampling campaign (autumn 2022). New records for the islands and shifts in distribution species in relation to previous studies will be discussed.

Keywords: conservation, islands, streams, endemism, biogeography.

14. Global patterns on the diversity of chalcid wasps (Hymenoptera: Chalcidoidea): resolving gaps on worldwide absent species

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Chalcidoidea contains approximately 22,500 known species, and an estimated total diversity of more than 500,000 species, meaning the vast majority have yet to be discovered and described. As recent contributions bring the number of families to 50, chalcid systematics can be considered under constant revision, as new hypotheses of relationships are constantly being proposed and rejected. This fact contributes to complicate the possibility of carrying out accurate approaches on the ecological traits in most of its taxonomic groups. Consequently, it is highly difficult to approach applied and conservation studies where different species of Chalcidoidea have an important role. Inside it, the spatial and temporal patterns that have influenced the distribution as well as the species description record in most groups are yet unknown. Moreover, the causes of the distribution of local pools of species as well as those that are absent from an ecosystem but belong to its potential species pool (known in community ecology as 'dark diversity') are also under discussion. Here, we aim to update the taxonomic knowledge status of chalcid wasps globally and by biogeographical region, relating the local and dark diversities of each group. This will allow comparing the described biodiversity between regions, ecosystems and taxonomic groups. We compiled and analyzed all available geographical and nomenclatural data of Chalcidoidea, showing that the diversity of many families is highly underestimated, being Neotropics, Afrotropics and Oriental regions the biggest gaps. Species pool sizes were defined as the number of species within each family in each biogeographical region. With the global data, we illustrate the dark diversity concept in chalcidoid ecology by globally mapping dark diversity and we observed the highest values in tropical regions. Therefore, near the Equator, fewer species than those which are potentially present in the species pool of the biogeographical region are observed. The higher the dark/potential ratio, the greater the relative deficit and, therefore, the greater the proportion of the total diversity to be described. In addition, considering well-known diversity areas, such as Western Palearctic, the expected pattern emerged; temperate areas are often more diverse in relative terms compared with the tropics, and Europe territories exhibit lower values than North-America and Central-Asia.

Keywords: dark diversity, biogeographical region, parasitic wasps, inventory, species description.

15. Diversity and abundance of terrestrial arthropods as a function of plant community structure

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Ground arthropods play a very important role in ecosystems' functioning: they contribute to the decomposition of organic matter, they influence soil properties, they are useful for pest regulators and bioindicators. Different biotic and abiotic factors control arthropod communities in an ecosystem, emphasizing the role of vegetation and nutrient availability. However, little is known about how these factors can affect arthropod diversity and abundance in semi-arid environments, characterized by very low availability of resources and by a distribution of vegetation in patches. In this work, the temporal dynamics of the diversity and abundance of the edaphic arthropod communities was analyzed according to the diversity and size of the vegetation patches and the degree of availability of water and nutrients in a semi-arid environment. The study was conducted in an experimental area where vegetation patches with increasing levels of plant diversity and density had been established and where the availability of resources was manipulated through irrigation and fertilization. The variation in vegetation diversity and density did not show an effect on the abundance and diversity of ground arthropods. However, the irrigation and fertilization treatment had an effect on the total abundance of soil arthropods and their richness of taxonomic groups. These results suggest that the relative importance of resource availability in comparison is greater than plant diversity in semi-arid environments.

Keywords: plant diversity, arthropod community, drylands, vegetation patches.

16. Distribution Atlas of Iberian quadrifid Noctuoidea: state of the art

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Quadrifid Noctuoidea are a monophyletic group comprising Euteliidae, Erebidae, Nolidae and Noctuidae. During the last decades, several faunistic lists about the Quadrifid Noctuoidea of the Iberian area have been released, as well as one scientific monograph. A preliminary attempt to gather the geographic distribution and to provide distribution maps of all species recorded from Iberia was undertaken in the mentioned monograph. Nevertheless, there was not yet a complete, reasonably validated and critically annotated Atlas of noctuoids of the Iberian area. During the last 10 years, a database called FAUNOCIB has been compiled, which gathers faunistic information from Spain, Portugal and Andorra published in scientific journals and books, in public and private collections and resulting from research projects, steadily revised and validated. FAUNOCIB, which has a DarwinCore-compatible format, is hosted on the GeoBrink digital platform (http://geobrink.uclm.es/Geobrink/). It currently consists of 200,297 records. Thanks to this information, accurate and updated distribution maps of the 870 species recorded in the Iberian area of the aforementioned group have been produced, at a GRMS grid scale of 10x10 km, which will form the basis of the shortly forthcoming Distribution Atlas. A key aim of the Atlas is to proceed to a preliminary inductive analysis of the distribution areas, which allows the proposal of chorotypes or general distribution patterns in a descriptive way. The 22 chorotypes found are documented here; they are considered hypothetical and will be contrasted numerically later by means of the appropriate applications (MACOQUI, "k-means" grouping analysis, etc).

Keywords: distribution atlas, chorotypes, FAUNOCIB, GeoBrink, Iberian area, quadrifid Noctuoidea.

17. A preliminary DNA barcode library for Iberian Notodontidae

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We evaluate the utility of the barcode as a tool for Iberian species identification, for highlighting potential cryptic diversity and examining boundaries among taxa in groups that remain difficult to distinguish using morphology or ecology alone. We examine the Iberian notodontid barcodes in the context of existing European sequences to assess the status of potentially endemic taxa. A preliminary integrated approach using a combination of DNA barcoding and morphology-based taxonomy clearly provides the highest success rate for 37Notodontidae species identification in the Iberian Peninsula belonging to five subfamilies. Most species (82%) were successfully sequenced with 36 BINs (Barcode Index Number), including three species with different BINS compared with European ones, two BINs for Iberian endemism's and two species which shared their BINs. Three species were not yet found because they have restricted distribution in the Iberian Peninsula. Finally, we discuss how DNA barcodes can be used to improve field practices, update species distribution maps, propose fine-tune conservation measures and formulate recommendations on the potential use of DNA barcoding to improve species identification. This reference library has provided new perspectives on the incidence of both cryptic and potentially over-split of species, setting the stage for future studies that can further explore the evolutionary dynamics of this group.

Keywords: DNA barcoding, Barcode Index Numbers, operational taxonomic units, species delimitation, taxonomy, Iberian Peninsula.

18. Entomosfera: A website for the southeastern Iberian Lepidoptera

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Lepidoptera are one of the most important groups of insects due to their abundance, diversity, spatiotemporal stability, and relatively well-documented taxonomy. They are frequently used as bioindicator organisms, being a model for biodiversity and conservation studies, environmental impact estimates, monitoring of animal populations, ecological and genetic studies due to their sensitivity to environmental fluctuations and habitat changes, the role of pollinators and their relation to climate change. The Region of Murcia is a zoogeographic and biodiversity hotspot with a wide variety of ecosystems that includes ten habitats and 47 special Community conservation land areas for which there is a database with more than 80,000 records of more than1,000 species of which 846 have been included in the initial version of Entomosphera website (domains .es; .com; .org). This digital portal incorporates a visual identification guide, biological information on species, georeferencing of samples for current and potential distribution maps for biogeographic analyses, and genetic information (Barcode Index Numbers: BIN) at Boldsystem.org. All these data may be subsequently processed to facilitate knowledge of the lepidopteran fauna as bioindicators that facilitate their conservation, recovery of biodiversity and ecosystems and their adaptation to climate change. These actions will allow strategic decisions to be made when the study area and the number of species or families studied are increased, making the most of the synergies and opportunities of new technological developments and data management.

Keywords: diversity, life cycles, georeferentiation, distributional maps, DNA barcoding, citizen cooperation with science, south-eastern Iberian Peninsula.

19. DNA barcoding of the genus *Apaidia* Hampson, 1900 for species delimitation in the Western Mediterranean fauna (Lepidoptera: Erebidae)

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The genus *Apaidia* Hampson, 1900 is a relict Western Mediterranean genus in the South-western part of Europe and the North-western areas of Mediterranean Africa comprising three species, *Apaidia rufeola* (Rambur, 1832), *Apaidia mesogona* (Godart, 1824), and *Apaidia barbarica* Legrand, 1939. COI mitochondrial DNA sequences and adult morphology integration supports the existence of three main lineages of *Apaidia* with sequence divergence rates of approximately 4.5%, which are within the range reported for other well-defined insect congeneric species. In addition, we recovered three different BINS, suggesting the presence of different species with unique and specific identifierfor *A. mesogona* (AEC6797), *A. rufeola* (AEI9539) and *A. barbarica* (AEI9540). This study contributes to a better understanding of the taxonomy of genus *Apaidia* and challenges future revision of this genus in Northern Africa, as well as in Western Mediterranean islands and populations located in Italy.

Keywords: *Apaidia*, DNA barcoding, COI, species delimitation, Western Mediterranean.

20. *Calliphora splendens* Macquart, 1838: an endemic blowfly on laurisilva forest from Canary Islands (Diptera: Calliphoridae)

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The insect community of the islands provides an excellent natural laboratory to understand ecological, evolutionary, and biogeographical processes. With these aims, the life cycle, morphology, and systematics of the Canary blowfly, *Calliphora splendens* Macquart, 1838, are analysed in depth. For the first time, its morphological and molecular characterisation is presented through the description and SEM photographs of larvae, puparia and adults. Diagnostic characteristics are also provided for each of the stages of its life cycle, comparing them with the closest species from the Iberian, Macaronesian and African regions. The results show that *C. splendens* is part of an independent evolutionary lineage. It is, therefore, necessary to act for the conservation of this unique endemic blowfly, which is strongly linked to the unique relict forest of laurisilva of the Canary Islands.

Keywords: blowflies, endemism, conservation, description, biology, key of identification.

21. Preliminary study of the effect of forest fires on springtails (Hexapoda: Collembola) populations in a pine forest of *Pinus nigra* Arn. in the Serranía de Cuenca

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A faunistic and ecological study was carried out in a pine forest of *Pinus nigra* Arn. in Fuentenava de Jábaga (Serranía de Cuenca) in order to know the impact of forest fires on the mesofauna composition and the variation in the populations of springtails. Samples of leaf litter, superficial and deep soil were taken in different points of the natural forest, the one affected by the fire, and the transition between the two, all in the winter season. Abundance and distribution studies and indices of richness, diversity, evenness and dominance show that the least number of springtails is found in the burned forest, although it has the highest diversity value. By means of discriminant and principal component analysis, we were able to identify those springtail species that appear associated with the natural or burned environment, corroborating the value of these animals as bioindicators in edaphic ecosystems.

Keywords: Collembola, pine forest, *Pinus nigra*, fire, bioindicator, Serranía de Cuenca.

22. Distribution and diversity of native and exotic species of springtails (Hexapoda: Collembola) in the soils of Deception Island (South Shetland, Maritime Antarctica)

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In this work, a study of the collembolan communities of Deception Island (South Shetland, Maritime Antarctica) has been carried out. This is an exceptional territory where the collembolan fauna is well known from previous studies. Numerous species identified, both native and exotic, are shown to be good bioindicators of the environmental edaphic conditions. The work presented here contributes to a better understanding of the distribution patterns of the springtail fauna and the factors that determine them, as well as the richness and diversity of allochthonous and native species in each of the points sampled. This completes the records for these species on Deception Island. To meet these objectives, numerous additional points on the Island are sampled during the 2019 Antarctic Campaign. With the data found, alpha diversity indexes, Spearman's correlation, as well as statistical analysis of Principal Components are calculated. Eleven species have been collected, 8 of them autochthonous: *Friesea antarctica* (Willem, 1901), *Friesea woyciechowskii* Weiner, 1980, *Tullbergia mixta* Wahlgren, 1906, *Archisotoma brucei* (Carpenter, 1907), *Cryptopygus antarcticus* Willem, 1902, *Cryptopygus badasa* Greenslade, 1995, *Folsomotoma octooculata* (Willem, 1901) and *Mucrosomia caeca* (Wahlgren, 1906); and 3 allochthonous: *Hypogastrura viatical* (Tullberg, 1872), *Ceratophysella succinea* (Gisin, 1949) and *Proisotoma minuta* (Tullberg, 1871). The dominant species is *C. antarcticus*, and *F. octooculata* is the most frequent, although in smaller populations. Through the Spearman correlation and Principal Component Analysis an inverse correlation has been found between the two species of the genus *Cryptopygus*. A relationship has also been found between the distributions of *C. badasa, T. mixta* and *F. octooculata*, which occurs recurrently in several locations associated with rocky substrates. The most important result of this work is to show that exotic species are not widely distributed on the island. *H. viatica* is present at low population densities in a small number of samples from several localities, except at Kroner Lake, where it is dominant. Another exception is *P. minuta*, also cosmopolitan, which is abundant only in Mt. Pond. However, native species occupy multiple ecological niches, with very numerous populations in different locations. This result in no way invalidates the care and protection necessary for a unique and fragile ecosystem.

Keywords: Deception Island, springtails, exotic species, distribution patterns, vegetation.

23. Thermal tolerance in the minute moss beetle genus *Hydraena* Kugelann, 1794 (Coleoptera: Hydraenidae): first data on their acclimation capacity to climate change

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Understanding how species respond to changing climatic conditions is a complex question in ecology, especially under current and predicted climate scenarios. This issue is particularly important in the Mediterranean region, where impacts are more severe, resulting in more intense summer periods and alterations to precipitation patterns. In the case of ectothermic animals, temperature is probably the main factor determining species distribution. Therefore, studying species' temperature tolerance can help us understand their current and future distribution patterns. We ran laboratory experiments to quantify the thermal tolerance of two species of aquatic beetles of the genus *Hydraena* Kugelann, 1794 (Coleoptera: Hydraenidae) with a focus on both their upper and lower thermal limits. These species have different habitat preferences: *Hydraena rugosa* Mulsant, 1844 is associated with temporary stagnant waters (lentic habitats) and *Hydraena testacea* Curtis, 1830 is associated with running waters (lotic habitats). Moreover, upper thermal limit is compared with two hydraenids of the genus *Ochthebius* Leach, 1815 that live in supralittoral coastal pools. All the studied species are found in the western Palearctic, being abundant in the Iberian Peninsula. We predicted that the species thermal tolerance is related to both their habitat preference and distributional extent (i.e., the 'Habitat constraint' and the 'Climate Variability' hypotheses). Despite differences between the studied species, upper thermal limit is similar in each genus, being lower in *Hydraena* (approximately 37°C) than *Ochthebius* (approximately 47°C). These results may be related to the different average temperature of their habitats, which are much more exposed to insolation in *Ochthebius*. Regarding the lower thermal limit, *H. testacea* shows a lower tolerance to cold than *H. rugosa*. This difference is in agreement with both the 'Habitat constraint' and the 'Climate Variability' hypothesis.

Keywords: *Hydraena*, water beetles, thermal tolerance, climate change, Iberian Peninsula.

24. Adult thermoregulatory behaviour does not provide an adaptive explanation for a reflectance-climate relationship (Bogert's pattern) in Iberian butterflies

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The association of darker, less reflective insect wings with cooler environments (Bogert's rule) is thought to be related to adult thermoregulation, but the adaptive explanation and the implications for sensitivity to climate warming are yet to be tested. We re-evaluate the pattern for butterflies using finer resolution data than in previous approaches, both geographically and morphologically, and test its correlation with recent evidence of impacts of warming on butterflies. To do this, we compared reflectance-climate relationships at different grid sizes, selected the best subset of reflectance measurements and tested the contribution of the species basking mode, the phylogenetic structure of the data and the correlation between reflectance and published abundance or altitudinal shifts. We used standardized RGB values from 222 species from the Iberian Peninsula, and regional mean temperature and precipitation data from the study area (10 km and 50 km resolutions) and Europe (50 km resolution). Correlations between reflectance and temperature increased at finer geographical and morphological resolutions. However, the butterfly basking mode did not improve the statistical explanation of the pattern. Reflectance also shows a strong phylogenetic structure, while variance partitioning indicated a poor pure contribution of the climate variables in the reflectance-climate correlation. Overall, mean temperature and precipitation were only modest predictors of butterfly reflectance, and no correlation between reflectance and recent abundance or altitudinal shifts was found. The strong phylogenetic pattern of the reflectance and the low fraction of the reflectance measures analyzed suggest that tests for alternative explanations are still needed to shed light on the meaning of the colour-environment relationships in butterflies, which probably are of a complex nature. If species abundance or distribution do not respond to warming linked closely to adult reflectance, unravelling the basis of Bogert's pattern in butterflies may require a habitat-level approach and alternative variables to adult thermoregulatory behaviour to be tested.

Keywords: Iberian Peninsula, Papilionoidea, thermoregulation, colour, Bogert's rule, climate.

25. Species of spiders associated with the different environments of a zoo

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This paper presents the results of a study on the diversity of spiders of the Araneae Order (Cl. Arachnida) associated with a unique urban ecosystem: a zoo, which is undoubtedly home to a specific mosaic of environments. The study was carried out in Barcelona Zoo (Catalonia, NE Iberian Peninsula), which covers 13ha of the total 31ha of Ciutadella Park, located in the heart of the city from January 2020 to January 2022. Spaces for public use (walking areas, picnics and flower beds), and the surrounding vegetation were investigated. A search was made of service and logistics areas (stables, sheds, warehouses, offices, changing rooms, etc.) and animal enclosures, with their particularities and specific environmental requirements. The aims were to ascertain: 1) the species of spiders present in the zoo; 2) the level of synanthropy, based on an indicative non-statistical Permanence Index (PI) for each species. They were grouped into 4 categories (common, frequent, occasional and accidental), with 'PI' meaning the 'number of months of appearance of a species/number of total months x 100'. A total of 70 species of spider were detected, representing 64 genera and 28 families. Of these, 52 were identified nominally (8 as cf), and 18 at the genus level. The most diverse families were Salticidae, Araneidae and Theridiidae; represented respectively by 9, 8 and 7 genera, forming 43% of species. A second block, made up of the families Lycosidae and Aglenidae (4 genera), Thomisidae, Linyphiidae and Philodromidae (3 genera respectively), made up 24 % of species. A 40% of the species recorded at Barcelona Zoo could be considered between common and frequent, and 60% occasional and/or accidental.

Keywords: arachnid, Araneae, list of species, synanthropy, urban ecosystem, Barcelona Zoo, diversity.

26. Spiders occupy their place: microhabitat community segregation at small spatial scale

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Spiders constitute an abundant and diverse group of arthropods that plays an important role at ecosystems both as predators and prey. Moreover, they show an outstanding functional diversity based on the wide array of hunting techniques that allows them to occupy different ecological niches. However, spider microhabitat selection has been rarely assessed at small spatial scale. In this study, we analyse the inter-specific segregation of spiders among microhabitats in open forests of central Iberian Peninsula. We defined four microhabitats associated to different strata (tree canopy, shrubs, leaf litter below the canopy and open grassland). The canopies were sampled by branch-shaking, the shrubs with a sweep net and both open grassland and leaf litter below canopies with pitfall traps. The spider biological communities were analysed with indexes of true diversity, similitude (SIMPROF and NDMS), segregation (Venn diagrams) and functional guild generation (UPGMA). We obtained a clear and precise segregation of the spider communities among the four strata, both at the levels of effective and dominant richness. The main segregation occurred between the species linked to the vegetation (trees, shrubs) and those collected by pitfall traps below the tree canopies and open grassland. In addition, the results of the guild analyses support this segregation, as the functional traits of the spiders and the strata they occupy are related. These results show that microhabitat segregation among spider communities takes place at a very small spatial scale. They also warn about the consequences of the loss of certain elements of the landscape that proportionally occupy only a small surface (i.e., isolated trees) but are essential for the conservation of some spider communities. If they disappear, many specialist spider species will be gone with them.

Keywords: Araneae, biological community, community structure, spider guilds, spider ecology.

27. Including juveniles changes the results of spider community analyses

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Spiders are an abundant and diverse group of arthropods widely studied at the community level due to their key role for ecosystem functioning, being nowadays one of the main bioindicator groups. Nonetheless, the vast majority of studies are based on adult identification, as determination at the species level sometimes relies on fully developed genitalia. Thus, juveniles, which frequently suppose two thirds of the total sample, are usually discarded for further analyses. In this study, we carried out monthly samplings throughout a year at two sites with a similar landscape (isolated trees in open grasslands) and morphologically identified not only adults, but also juveniles. In some species we sequenced target genes (mitochondrial coxI) from adults and juveniles (DNA barcoding approach) and confirmed that juvenile morphological identification was correct (their sequences matched those of adults of the corresponding species). We then analysed the quality of the sampling (accumulation curves), species richness (true diversity), species composition and nestedness among vegetation strata considering only adults or adults plus juveniles (the complete spider community). We obtained stronger results when we considered adults and juveniles together, and this was not only due to the larger sample size. We also got a clearer segregation among the species inhabiting the vegetation layers (trees, shrubs/tall grass) and ground-dwelling ones as well as a higher community nestedness. The results show that including juveniles changes the results and strongly advise against neglecting them systematically in spider community analyses. We acknowledge that in wide geographical scale studies with punctual samplings it may not be possible to include them but, in local ones with repeated samplings in different seasons, it is feasible. In these cases, for most species there are adults that confirm local presence and may be used by taxonomists as references for juvenile morphological identification.

Keywords: Araneae; biological community; community structure; morphology and phylogenetic comparison; spider ecology.

28. Trophic niche breath and overlap in two sympatric species of the genus *Serratella* [*Serratella ignita* (Poda, 1761) and *Serratella albai* González del Tánago & García de Jalón, 1983] (Insecta: Ephemeroptera)

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New data are provided on the biology of *Serratella ignita* (Poda, 1761) and *Serratella albai* González del Tánago & García de Jalón, 1983, based on the analysis of feeding and the breath and degree of overlap of the trophic niche. In order to determine the probable intra- and interspecific competition, an analysis of feeding in the different months and sampling sites was carried out and the trophic niche breath was calculated for both species using the Levins' niche breath index. The interspecific competition was assessed by calculating the values of three trophic niche overlap indices widely used in similar studies: the niche overlap or Schoener's index, the Simplified Morisita index and Horn's index. The intraspecific competition was studied on the basis of the degree of intraspecific overlap or individual specialization in the diet of each species and by examining the effect of different population densities on the size of the cephalic capsule of individuals.

Keywords: trophic niche, *Serratella*, Competence, Ephemeroptera.

29. Ground-dwelling arthropod communities along a gradient of anthropogenic pressure in Menorca

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Currently, we are witnesses to a worldwide reduction in biodiversity that has been suggested as leading to considerable extinction rates in the upcoming decades, with many of the affected taxa being arthropods. Agriculture intensification and urbanization are among the main drivers of biodiversity decline, and strongly drivers of arthropod diversity. We developed a study in Menorca Island to evaluate arthropod communities along a landscape gradient of anthropogenic pressure. Nine 1 × 1 km landscape sectors were selected and characterized considering the percentage (%) cover of (semi-)natural habitats and agricultural and urban areas. Ground-dwelling arthropods were collected using pitfall-traps placed in a sampling sector of 200 × 200 m around the centre of each landscape sector. Our results revealed that the community composition differs along the landscape gradient, with most of the groups benefiting from intermediate and even high disturbance levels. Only Chilopoda reached higher abundances in areas of low anthropogenic pressure. This reflects how all forms of agriculture differently jeopardize its associated biodiversity. Mediterranean areas still maintain high-nature-conservation farmlands that are generally well integrated with the environment, as those of the study area. Small fields, low-intensity management, high habitat heterogeneity, and the tendency to preserve substantial amounts of natural or semi-natural vegetation make these traditional agroecosystems highly biodiverse and sustainable environments. Our study highlights the relevance of preserving the high landscape heterogeneity associated to traditional agroecosystems in order to maintain diverse arthropod communities.

Keywords: agriculture intensification, urbanization, traditional agriculture, (semi-)natural habitats, ground-dwelling arthropods.

30. Larval habitats and diversity of mosquitoes (Diptera: Culicidae) in temperate areas of Galicia (NW Spain)

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Mosquitoes (Diptera: Culicidae) are cosmopolitan insects that can breed in practically any accumulation of water, being common in wetlands and even in artificial containers, whether in natural or urban areas. While many species are harmless to humans and other animals, others can transmit such serious diseases as malaria, dengue fever and West Nile virus (WNV). Climate change and globalization have particularly favoured the spread of the latter group, increasing the incidence of these diseases worldwide. Expanding knowledge about the larval habitats frequented by different mosquito species is vital to determine their presence and distribution over a region, which is the basis for establishing efficient control programs. The aim of this study is to provide information on mosquito diversity in Galicia (NW Spain) regarding three environmental factors: larval habitat (rivers, lagoons, ponds, puddles, rockpools and artificial containers), environment (urban, suburban, rural and natural) and type of climate according to the Köppen-Geiger classification (Cfb, Csa, Csb). Sampling was carried out using the dipping technique in 329 water bodies in Galicia between 2020 and 2021.In total, 5307 individuals and 14 species belonging to three gender were identified: *Culex* L., 1758 (88%), *Anopheles* Meigen, 1818 (7%) and *Culiseta* Felt, 1904 (4%). No differences in richness and abundance have been detected among environments, but between larval habitats and climates: the highest median values are found in rockpools and artificial containers, as well as in Csa climate. The most widespread species in the study area is, by far, *Culex pipiens* s.l. L., 1758, being present in 45% of the total locations with mosquitoes and almost representing 50% of the total captures. Although this is a native species, it is important to constantly monitor its populations since it is considered one of the main vectors of WNV.

Keywords: mosquitoes, diversity, vector, larval habitat, environment, climate, *Culex pipiens* s.l., Galicia.

31. An attempt to discriminate some endemic Pamphagidae species from the Canary Islands based on the chorion features (Orthoptera)

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Egg-pod and egg morphologies have revealed themselves as an accurate aspect for systematic purposes in several groups of insects, such as Orthopteroids, both to distinguish between species and to establish their phylogenetic relationships. Although egg-pod morphology has been proposed as not enough to differentiate among Acrididae species, at least when they are closely related, the egg morphology described by SEM can help to distinguish species, such as the case of some sympatric or closely related Pamphagidae species. This work deals with an attempt to differentiate the closely related endemic Pamphagidae species from the Canary Islands based on their egg morphology. For that purpose, tree egg-pods of each of five species belonging to two genera (*Acrostira bellamyi* (Uvarov, 1922), *Acrostira tamarani* Báez, 1984, *Acrostira tenerifae* Pérez & López, 2005, *Purpuraria erna* Enderlein, 1929 and *Purpuraria magna* López & Oromí, 2013) have been studied, as well as five eggs of each egg-pod. The egg-pods were obtained from captive females maintained under suitable conditions in the laboratory. The eggs were obtained directly from these egg-pods, cleaned, and preserved in 70% ethanol and studied at SEM. The mesh size of chorionic sculpturing has been compared facing the length of mesh-unit perimeter. The measures were given for all the complete mesh units that were included in an approximate area of 3 square millimeters of chorion in the central area of the egg. A non-parametric test of comparison of means was performed (R software version 3.3.3). Figures describing the egg-pod, egg and chorionic morphology for each species are provided, as well as box-plots and density curves of chorionic sculpturing metrics comparing the five studied species. Results suggest that the size of chorionic mesh is useful to distinguish between genera and, even, among *Purpuraria* species.

Keywords: Pamphagidae, *Purpuraria*, *Acrostira*, Canary Islands, chorionic features.

32. The importance of scientific illustration in entomological studies in the age of photography and artificial intelligence

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Scientific illustration (SI) is the use of drawings, graphics, and diagrams to communicate scientific concepts, from simplified representations in primary school books to detailed descriptions in scientific papers. Until the late 19th century, illustration was the sole format that represented species and habitats and was associated with most species descriptions and the dissemination of scientific knowledge. In the 20th century, with the advent and popularization of photography and its ability to hyper realistically represent subjects, illustration started to lose appeal. In the 21st century, the development of artificial intelligence (AI), with its ability to "create" illustrations, has led to speculation about its potential role in scientific representations and illustration. So, the question surges: is SI obsolete? The first illustrations of insect life cycles were done in the 17th century by Maria Sibylla Merian. Her compositions were revolutionary because they compiled information regarding hosts, habitat, and life cycles, emphasizing inter-species interactions, which were crucial in the development of entomology. This ability of illustration to study and "compose" the natural world, and to simplify concepts and highlight anatomical traits, has kept SI relevant throughout the age of photography. However, with the advent of AI, some are predicting human-made illustration will be obsolete. But could AI replace hours of observation, in-depth understanding, and attention to detail, or even the first description of a new species or the representation of a life cycle? In summary, although photography and AI may be useful tools to complement SI, illustration will remain a valuable tool in research and knowledge dissemination. Its ability to simplify, detail, complement, combine, select, adapt to the audience, contextualize and represent aesthetically, makes it an unparalleled tool that cannot be surpassed, at least at currently. In entomological studies, to be able to communicate complex life cycles and detailed anatomical structures.

Keywords: scientific illustration, entomology, life cycles, photography, artificial intelligence.

33. Beetles of the East of Spain. Field guide for its identification

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The work consists of two parts. The first one includes index of subjects, introduction, glossary, key of families and systematics of superfamilies Caraboidea, Hydrophiloidea, Dryopoidea, Histeroidea, Staphylinoidea, Byrrhoidea, Scarabaeoidea, Buprestoidea, Elateroidea, Cantharoidea, Cleroidea and Cucujoidea. The second one includes systematics of superfamilies Tenebrionoidea, Chrysomeloidea and Curculionoidea, bibliography and taxonomic index. There are a total of 2.484 photos in colour, and review for 1.474 species of beetles that can be found in the East of Spain. This area includes the Spanish provinces of Tarragona, Teruel, Castellón, Valencia, Alicante, Cuenca, Albacete and Murcia. For 255 of these species new data, which have not been previously published, are provided. This new information concerns their presence in different localities and provinces. A summary about the beetles in the old Mediterranean civilizations, paleontology and relations with the human being is included in the introduction. Additionally, data about the geomorphology, climatology and floristics are provided in the study area too. The glossary summarizes the 72 main terms which are used to classify coleoptera. All the 63 studied families are included in the key of families. Morphologic characteristics for each taxonomic category are given in the systematics and, for each species data about habitat, biology and general distribution are also supplied. Their distribution in the Iberian Peninsula and the study area are provided, when possible, too.

Keywords: beetles, field guide, east Spain.

34. The scientific value of private collections. The case of the Carlos Diana's butterfly collection

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Much of the current knowledge we have in many fields of the natural sciences has been built on the contribution and work of people outside the professional field. The contribution of "amateurs" or "naturalists" in scientific research has been especially important in Entomology. Many data of the life cycles, distribution and ethology of arthropods are based on the work of this people. In this respect, private entomological collections are one of the fundamental repositories of this information, which should be consulted if certain data need to be confirmed, revised or validated. In this communication we will analyse and evaluate the contribution of one of these private collections to the general knowledge of a specific group of insects, the butterflies. The Carlos Diana collection was acquired by the Museu de la Universitat de València de Historia Natural through a donation from his widow in 2017. It contains a series of entomological boxes with approximately 1000 specimens belonging to 112 species of butterflies, the vast majority of which are from Valencian region. The butterfly fauna of the Valencian Community is well known, as several research projects have been undertaken and there are numerous bibliographical references on the subject. Our aim, in this work, is to assess the job of individual work, from a non-professional entomologist and as a representative of the efforts of the amateur collective, in our knowledge of this group of organisms.

Keywords: Lepidoptera, butterflies, biodiversity, Mediterranean fauna, Comunitat Valenciana.

35. Species of mole crickets (Orthoptera: Gryllotalpidae) in the entomological collection ENV of the University of Valencia

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The mole cricket family Gryllotalpidae (Orthoptera, Ensifera, Grylloidea) includes orthopterans characterized by highly modified forelegs adapted for digging; the specialized subterranean burrows where they live include singing chambers from which they emit a sexual calling song. The family is represented by fourteen species in Europe, all of them belonging to the genus *Gryllotalpa* Latreille, 1802. Four species have been recorded from Spain: *Gryllotalpa africana* Palisot de Beauvois, 1805, *Gryllotalpa gryllotalpa* (Linnaeus, 1758), *Gryllotalpa septemdecimchromosomica* Ortiz, 1958 and *Gryllotalpa vineae* Bennet-Clark, 1970. The collection named 'ENV' is the historic entomological collection of the Laboratory of Entomology and Pest Control of the Valencia University, and it is housed at the facilities of the Cavanilles Institute of Biodiversity and Evolutionary Biology. This collection has around 70 specimens of mole crickets, either not identified or mostly erroneously assigned to the species *G. gryllotalpa*. The preliminary results of the *Gryllotalpa* specimens revision evidence that the four Iberian species are represented with male and female specimens. This communication offers the comparative examination of keystone taxonomic characters that allow the identification of these four species, being the most useful ones the male stridulatory file and the venation of the male fore tegmina; additionally, the male genitalia as well as the female fore tegmina has been also analyzed. All Iberian mole cricket species are considered like "Least Concern" at the IUCN Red List Category, but a true reduction of their populations has been verified in the past years. An accurate and trustworthy identification of these species will improve their knowledge and will be helpful to their conservation.

Keywords: mole crickets, diversity, conservation, stridulatory apparatus, taxonomic characters.

36. An updated and agreed-upon proposal for the common names of dragonflies and damselflies in Spanish

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Odonata (dragonflies) is one of the most attractive Order of insects for nature enthusiasts, photographers, and wildlife observers. It is worth noting that unlike all other European countries, there is not yet a widely accepted list of common names in Spanish for dragonfly species present in Spain. Among international organizations, IUCN has asked for such names in Spanish. In recent years, some citizen science publications and web portals have incorporated the use of common names for dragonflies, albeit with a lack of standardization. In 2015, a reasoned proposal was presented at the I Iberian Symposium of Odonatology held in Córdoba, but it did not include species found exclusively in the Canary Islands. Although this first proposal generated an enriching debate, it also had some reservations. In 2021, at the III Iberian Symposium of Odonatology held in Irún, another proposal was presented in order to stimulate the need for agreement on Spanish dragonflies common names. In the following weeks, the Grupo Ibérico de Odonatología called for participation and created a working group with the goal of creating such a consensus list. This working group is currently reviewing the 2015 and 2021 proposals, considering the existing names in Catalan (2016) and Galician (2012). As a result, a consensus list has been elaborated for the 82 Ibero-balear species, plus 4 species exclusive to the Canaries within Spain.

Keywords: Odonata, Iberian Peninsula, Canary Islands, common names.

37. Description of the female of *Labium walkeri* Turner & Waterson, 1920 (Hymenoptera: Ichneumonidae: Labeninae) from Australia

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The Ichneumonidae is thought to be one of the most species-rich insect families on Earth with about 25.000 described species widely distributed throughout the world. Current realistic estimations suggest that total global species-richness will be more than 100.000 species. The fauna of this family has been studied mostly in the Palearctic, Nearctic and Neotropical regions, but scarcely in the Afrotropical and Australian regions. In a study of material from Australia, the female of *Labium walkeri* Turner & Waterson, 1920, a species for which only the male holotype is known, was found. *Labium* Brullé (1846) is a primitive genus of trans-Antarctic and Australian distribution with 28 known species from Australia and many more awaiting description. The genus can be recognized by the large and bare labrum, as long as the clypeus, elongated mandible with the upper tooth much shorter than the lower one, slender first tergite, with the spiracle placed posteriorly to the middle, and a short ovipositor. In this communication, we describe and illustrate the female of this species and redescribe the male with new material. We also provide new distribution data in Australia of the species *Labium montivagum* Turner & Waterson, 1920, and a key for the identification of the females of all Australian species.

Keywords: Darwin wasps, parasitoid, female description, key.

38. Metagenomic exploration of *Coxiella* (Derrick, 1939) Philip, 1948 endosymbionts diversity in ticks: new insight from phylogenomic analyses

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Ticks are blood-feeding arthropods that require essential nutrients that their blood-based diet lacks, leading to mutualistic associations with bacteria that can provide these missing nutrients. *Coxiella*, a genus of Gammaproteobacteria in Legionellales order, is the most common symbiont found in ticks. Interestingly, this genus also includes *Coxiella burnetiid* (Derrick, 1939) Philip, 1948, the causative agent of Q-fever. *Coxiella* genus is defined into four phylogenetic clades (A-D) that exhibit partial cocladogenesis with their hosts. To improve our understanding of the diversity and evolution of *Coxiella* endosymbionts (CEs) and the origin of *C. burnetii*, we employed a metagenomic approach using Illumina sequencing. This approach allowed us determined genomic information of CEs in two genera of Ixodidae (*Amblyomma* Koch, 1844, and *Rhipicephalus* Koch, 1844) and one genus of *Argasidae* (*Alectorobius*) Koch, 1844, ticks. In this study, we present the first genomic insights into the CEs of *Amblyomma dubitatum* Neumann, 1899, *Amblyomma parvitarsum* Neumann, 1901, *Amblyomma neumanni* Ribaga, 1902, *Amblyomma naponense* Packard, 1869, *Rhipicephalus bursa* Canestrini & Fanzago, 1878, and *Alectorobius* sp. Our preliminary phylogenomics tree provides a well-supported topology that differs from the most of previously described, particularly for the relationships of the major *Coxiella* clades. A + B clades are now sisters to the D + C clades, in contrast with previous studies. Based on their geographic origin, the CEs found in *A. dubitatum*, *A. neumanni*, and *A. naponense* are clustered into clade D, composed of CEs species from American ticks. Similarly, the inclusion of CE from *R. bursa* in clade C supports the co-speciation of this tick group and their associated CEs species. The CE from *Alectorobius* sp. was grouped into clade B, making it the first CE from American ticks to be integrated into this group of African tick coxiellae. Finally, *C. burnetii* (pathogenic trait) is recovered in a derivate position into CEs. A further denser sampling of CEs genomes across tick diversity will improve evolutionary knowledge of *Coxiella*.

Keywords: high-throughput sequencing technology, Tick-borne diseases, Symbiosis, Ixodida, Q-fever.

39. *Hyalomma* Koch, 1844 (Acari: Ixodidae) phylogeny: A mitogenomic approach

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Ticks (Acari: Ixodida) constitute a globally distributed clade, with high medical and veterinarian importance due they are vectors of several infectious agents. Ixodida comprise close to a thousand species belonging three families, Nuttalliellidae, Argasidae (soft ticks), and Ixodidae (hard ticks). Among hard ticks, the genus *Hyalomma* Kock, 1844, includes at least 27 species distributed in Asia, Africa, and southern Europe, showing great diversity in North Africa. Two species of genus, *Hyalomma lusitanicum* Koch, 1844, and *Hyalomma marginatum* Koch, 1844, are present in the Iberian Peninsula and pose a risk to human populations given they are potential vectors of Crimean–Congo hemorrhagic fever and transmit other pathogens such as *Anaplasma* spp. *Babesia* spp. *Coxiella* spp., and *Theileria* in animals. However, taxonomy and systematics understanding of the genus *Hyalomma* remains inconclusive due to sparse sampling, shallow DNA sequencing, and misleading morphology, resulting in knowledge gaps that obscured the circumscription and the evolution of these species. Until now, no study has reconstructed the phylogenetic relationships of the Iberian *Hyalomma* species at the genomic level. In this study, we have determined the first mitogenome of *H. lusitanicum*, an endemic Iberian species, as well as mitogenome of *Hyalomma excavatum* Kock, 1844, and *Hyalomma aegyptium* Linnaeus, 1758, both with Moroccan distribution, using high-throughput sequencing technology. We reconstructed the phylogenetic relationships of *Hyalomma* using mitogenomes, focusing on circun-Mediterranean clades. Our results strongly support *H. lusitanicum*, *Hyalomma truncatum* Koch, 1844, (sub-Saharan distribution), and *Hyalomma anatolicum* Koch, 1844 + *H. excavatum* (which require taxonomic revision) as the sister clade of *H. rufipes* (sub-Saharan distribution) + *H. marginatum*, as well as *H. aegyptium* + (*Hyalomma. scupense* Schulze, 1919, + *Hyalomma asiaticum* Schülze & Schlottke, 1929). Denser sampling across *Hyalomma* distribution, combined with detailed morphological and genomic studies, will improve the systematic knowledge of the genus, which is fundamental for developing measures to control of these vectors.

Keywords: tick evolution, tick-borne pathogens, phylogenomics, Iberian Peninsula, mitogenomics; circun-Mediterranean fauna.

40. Dividing the indivisible: first steps towards the morphological characterization of molecular clades within *Synergus* Hartig, 1840 (Hymenoptera: Cynipidae) to describe new genera

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The inquiline gall wasp genus *Synergus* Hartig, 1840 (Hymenoptera: Cynipidae), which was originally described from the Palaearctic fauna and subsequently found in other regions, has long been considered monophyletic. In a recent phylogenetic study that included sequenced material from around the world, this genus was recovered as polyphyletic. Nearctic and Neotropical *Synergus* were resolved into three distinctly separate molecular clades from the one including all Palaearctic species; thus, it was concluded that this genus is not really present in the New World. At this point, we are faced with a new challenge: to morphologically characterize all the clades within *Synergus* in order to divide the genus into new taxa. Gall wasps are organisms that show a high degree of evolutionary convergence and so traditional morphological traits used to describe new species have proved insufficient to characterize the resulting clades. Therefore, it is imperative to study finer and much more informative morphological characters, including those most ignored in the literature. With this in mind, we are dissecting, and subsequently photographing under light and electron microscopy, as many *Synergu*s species as possible to build a morphological phylogeny that, together with the most up-to-date molecular data, will allow us to separate the New World clades and describe new genera.

Keywords: gall wasps, inquilines, New World, phylogeny, morphology, molecular, new genera.

41. Taxonomy and differences in the life cycle of two subspecies of *Musca domestica* Linnaeus, 1758 in Spain (Diptera: Muscidae)

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The intraspecific taxonomic status of *M. domestica* is complex, and it consists of at least two subspecies in Spain. Thus *M. domestica domestica* Linnaeus, 1758 is found abundantly throughout the Palaearctic, but *M. domestica calleva* Walker, 1849 is distributed mainly on the African continent, and in the southern of Europe. With this aim, several studies of its biology and morphology were carried out at the University of Alicante (Spain) and the University Nicolaus Copernicus (Poland). For this purpose, the life cycle of both subspecies was studied under controlled conditions, analysing different biological parameters as development time, survival and fertility. The imaginal morphometric analysis and pre-imaginal morphology were also performed. The results showed biological differences between the two subspecies. However, preliminary morphological analysis of larvae did not detect clear differences, although morphometric analysis allowed the separation of adults of both subspecies.

Keywords: morphology, larva, adult, lifecycle, subspecies, housefly.

42. Taxonomist: an R package to accelerate taxonomy

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Taxonomists have to invest a large amount of time measuring specimens, delimiting and describing new taxa and developing new identification keys or modifying existing ones. To solve this problem, new 'taxonomist' R package has been developed to speed up and facilitate taxonomic works with the use of informatics tools. This package is intended to handle and visualize morphological, taxonomic, phenological and distribution data sets. One of its main features is the ability to automatically develop classical dichotomous keys with different methods: regression trees, tree-based C5.0 models or rule-based C5.0 models. Each of these models has its own advantages and caveats and all of them offer the possibility to test the dichotomous keys and to quantify their accuracy. Furthermore, it can be used to represent taxa distribution maps, to visualize morphological variables altogether or to represent all taxa in a multidimensional space. To make the package easier and more interactive to use, an R Shiny application is provided along with 'taxonomist'.

Keywords: cibertaxonomy, dichotomous keys, R package, taxonomy.

43. Arthropods and ecosystem services: a board game for scientific literacy

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Arthropods have been one of the most unknown and undervalued animal groups in our society. However, in recent years, invertebrates have begun to receive more attention due to several alarming factors, including biodiversity loss. But arthropods have always had a very close relationship with the human population's well-being. The benefits that society obtains from ecosystems are called ecosystem services. The proposal for the board game based on ecosystem services arises from the elaboration of a Master's Thesis whose main objective is to focus on the benefits provided by arthropods, making citizens aware of their ecological importance. To carry out the proposal, two main tools have been constructed, based on the thematic "the end of the world". The first resource is a video in which participants are given the following challenge: help save the planet from the disappearance of arthropods. But why is it important to save the arthropods? Players will find the answer in the second tool, which consists of their participation in the board game in question. Throughout the game, they will discover numerous examples of arthropods that bring us benefits, as well as the human actions that damage and reduce the biodiversity. In addition, they will also have a research notebook in which they will write down information about the different ecosystem services supplied by arthropods, in order to share what they have learned with other participants, thus raising awareness of the importance of these animals in ecosystems.

Keywords: benefits, arthropods, ecosystem systems, board game, science literacy.

44. Biocontrol of *Drosophila suzukii* Matsumura, 1931 (Diptera: Drosophilidae), a pest of red fruits, using the cosmopolitan endoparasitoid *Trichopria drosophila* (Perkins, 1910) (Hymenoptera: Diapriidae): does host preference matter?

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Drosophila suzukii Matsumura, 1931 (Diptera: Drosophilidae), also known as the spotted wing fly (SWD), is a pest of berries and small fruits. It was detected in Europe in 2008 and in Portugal in 2012. This quarantine pest (EPPO list A2) infests fruits during their ripening process, due to their serrated ovipositor. The development of larvae in the fruits, associated with secondary infections caused by microorganisms, makes these fruits unmarketable, causing huge losses to producers. Commonly used pesticides (e.g., Delegate250 and Spintor) are not very effective because, in addition to being broad-spectrum (harming non-target insects, such as pollinators), they do not reach SWD larvae inside the fruits. Furthermore, its excessive and recurrent use can lead to resistant SWD populations. Being aligned with the European Green Deal, it is of dire urgency to develop effective and sustainable alternative control methods. The use of a cosmopolitan pupal endoparasitoid - *Trichopria drosophilae* (Perkins, 1910) (Hymenoptera: Diapriidae) - which can resort to several species of drosophilids as hosts, including SWD - emerges as one of the most sustainable and specific biocontrol techniques for this insect pest. The main objectives of this work were to 1) create and maintain cultures of *T. drosophilae* using pupae of *Drosophila* spp. grown in the laboratory and from infested fruits collected in the field, and 2) test the host preference of the parasitoid using pupae of different species of *Drosophila* spp. From these assays, it was possible to observe that it was possible to generate more *T. drosophilae* when cultivated in *Drosophila* spp. infested raspberries. Further evaluations are currently being performed. The obtained results will allow an understanding of the adaptation of *T. drosophilae* to the hosts available in the field, and allow producers to develop a sustainable resource to apply in situ for themselves in their productions to control *D. suzukii*.

Keywords: *Drosophila suzukii*, endoparasitoid, *Trichopria drosophilae*, sustainable control.

45. Population dynamics of *Cybocephalus nipponicus* Endrödy-Younga, 1971 (Coleoptera: Cybocephalidae) in Spanish mango orchards

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The larvae and adults of the minute beetles of the family Cybocephalidae are voracious predators specialized in feeding on armored scales and have been used extensively in biological control programs. *Cybocephalus nipponicus* Endrödy-Younga, 1971 has been described as the main predator of the white mango scale (WMS), *Aulacaspis tubercularis* Newstead (Hemiptera, Diaspididae), the most damaging pest of mango crops in southern Spain. In this study, the interannual variation in the population dynamics of *C. nipponicus* was assessed. Field samplings were done twice a month from July 2019 to May 2022 in three mango orchards of the Axarquia region (Málaga, Spain), using yellow sticky traps (10 x 25 cm). Based on the number of adults captured, two main population peaks of *C. nipponicus* were recorded during the year in the southern Spanish mango orchards. The average number of captures was lower during the winter but reached a first peak in spring (between late May and mid-June), with an average of 7.58 ± 1.64, 1.56 ± 0.40 and 6.89 ± 1.42 adults per trap in 2020, 2021 and 2022, respectively. Nonetheless, the highest values of abundance occurred in a second peak in late summer (between mid-August and mid-September), coinciding with the highest populations of the WMS in the studied orchards, with 51.08 ± 7.22, 8.31 ± 1.30 and 6.97 ± 1.59 adults per trap in 2019, 2020 and 2021, respectively. However, the action of *C. nipponicus* was insufficient to keep the WMS populations below the economic injury levels. Thus, complementary measures should be taken to improve the abundance and conservation of this and other natural enemies, such as the use of ecological infrastructures and safer chemical insecticides.

Keywords: Diaspididae, *Aulacaspis tubercularis*, white mango scale, integrated pest management, biological control, predators, *Mangifera indica*.

46. Community of ants (Hymenoptera: Formicidae) associated with mango orchards in southern Spain

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Invasive pests are a growing threat for crop sustainability worldwide. Currently, the control of invasive species in the Spanish mango orchards, such as the white mango scale *Aulacaspis tubercularis* (Newstead, 1906) and the green shield scale *Pulvinaria psidii* Maskell, 1893 poses a growing challenge due to global change and the progressive reduction in pesticide availability. Biological control should be prioritized as a primary approach for managing these invasive pests. In order to effectively implement biological control techniques in mango, a comprehensive understanding of the different arthropod communities present in the crop and their roles is essential. To this end, entomological samples were taken using the beating technique in three organic mango orchards located in the Axarquía region (Málaga, Spain). Sampling was carried out fortnightly from July 2019 to June 2022. This study focuses on the ant community due to their ecological importance in all ecosystems, their nearly ubiquitous presence, and their role as ecosystem engineers. Their ecological roles are relevant for pest control, both as mutualists of pest species and pest predators. Almost 5,000 specimens of formicids were collected, identifying 10 different species. *Plagiolepis schmitzii* Forel, 1895 was the dominant species in all three orchards, followed in abundance by *Monomorium subopacum* (Smith, 1858). Other abundant species included the *Tapinoma nigerrimum*-group, *Crematogaster auberti* (Emery, 1869), and *Camponotus sylvaticus* (Olivier, 1792), which varied in abundance across orchards.

Keywords: *Plagiolepis schmitzii, Monomorium subopacum, Aulacaspis tubercularis*, integrated pest management, biological control, tropical fruits, Málaga.

47. A snapshot in time: composition of native gall-inducing cynipids and their associated parasitoids and inquilines in contact zones with chestnut trees infested by the invasive *Dryocosmus kuriphilus* Yasumatsu, 1951 (Hymenoptera: Cynipidae)

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The species composition in an area varies over time, due to both intrinsic and external causes such as, for example, changes in the environment or the entry of new species. In this case, exotic species can modify the assemblages of native species by giving rise to de novo interspecific interactions in a geographic area. In the present study we explored and analyzed the species composition of gall inducers and their associated parasitoids and inquilines in Spanish areas where *Dryocosmus kuriphilus* Yasumatsu, 1951, an invasive pest of chestnut trees, occurs. After a quantitative description of these species' assemblages, we analyzed, in bipartite networks, how trophic specialization level of parasitoids and inquilines changes if either host taxonomic identity or host ecological/functional category is used as lower trophic level. To achieve our objectives, we sampled galls of *D. kuriphilus* as well as native species of Cynipidae in different areas of Spain, with preference to areas where the exotic parasitoid *Torymus sinensis* Kamijo, 1982 had been released for its biological control. Galls were collected on *Quercus* L. species and other host plants. Emerged parasitoids and inquilines were identified to species level. Analyses of host plant segregation, species richness (true diversity) and food webs were carried out, obtaining species specialization (d'). The results indicate that the parasitoids recruited by *D. kuriphilus* come almost exclusively from native cynipid communities on *Quercus*, except for a species from plants of *Rosa* L. *Dryocosmus kuriphilus* has the second most diverse species composition, even though it is a biological community formed de novo in less than a decade. The food webs are more stable at the ecological level of analysis (i.e., considering host plant taxa and gall morphological types) than at the taxonomic level of analysis. There are few specialists and many generalist parasitoid species, which agrees with the rapid recruitment by *D. kuriphilus*. Furthermore, a high parasitoid/inquiline species richness in *D. kuriphilus* galls is expected, due to they being a largely unexploited available resource for the native parasitoid fauna.

Keywords: chestnut gall wasp, *Torymus sinensis*, Chalcidoidea, environmental risk, biological control.

48. Present and potential biological control agents of invasive alien plants in Portugal

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Classical biological control aims to reduce populations of invasive species using specific natural enemies from the regions of origin of the species to be controlled, either reducing the growth or reproductive potential of species, thus reducing their abundance. In the case of invasive plants, several insects can be used for biological control, e.g., seed borers, leaf miners, suck sapping insects, galling insects, etc. This work aims to establish a baseline of knowledge about the potential and available biological control agents present in mainland Portugal. The first and only agent to be intentionally introduced was *Trichilogaster acaciaelongifoliae* Froggatt, 1982 (Hymenoptera: Pteromalidae), in 2015, against the invasive plant *Acacia longifolia* (Andrews) Willd (Fabaceae). This agent is now established along the Portuguese coast, significantly reducing the seed production and growth of the target-species. There are other biological control agents with great potential to be used against other invasive plant species in Portugal. Specificity tests with the weevils *Melanterius acaciae* Lea, 1899 and *M. maculatus* Lea, 1899 (Coleoptera: Curculionidae) are being carried out for several *Acacia* species, namely *A. dealbata* Link., *A. mearnsii* De Wild., *A. melanoxylon* R. Br. and *A. retinode*s Schlecht.; these agents have been previously used with success in South Africa. In addition, during field work, the presence of other natural enemies of alien species were detected, which are thought to have been introduced accidentally in Portugal. This is the case of *Bruchidius terrenus* Sharp,1886 (Coleoptera: Chrysomelidae), which may help to contain *Albizia julibrissin* Durazz. (Fabaceae), *Stenopelmus rufinasus* Gyllenhal, 1835 (Coleoptera: Brachyceridae) detected more than a decade ago on *Azolla filiculoides* Lam. (Saviniaceae), *Spanolepis selloanae* Gagné (Diptera: Cecidomyiidae) found on *Cortaderia selloana* (Schult. & Schult.f.) Asch. & Graebn (Poaceae), among others. Finally, other biological control agents may be of interest to explore in the near future, such as *Aphalara itadori* Shinji, 1938 (Hemiptera: Aphalaridae) against *Fallopia japonica* Houtt. (Polygonaceae), *Megamelus scutellaris* Berg 1883 (Hemiptera: Delphacidae), *Neochetina eichhorniae* Warner, 1970 (Coleoptera: Brachyceridae) or *Neochetina bruchi* Hustache, 1926 (Coleoptera: Brachyceridae) for *Pontederia crassipes* Mart. (Pontederiaceae), among others.

Keywords: gall midge insects, seed borer, sapping Insects, natural enemies, checklist, non-intentional introductions, intentional introductions.

49. Selection of plant species to form perimeter hedges in the cultivation of citrus in the Canary Islands

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The design of living ecological infrastructures, with non-cultivated plant species, allows increasing the presence of natural enemies and, consequently, the biological control of pests. For these infrastructures to be effective, it is necessary to know the specific associations between plant species and natural enemies. In the present work, developed within the framework of the LIFE18 CCA/ES/001109 project, and carried out in two plots on Tenerife, one on the northern slope and another in the south, we carried out the identification of the arthropofauna associated with seven autochthonous plant species. The species were selected for their adaptation to the edaphoclimatic conditions of the Canary Islands, with the aim of forming perimeter hedges in citrus that favour biological control for conservation. The species chosen were: Canary Island sorrel (*Rumex lunaria* L.), lavandula (*Lavandula canariensis* Mill.), artemisia (*Artemisia thuscula* Cav.), magarza (*Argyranthemum frutescens* (L.) Sch.Bip.), lobularia (*Lobularia canariensis* (DC.) L. Borgen), Lentisco (*Pistacia lentiscus* L.), rosemary (*Rosmarinus officinalis* L.). Three of these species have been evaluated under the two conditions, north and south of the island. The monitoring of arthropods, both in the hedges and in the citrus trees, was carried out by means of visual inspection, electric insect vacuum and stem-tap samples. The results show that the hedgerows studied can harbour a great diversity of auxiliary fauna, with the species found being very similar to those observed in citrus. Hemiptera (myrids and anthochoridae) were the most abundant group, followed by hymenoptera, predatory diptera (syrphids and caecidomids) and coccinellids. The location of the plots showed to influence these plant-natural enemy associations. The plant species with the greatest diversity of auxiliary fauna was lavandula, followed by the Canary Island sorrel in the southern area and the artemisa in the northern area. The knowledge generated will allow the design of hedges that help maximize biological control for conservation.

Keywords: biological control for conservation, biodiversity, auxiliary entomofauna, ecological infrastructures.

50. The management of the Asian hornet *Vespa velutina* Lepeletier, 1836 (Hymenoptera: Vespidae) and the protection of assets: the case of vineyards in NW Spain

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The Asian hornet *Vespa velutina* Lepeletier, 1836 (Hymenoptera: Vespidae) is an invasive insect present in Europe since 2004 that has spread mainly along the Atlantic coast. Among the invaded areas, Galicia (NW Spain) has been reported as one the regions with the highest densities of nests. Traditional control methods include diverse techniques aimed at reducing the number of individuals of the population, but at present there is no clear evidence of the success of any method to attain this objective. As a consequence, there is an urgent need to design new techniques that allow the protection of particular assets. Adult hornets are well known to cause damages on fruits while feeding on them, and wine producers in NW Spain use liquid-baited traps both in spring and summer in an attempt to reduce damages. Yet, these traps capture a high range of other insects as bycatch, specially Diptera, so we have tested the use of anti-hail nets as a method of protection of vines. In this work we discuss the pros and cons of both methods, presenting a comprehensive list of insects captured as bycatch in traps used in the area, as well as the results of a pilot project on the suitability of anti-hail nets for the protection of vines against *V. velutina*. Results show that anti-hail nets might be an adequate option for protecting vineyards in highly invaded areas, as they avoid the detrimental side-effects of non-selective trapping on insect populations. However, potential unwanted impacts on the spread of diseases and other socioeconomic factors might shape the acceptance of the method by producers.

Keywords: *Vespa velutina*, management, vineyards, damage, trapping, bycatch, anti-hail nets.

51. Chasing Asian hornets *Vespa velutina nigritorax* Buysson, 1905 (Hymenoptera: Vespidae) to find the nest

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Vespa velutina nigritorax Buysson, 1905, is an alien species in Europe. Firsts appearances date back to 2004, in southwestern France, due to the arrival of a single fertilized queen, probably by sea transport. Since then, it has spread to many countries including Spain causing several economic, ecosystem and human damages. To fight against it, numerous control methods were implemented, however, the invasion still increasing. In this study, radio-tracking combined with protein feeders was tested as a tool for invasion control in a coniferous forest area in the NW of Spain (Galicia). The basis of the technique is to attract hornets with the feeders, mark it with paint and select the most adequate hornet based on weight, fly direction and time to return to the feeder. Only the heaviest hornets were able to fly with radio-tracking transmitter, so it was the main factor to consider. Transmitter was attached to them, and radio-tracking was conducted until find the nest. We found 8 different nests in 1,5 Km2 area during the summer of 2021 year. All of them were in treetops of *Pinus pinaster* Aiton and *Eucalyptus globulus* Labill at a height of 30.5 ± 6.6 m (mean ± standard deviation). The foraging distance was of 418 ± 275 m, the time used to locate the nest from hornet release was 117 ± 43 min. and the weight of the hornets 370 ± 78 mg. The study proved the effectivity of radio-tracking combined with protein feeders, finding nests in specific areas, but due to the time expended in the process (hornet capture, marking and selection, transmitter attachment and radio-tracking) and the cost of the technique, it is limited to find specific nests of interest e.g., close to schools, apiaries, or housing.

Keywords: invasion, Hymenoptera, feeders, marking, control.

52. Acute contact toxicity of biopesticides to adult *Vespa velutina nigrithorax* Buysson, 1905 (Hymenoptera: Vespidae) in laboratory

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Vespa velutina nigrithorax Buysson, 1905 (Hymenoptera: Vespidae) is an invasive species in Europe that was first identified in France in 2004 from China. As a predator with high voracity, this hornet poses a major threat to native insects, especially honeybees and other pollinators. Eradication in Europe seems impossible, leading to the necessity of finding (more) efficient control solutions, which invariably will depend on long term and qualified management procedures that comprise early detection and nest destruction using proper methodologies. Chemical control, by pesticide injection, is the most common method to eliminate wasp colonies. Despite the intervention by the responsible authorities, most nests are not removed due to difficult access and being time consuming, thus becoming a potential environmental hazard if other species enter in contact with it or feed on hornet dead adults/larvae. As there is no standardized application protocol and tested concentrations for effective hornet control without environmental damage and risk to biodiversity, pesticides might be used indiscriminately, which can lead to damage to local species, especially pollinators, birds, or mammals. Therefore, it is of the utmost importance to proceed with new research studies to generate a methodological protocol for assessing the effects of pesticides on *V. v. nigrithorax* and to test and select their efficiency for its control. We tested in laboratory two commercially available biopesticides (a pyrethrin mix and another one with spinosad as active ingredient) in different concentrations for their acute contact toxicity on workers (caste which constitutes the major workforce of the colonies) of *V. v. nigrithorax*. Both biopesticides are potentially effective for the control of hornets. For both substances, the most suitable dose for our purpose – which reached the desired mortality (>90%) in the shortest period after exposure – is 25 µg a.i./hornet (at +48h). This is the first step towards standardizing a protocol in the field.

Keywords: asian hornet, ecotoxicological tests, invasive alien species, pesticides, yellow-legged hornet.

53. Functional responses to anthropogenic disturbance and the importance of selected traits: a study case using dung beetles (Scarabaeoidea: Scarabaeinae)

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Functional diversity has been defined as the value, range, distribution, and relative abundance of the functional traits of individuals that belong to an ecosystem. Therefore, the functional response of organisms to environmental disturbances depends largely on their functional traits. We evaluated dung beetle functional diversity associated with the Atlantic Forest replacement using a matrix with 25 functional traits (ten morphological, four ethological, and eleven physiological). We compared functional diversity among native forests and disturbed habitats, with a multi and single-trait approach. Contrary to previous studies, habitats with higher disturbance (open pasture) exhibited higher functional diversity compared to others land uses, which could be explained by the inclusion of physiological response traits; species of open disturbed habitats showed extreme values of such traits. However, the higher functional diversity in the most disturbed habitat may not be correlated to ecosystem functioning since physiological traits do not have a significant contribution to ecosystem functioning compared to ethological and morphological traits. The inclusion of several traits that represent not only the ecology and morphology of species but also their physiology, generates different results to those observed in previous functional studies. Therefore, we propose that functional traits must (1) be carefully chosen according to their biological and functional basis; (2) represent species ecology and physiology; and (3) include both effect and response traits. In addition, we consider as extremely relevant to include a multi and single-trait approach in functional diversity studies and evaluate the ecosystem process empirically rather than theoretically. A combination of all these considerations will provide a more realistic and complete overview of functional diversity patterns and the potential consequences of human disturbance on ecosystem functioning.
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Keywords: environmental disturbance, functional ecology, ethological traits, morphological traits, physiological traits.

54. GREENCATTLE Project: Nature-based solutions for parasite control in extensive livestock farming, restoration of dung insect biodiversity and associated ecosystem services

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Extensive livestock farming has numerous benefits on the environment and rural development, as well as potential for adaptation to climate change and as a landscape diversifier. However, it can also have negative effects on biodiversity due to the generalized use of veterinary medicinal products (VMPs). The decline of the diversity of decomposer insects and their ecological activity is responsible for drastic changes in key ecosystem services. At the community and environmental levels, the long-term use of VMP reduces the diversity and abundance of dung beetles, causing an accumulation of dung on the pasture, greater soil nitrification and higher emission of greenhouse gases. Neither farmers nor related stakeholders (e.g. veterinarians) are properly informed of these adverse effects while the necessary alternative strategies are also limited. The GREENCATTLE project addresses the challenge of ecological transition by including nature-based solutions, local ecological knowledge and strategies for the ecological restoration of agroecosystems. Our proposal aims to provide technical and scientific information to facilitate the conversion towards extensive and sustainable ecological livestock systems without preventive and routinely use of allopathic chemical antiparasitics. For the first time, we carried on ecotoxicological tests of four compounds derived from plant extracts (thymol, carvacrol, cinnanmaldehyde and garlic oil) and they showed no negative health effect on dung beetles (Coleoptera, Scarabaeidae), being the first non-allopathic compounds with a favourable toxicology test. The availability of new antiparasitics derived from medical herbal extracts (MHE) and subjected to toxicological tests will be a real alternative to the use of allopathic VMPs.
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Keywords: ecological livestock, nature-based solutions, medical herbal extracts, dung beetles.

55. Development ability and establishment of *Philaenus spumarius* (Fallén, 1805) (Hemiptera: Aphrophoridae) on different host plants

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Philaenus spumarius (Fallén, 1805) is a xylem-feeding insect and a recognized vector of the bacteriu, *Xylella fastidiosa* (Wells et a., 1987) (one of the main quarantine pathogens in the European Union). This bacterium was detected for the first time in Spain at the Balearic Islands in 2016 and one year later in the province of Alicante. Since that moment, different strategies have been carried out to control the expansion of the bacterium. One way of controlling this expansion could be the management of crop cover to difficult the vector establishment. In this work we analyzed the suitability of vectors to some host plants (alfalfa, field marigold and grasses) regarding to: 1) The attraction of the plant volatiles to the adults, 2) The female preference to egg-laying and 3) The nymph viability to reach the adult stage. All the assays were carried out in laboratory (1) and greenhouse (semi-field) (2 and 3) conditions and a Y-tube olfactometer was used to analyze volatile attraction. The results show that: 1) Adults respond to plant volatiles, 2) Females prefer to do the egg-laying in dry material instead of plant material but there is no preference for any host plant, 3) Host plants seem to be essential for the development of the nymphs, in this case the nymphal development to adults in alfalfa and field marigold was near the 80%, however, no nymphs reached the adult stage on grasses. In conclusion, more assays need to be done, but these results provide valuable new information to implement the use of cover crops as a population control method for this insect vector of *X. fastidiosa*.

Keywords. *Xylella fastidiosa*, insect, vector, attraction, host plant, egg-laying.

56. Fungal isolated from the red palm weevil (Rhynchophorus ferrugineus, Olivier, 1790) (Coleoptera: Curculionidae) and its associated mites in northern Portugal

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Rhynchophorus ferrugineus (Olivier, 1790), also known as the red palm weevil (RPW), has become a pest of the *Phoenix canariensis*, H. Wildpret, palm tree. This weevil, and its associated mites, are known to carry fungi. The objective of our study is to identify the fungal species present on the RPW and its associated mites, in Portugal. RPW specimens were collected with pheromone traps in four districts (Aveiro, Braga, Viana, and Porto) in northern Portugal between July 2021 and January 2022. Fungal spores and mycelium were collected from weevils and mites that had visible fungal growth, and placed on potato dextrose agar plates. Strains were isolated through serial plating, and the fungal species were identified based on morphology and ITS2 rDNA sequences. Four different fungal genera were identified: *Scopulariopsis* sp., *Alternaria* sp., *Fusarium* sp. and *Penicillium* sp. *Scopulariopsis* sp. has been observed to be both protective against infections by other fungi (protecting the *Dermacentor* sp. Koch, 1844, tick against *Metarhizium anisopliae* infection) and pathogenic to mites. *Alternaria* sp. and *Fusarium* sp. are pathogenic to both plants and immunocompromised humans, and *Penicillium* sp. has been found to grow better in chitin rich-mediums, indicating its potential as an entomopathogen. *Fusarium* sp. specifically is the cause of the disease “Fusarium wilt” in palm trees. Our study reveals that the RPW, and its associated mites, can be a vector of pathogenic agents potentially targetting plants, humans and other animals. The RPW was also observed to carry potentially entomopathogenic fungi, indicating prospective novel biocontrol agents. In general, the study of fungi associated with the RPW-mite parasitic complex could be a research field with broad potential in both the field of biocontrol and pathogen spread.

Keywords: red palm weevil, phoresis, fungi, mites, pathogens.

57. Searching for functional groups of urban butterflies in the city of Madrid and their use as bioindicators

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The aim of this study is to identify functional groups of butterflies in the city of Madrid, based on the butterflies' biological, ecological, and behavioural traits of the butterflies, such as their food sources, habitat preferences, and morphology. Different traits of the species have been compiled from the literature and the study of material from collections, and through a phenogram obtained based on these traits, the different functional groups of butterflies present in the city are being defined. By categorizing the butterflies into functional groups, we can better understand their roles in the urban ecosystem and their response to changes. Functional groups provide a way to simplify the complexity of species diversity by grouping species with similar ecological functions together. This kind of approach is valuable in ecological research, conservation planning, and environmental monitoring because it provides insights into the roles and contributions of different species to ecosystem processes. Moreover, it helps identify key species or groups of species that are essential for maintaining ecosystem health and functioning, and it can be used to assess the impacts of disturbances or environmental changes on ecosystem structure and function. Butterflies are highly sensitive to changes in their environment, and their presence or absence can indicate the presence or absence of specific environmental conditions. In the last decade, we have been conducting surveys in different green areas of the city and recording the number and species of butterflies observed, and we also have the data from the volunteers of the uBMS project. By comparing the abundance and diversity of butterfly species and functional groups in different areas of the city, we can identify areas that are rich in butterfly diversity or that may require additional conservation efforts or specific environmental interventions to improve urban biodiversity.

Keywords: bioindicator species, Central Spain, diversity, insect monitoring, Papilionoidea, species guilds, traits, urban environment.

58. Species-specific variations in cuticular hydrocarbons profile in response to Urban Heat Island effect in wild bees and a wasp

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Urbanization leads to rising in temperatures, known as the Urban Heat Island (UHI) effect. In insects, cuticular hydrocarbons (CHCs), particularly long-chain *n*-alkanes, are known to be involved in protection against desiccation. Wild bees and wasps may respond to the UHI effect through variations in CHCs profile. Here, we hypothesize that insects living in more urbanized (i.e., hotter) areas, where desiccation risk is higher, possess more saturated and/or more long-chain compounds. We sampled *Halictus scabiosae* (Rossi) (Hymenoptera: Halictidae), *Osmia cornuta* (Latreille) (Hymenoptera: Megachilidae) and *Polistes dominula* (Christ) (Hymenoptera: Vespidae) across an urbanization gradient in the Metropolitan City of Milan (Italy). We found the whole CHCs profile to be significantly correlated with site temperature in both *O. cornuta* and in *P. dominula,* though not in *H. scabiosae.* In accordance with our hypothesis, in *H. scabiosae* we found an increase in the relative abundance of C28 and C29 with increasing temperature. In *O. cornuta* we found the same trend but regarding mean chain length, number of compounds, and Shannon index of the CHCs profile. Finally, in *P. dominula,* we found an increase in the relative abundance of C29 and C31 with increasing temperature. Overall, our hypothesis is confirmed, albeit idiosyncratic responses from the three species are highlighted. The species-specific variations may be explained by the inter-specific differences in the overall CHCs profile composition. *H. scabiosae* presents the highest proportion of *n*-alkanes, and thus weaker variations may be expected. Both *O. cornuta* and *P. dominula* are poor in *n*-alkanes and indeed temperature more strongly affects their CHCs profile. Our findings suggest that the inherent characteristics of the CHCs profile can differently influence responses to urbanization. Furthermore, our study reveals that temperature effects on CHCs profile, previously found across large-scale gradients, can be also detected at small (i.e., city) scale.

Keywords: wild bees, wasps, urbanization, urban heat island, cuticular hydrocarbons profile.

59. Application of remote sensing to the quantification of defoliation caused by *Lymantria dispar* (Linnaeus, 1758) in the "Los Alcornocales" Natural Park (Cádiz, Spain) (Lepidoptera: Erebidae)

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The cork oak woodlands represent one of the forests with the greatest biological richness in Mediterranean ecosystems. At present, they are in decline as a result of human activity, deforestation and land fragmentation, and the presence of pathogens and defoliating insects. Defoliating moths pose a threat to the conservation of cork oaks. In recent years, the gypsy moth *Lymantria dispar* (Linnaeus, 1758) has caused numerous defoliations in the Iberian Peninsula. Specifically, in the area of Catalonia and in the center and southwest of the peninsula. Highlighting, the damages generated in the province of Cádiz in "Los Alcornocales" Natural Park during 1994 and 1995. Currently, one of the methods for monitoring damage from defoliating insects is remote sensing. In Spain, work has been carried out to quantify the damage of *L. dispar* in the province of León (Landsat 8 satellite) and in Catalonia (Sentinel-2 satellite). The aim is to calculate the extent and severity of defoliation caused by *L. dispar* in "Los Alcornocales" in the first half of the 90s. The damage is calculated using Landsat-4 images from 1990 to 1998 and is quantified through differences in Normalized Difference Moisture Index (NDMI) of images from the years with defoliation (1994 and 1995) and the years before defoliation (1990 to 1993). The results obtained show a similar pattern in the distribution of damage with other studies, where the areas with the highest degree of defoliation are found around urban areas.

Keywords: Lepidoptera, Erebidae, *Lymantria dispar*, NDMI, imagen satellite, Landsat, Cádiz.

60. Mass-rearing and biology of the almond moth *Cadra cautella* (Walker, 1863) (Lepidoptera: Pyralidae) under laboratory-simulated food storage conditions

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It is well-known that a great deal of stored products such as nuts, as well as other unprocessed products (potatoes, corn, figs, rice, cocoa, oats, among others), are affected yearly by the almond moth, *Cadra cautella* (Walker, 1863). This dithrisium lepidoptera of the Pyralidae family is an ubiquitous species which can give place not only to significant damage to a large amount of species of trees, bushes and plants of financial interest, but it also may harm their fruits when being transported worldwide in their preimaginal stages of development of egg, caterpillar and chrysalid. Taking everything into consideration, this pyralid is regarded as a serious pest both in the crops and storehouses due to the grave economic problems that generates. The present communication states the outcomes obtained after having carried out two years of weekly surveillance and monitoring of four populations of this species in two types of storable products, two replicates for each one of the chosen substrates. Our scientific research was designed with the target of reporting in detail its bioecology under a simulation of the hardly invariable conditions of warehouses, being them temperature, humidity and photoperiod, based always on a feeding from two distinct sources of foodstuff that we created taking into account the foods that the supermarkets reported to be colonized by this moth in their packed products. Those substrates were composed of chocolate bar with almonds in one case, and of a mixture of almonds, walnuts, pine nuts, peanuts, pumpkin seeds, sunflower seeds and raisins in the other one. The results depict the bioecology of separated populations of *C. cautella* subjected to controlled abiotic factors and diets with different nourishments in order to provide useful information to stakeholders to prevent or minimize the more the better the economic losses in the sector.

Keywords: almond moth, abiotic and biotic factors, bioecology, Valencia, Spain.

61. Another silent invasion: *Xyleborus bispinatus* Eichhoff, 1868 (Coleoptera: Curlulionidae: Scolytinae) in Iberian Peninsula and Balearic Islands

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We present the first record of the tropical ambrosia beetle *Xyleborus bispinatus* Eichhoff, 1868 in the Iberian Peninsula, collected in traps located in Murcia, Alicante, Valencia, and Majorca (Spain). Insects have been captured in baited trap trapping networks installed in Eastern Spain and Balearic Islands. Several individuals (477) of *X. bispinatus* have been collected in nine locations, firstly in 2009 in Murcia Region, since 2018 to 2021 in Valencia Region and in 2020 and 2021 in Majorca. No attacks by *X. bispinatus* on plants have been detected, thus, the host plant remains unknown in Spain. Given that we detected a stable population of *X. bispinatus* in central Valencia province and possibly in Majorca, and a wide area where the alien species has been captured, we may consider this as a concerning scenario that should be kept monitored by the maintenance of the present trapping webs and with the intensification of host plant search.

Keywords: invasive species, Ambrosia beetles, trapping networks, biological invasions.

62. Discovering a tiny unknown: REGAVIVEC results for biting midges in Galicia, NW Spain

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Biting midges of the genus *Culicoides* Latreille, 1809 (Diptera: Ceratopogonidae) are a very important group in veterinary terms considering they can act as vectors of many diseases, such as the Blue Tongue virus, the African Horse sickness or the Schmallenberg virus. In Spain, this group is relatively well-studied, but it is not the case in Galicia. Thanks to the Galician vector monitoring network establishment (Rede Galega de Vixilancia de Vectores), biting midges' knowledge has considerably increased in the last years. Different adult traps (BG-Sentinel 2, CDC-WL and CDC-UV) were set in various environments (livestock farms, zoological parks, dog kennel, etc), leading to some interesting findings for the Galician territory. Among them, we can point out the presence of twelve biting midges' species, being the *Culicoides obsoletus* (Meigen, 1818) complex the most abundant one (85,2% from the total). This is relevant since it is the main vector of the Blue Tongue virus (BTv) in Spain. In addition to this one, another four potential BTv vectors were found: *Culicoides punctatus* (Meigen, 1804) (4,9%), *C. newsteadi* Austen, 1921 complex (2,3%), *C. lupicaris* Downes & Kettle, 1954 (0,2%) and *C. pulicaris* (Linnaeus, 1758) (0,1%). *Culicoides impunctatus* Goetghebuer, 1920, a concerning species in the United Kingdom because of its greediness with humans, was also detected (0,5%).

Keywords: biting midges, *Culicoides*, vectors, surveillance, traps, Galicia.

63. A review of the biology of *Chrysomya megacephala* (Fabricius, 1794) in SE Spain, and its role in forensic science (Diptera: Calliphoridae)

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The oriental latrine fly *Chrysomya megacephala* (Fabricius, 1794) was firstly detected at Europe in Alicante in 1997, and it is now an expansive species around the world. In Spain, it coexists both spatial and temporally with other blowflies, such as *Lucilia sericata* (Meigen, 1826), *Calliphora vicina* (Robineau-Desvoidy, 1830) or *Chrysomya albiceps* (Wiedemann, 1819). This communication presents new relevant data on the biology of *Ch. megacephala* analysing its abundance and annual activity in relation to other blowflies in SE Spain. Furthermore, the developmental duration of preimaginal stages and the effect on oviposition of different aged baits (fresh, 5 and 10 days old) are analysed. Finally, the historical expansion of *Ch. megacephala* during the last years is discussed, as well as the known information about role of this species as a forensic indicator.

Keywords: abundance, annual activity, lifecycle, competition, oviposition preferences, forensic.

64. Sarcosaprophagous Calliphoridae species along an altitudinal gradient in Southeastern Iberian Peninsula (Insecta: Diptera)

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Calliphoridae are considered one of the best indicators of minimum postmortem interval as they are among the first colonizers of a corpse. While the family is common, highly abundant, and cosmopolitan, the distribution, abundance, and specific composition of its fauna vary according to environmental characteristics. In the Iberian Peninsula, several studies contribute to the knowledge of the structure and dynamics of the species of this family, but few studies compare this community at different altitudes despite the interest of its knowledge in as many different habitats as needed for forensic purposes, even if such habitats are close to each other. To test whether the altitude influenced the composition of Calliphoridae communities a study was performed in a wild mountainous area of southeastern Spain at three different altitudes (400 m, 980 m and 1500 m) in the four seasons, using a modified Schoenly trap baited with 5 kg piglets (*Sus scrofa* L.). A total of 38,897 adults belonging to 5 different Calliphorinae species and the Polleninae subfamily were collected. In addition to significant differences in the abundance of the diverse species among the three altitudes, it was possible to establish an altitudinal substitution of species with *Chrysomya albiceps* being dominant at 400 m and 980 m, and *Calliphora vicina* at 1,500 m. Moreover, seasonal differences were also found. *Chrysomya albiceps* was the most abundant species during the warm seasons (i.e., autumn and summer) at the three altitudes, *C. vicina* in winter and *C. vomitoria* in spring, mainly at 400 m and 980 m. Our results demonstrate the importance of such calliphorid species as seasonal, altitudinal, and environmental indicators what makes them useful in assisting the interpretation of entomological evidence in actual forensic cases.

Keywords: Calliphoridae, southeastern Spain, altitudinal gradient, indicator species.

65. Corpse hiding strategy: does the vegetation covering affect the faunal succession?

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It is not infrequent that, after committing a crime, an attempt is made to hide the body of the victim. One of the hiding strategies in the open field is covering the corpse with vegetable matter. Considering that some plants can contain different types of toxic or repellent substances, such concealment strategy can affect the rate of carrion decay, the species composition of the forming carrion community and the patterns of insect succession. Therefore, a serious mistake when estimating the minimum PMI could occur. A study was carried out in autumn at Patiño (Huerta de Murcia), an agricultural area with scattered buildings. The selected site was a plot with fruit trees and a canal. Nine commercial chicken carcasses, without feathers, were installed at the site protected with metallic mesh to avoid scavenger activity. Three carcasses acted as control (no plant covering), three were covered with oleander leaves and three with pine needles. One pitfall was installed under each carcass as well as two other traps on the sides of it. Samples were taken daily for ten days. 6633 specimens were collected. An ANOVA test was applied to check if any significant difference between treatments exists. Preliminary results point to a significant difference between the pine needles treatment and the control but no difference exists between oleander and control treatments.

Keywords: entomosarcosaprophagous fauna, plant covering, chicken carcasses.

66. Could the benthic macroinvertebrate community be used as indicator of microplastic pollution in rivers?

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Benthic macroinvertebrates that inhabit the river bottom, mainly insects, are recognized as one of the most useful tools for assessing the ecological status of rivers. They are a relatively abundant group of organisms that are present in practically all freshwater ecosystems. Combined with the fact that their ecological requirements are reasonably well understood, and their collection method is straightforward, they make excellent indicators of river water quality, However, they are particularly sensitive to organic pollution, and the composition of their community may not be good indicator. Of other types of contamination. Nevertheless, this study aims to relate the structure and composition of the benthic macroinvertebrate community, predominantly composed of insects, to the degree of microplastic (MP) contamination to which different freshwater bodies in the peninsula are exposed. In this way, it will be assessed whether the factors that influence the presence or absence of different taxa in the river, and therefore determine the value of IBMWP index, can be the same as those that influence the presence of a higher quantity of MPs in the river. For this purpose, three rivers in the NW of the Iberian Peninsula were selected, and three sampling stations were ESTABLISHED IN EACH OF THEM. Benthic invertebrates were captured at each station using 20 kicks technique, and samples of MPs were taken from both the riverbank sediments and the water column. Once in the laboratory, all individuals were identified to the family level, and IBMWP and IASPT indices, along with various biodiversity indices (Richness, Shannon-Wiener, Simpson, etc.), were calculated. Additionally, the concentration of MPa per kilogram of sediments and per liter of filtered water was determined.

67. Exploring natural repellents: a laboratory study of the efficacy of seven essential oils as surface repellents against wild ants of *Lasius* Fabricius, 1804 genus (Hymenoptera: Formicidae)

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In recent years, the use of essential oils (EOs) as low-risk biocides has increased considerably owing to their popularity with environmentally conscious consumers. This laboratory study evaluated the repellent effects of seven essential oils, including thyme, peppermint, sweet orange, lavender, rosemary, cedarwood, and cottonseed oils, on wild ants of the *Lasius* genus. The method used was a choice test consisting of a test arena with two dark tubes (treated and not treated) containing an attractant. The treated tube was coated with a barrier of 2.5 cm using an alcoholic solution containing 0.5% of EO, with a dose of 64mg/cm^2, which is deemed suitable for commercial use. Each EO underwent ten replicates, with negative and untreated controls running in parallel. The repellence effect was checked just after its application and then, after 24h and 48h. The repellence was assessed by counting the number of ants in the tubes after 1 hour. The results were compared with the untreated control groups. In fresh, all the EOs exhibited a repellent effect of 70-100% except cottonseed which showed 48% repellence. After 24 hours, sweet orange, thyme, peppermint, and lavender oils continued to repel ants reaching 61%, 58%, 46%, and 38% respectively. The two first EOs were the only ones maintaining repellence effect after 48 hours, albeit with less than 40% repellence observed in both cases. These findings indicate the EOs evaluated, when used in commercial doses, have a powerful repellent effect against ants just after its application, but their effectiveness declines considerably within the first 48 hours. Further investigation is required to establish the best concentrations and application techniques for employing essential oils as botanical commercial repellents against ants.

Keywords: essential oils, repellence, ants, low-risk biocide, surface repellent.

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