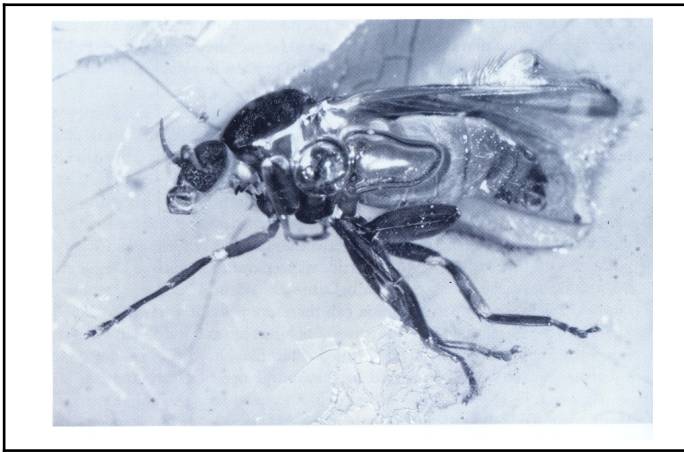


The Simuliid Bulletin

(previously, The British Simuliid Group Bulletin)

Number 48

July 2017



THE SIMULIID BULLETIN

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Cover Image: *An adult female blackfly in Baltic amber from the Oligocene age belonging to the North American Genus Ectmnia. From p. 62 in Crosskey, R.W., 1990. The Natural History of Blackflies, John Wiley & Sons, Chichester. 711pp.*

From the Editor

At 36 pages this issue is fatter than usual due to a long checklist of the blackflies of Spain by David López-Peña and Ricardo Jiménez-Peydró. Even so it has been necessary to omit the distribution maps. These can be found attached to the complete article which is published as a supplement to this Bulletin and can be found in the Simuliid Bulletin online archives at:

http://simuliid-bulletin.blogspot.co.uk/p/archive_30.html.

Important Notice: Please note that the The 2018 Simuliidae Symposium will now be held one week earlier than previously announced, on **21 to 22 June** 2018 at Birmingham University, England. Further information on page 2.

We are happy to announce that *The Simuliid Bulletin* has entered into a content licensing relationship with EBSCO. The full text of *The Simuliid Bulletin* will now be available on EBSCO's databases. I would like to remind you that *The Bulletin* is also scanned by Thomson-Reuters for content suitable for entry into *The Zoological Record*

John Davies, Editor

FORTHCOMING MEETINGS

VIII INTERNATIONALSIMULIIDAE SYMPOSIUM 2018

Advance Notice

Note the new Date!

June 21-22nd, 2018

The 2018 Simuliidae Symposium will be at University of Birmingham, England **June 21-22nd, 2018**. Arrival and registration will be during the evening of Wed., June 20. The conference facilities can be viewed at venuebirmingham.com

The registration fee will be 100 GBP, which will include the conference dinner on Thursday June 21. An optional dinner/canal boat ride will be available for 20 GBP per person on the evening of Friday June 22.

Sessions on blackfly ecology and systematics, genomics, and working towards the elimination of onchocerciasis in Africa will be held, with a possible workshop on nanopore DNA sequencing. Both oral/powerpoint and posters presentations will be accepted.

Accommodation:

Delegates will be able to book their own rooms directly with VenueBirmingham. In late August we'll be given a meeting code for booking.

Conference rate room charges per night are:

Single: 56.00 GBP

Double room 66.50 (per room)

King room 76.50 (per room)

The rooms include buffet breakfast.

Arrival/Transportation:

Birmingham International Airport has direct links to continental Europe, and North America through Iceland Air. Trains run from the airport to New Street Station, Birmingham. The University train station is two stops away from New Street.

More Information and Registration:

The conference website will be available for registration in September 2017. Further announcements will be made through the Simuliidae-L and Simuliid Bulletin Blog (<http://simuliid-bulletin.blogspot.com>).

Please contact Charles Brockhouse (charlesbrockhouse@creighton.edu) with expressions of interest or for further information.

Charles Brockhouse.

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**65th Annual Meeting of the Entomological Society of America
Denver, Colorado, November 5-8th 2017**

The 2017 ESA meeting will include a symposium titled "Resurgence of Black Flies (Diptera: Simuliidae) in the Academic and Public Arenas" chaired by graduate students Becca Wilson and Tina Nations.

The deadline has passed for presentation submissions. However, if you are interested in attending the conference and would like to be kept informed about the symposium and group plans, please contact the chairs at rcwilson@umd.edu and tina.nations@msdh.ms.gov. For more information, you can visit <http://www.entsoc.org/events/annual-meeting>.

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MEETING REPORT

**VIIIth European Mosquito Control Association (EMCA)
Conference, 12-16 March 2017, Bečići, Montenegro**

The last VIIIth EMCA Conference, entitled as "Mosquito Control in a changing environment" was held in Montenegro, in the touristic village of Bečići, located at the picturesque Adriatic coast, close to the city of Budva. The organization of the event was entrusted to the team of the Biotechnical Faculty of the University of Montenegro led by Dr Igor Pajović, who altogether with the staff of the Montenegro Adventures Travel Agency and Mediterranean Congress Center at Bečići achieved all the high level standards and requirements for a successful organization of an international conference and fulfilled the expectations of the participants by providing all the prerequisites for a pleasant working atmosphere and unforgettable stay in this historically rich and landscape breathtaking part of Montenegro, Balkan and Mediterranean.

The working part of the conference took place during 4 days and it consisted of 12 separate Sessions with 65 oral presentations including 7 keynote lectures and Poster Session with 25 presentations, given by scientists and professionals specialized in vector control from 25 different countries.

The conference was mainly focused on the state of art of mosquito ecology and mosquito borne diseases in the changing environment, as well as on latest achievements in practical aspects of their surveillance and control. Apart from mosquito research and control as the main topic, attention was also given to other vectors and their control, as demonstrated by the titles of the Sessions included in the conference program:

1. Mosquitoes in a changing environment
2. Mosquito borne diseases in the Balkans
3. Mosquito vectors and mosquito-borne diseases: surveillance and control
4. Mosquito control application technologies
5. New mosquito control strategies and tools
6. Mosquito control in the urban environment
7. Flood water mosquitoes- control strategies in protected areas
8. Insecticides and protection of public health
9. Surveillance and monitoring: sampling techniques and tools
10. Blackflies and other insects' control
11. Personal protection against mosquitoes
12. Citizen science as a contribution to mosquito surveillance

Regarding the presentations related to blackfly research, two oral presentations were given within the **Session 10: "Blackflies and other insects' control"**, chaired by Aleksandra Ignjatović Čupina and Jerome Hogsette, and two more presentations on blackflies were given in the Poster Session.

The Keynote presentation entitled "**Blackfly monitoring and control: past present and future**" was given by Prof. **Robert A. Cheke** from the University of Greenwich, UK. The comprehensive content of the keynote lecture was based on the personal long and extensive experience of the author by itself in the field of scientific research of blackflies, monitoring and control of vector species in different parts of the world, including the tropical areas affected by onchocerciasis, which was combined with the latest scientific information, particularly in monitoring of blackflies and potential new control methods.

Oral presentation of the study entitled "**Ecological factors influencing black fly species distribution and *Bti* control in a network of peripheral streams in the Guadalquivir River valley (southern Spain)**", conducted by the team of authors from Spain and Slovakia: Rafael Obregon, Diego Jordano, Rafael Villar, Tatiana Kúdelová, Matúš Kúdela, Ladislav Jedlička and Enrique Flores, was presented by the first author **Dr Rafael Obregon** from the University of Córdoba, Spain. The authors studied the species richness and abundance in different types of running water (temporary and permanent streams, irrigation channels) of the Guadalquivir River basin in correlation with the environmental requirements (water velocity, water temperature and cattle pres-

ence as food source for adult females). Larvicide treatment efficacy with Bti in liquid and granular formulations was also evaluated.

Furthermore, two posters prepared by authors David López-Peña and R. Jiménez-Peydró were presented by the first author **David López-Peña** from the University of Valencia, Spain. In the first poster, entitled **"Is the black fly community (Diptera: Simuliidae) affected by the different altitude of a river?"** the authors studied several rivers of the Valencia region (Mijares, Palancia, Turia, Júcar and Serpis) and recorded in total 21 species of blackflies, with more or less expressed altitude zonation. The authors demonstrated that the species richness of the blackfly communities was positively correlated with the altitude.

In the second poster entitled **"New data of the black flies (Diptera, Simuliidae) in the Júcar river basin (Valencia autonomous region, East of Spain)"** the authors focused their attention to the blackfly fauna of the Júcar river basin and its tributaries (Albaida, Barcheta, Cabriel, Clariano, Magro, Mariana, Sellent and Verde) and gave information on species distribution and population size of each of the 16 recorded species.

As demonstrated by the program of this conference, but also by programs of previous EMCA meetings (since 2004), the interest of the EMCA for blackfly related topics is continuously present. We hope that in the next future blackfly researchers, practitioners dealing with blackfly control, as well as young scientists and students will be attracted to participate the EMCA meetings and continue this nice tradition.

Dr Aleksandra Ignjatović Čupina,

University of Novi Sad, Serbia

Member of the Scientific Committee of the VIIIth EMCA Conference

OBITUARY

Dr. David Baldry 1936-2017



David Baldry died on 14 January 2017, one day short of his 81st birthday. A man of many interests and talents, David obtained a B.Sc in Zoology in 1957 and a Doctor of Science in Research and Control of Tropical Diseases in Africa and the Protection of Associated Aquatic Environments, at the University of London in 1981.

In 1959, newly released from the Royal Army Medical Corps, he was recruited by the Director of the West African Institute for Trypanosomiasis Research (W.A.I.T.R.) in Kaduna, Nigeria to work on the biology and control of tsetse flies. Whilst there, his most notable achievement was his study on peridomestic populations of *Glossina tachinoides* in villages near the Institute's field station at Nsukka, Eastern Nigeria. He found that although this species was the most abundant in the area, it did not contribute to the transmission of human sleeping sickness because it fed almost exclusively on domestic pigs.

He remained in Kaduna until 1969, moving in 1970 to a WHO/UNDP project in the Lambwe Valley, Kenya, for research on human and animal trypanosomiasis. During this time David became involved in aerial spraying projects, an interest that would continue until his retirement.

In 1973, although he had no previous experience of *Simulium* control, David was persuaded by the WHO Regional Director for Africa to join the Interim Project preparing the WHO Onchocerciasis Control Programme covering 7 countries in West Africa and on the launch of the Programme in 1974 was appointed Chief, Aerial Operations. In this capacity he was involved with the aerial contractor in developing special insecticide delivery systems suitable for this unique kind of spraying for both helicopters and aircraft, steering through the development of a delivery system that fired the liquid insecticide out the back of the aircraft at a speed nearing the forward velocity of the plane so that the insecticide landed as a compact mass.

He was a passionate cartographer and, together with other members of the Vector Control team, he greatly expanded the *Simulium damnosum* breeding site mapping survey initiated by ORSTOM in the preceding years, creating a reference set of maps that were essential to the accurate deployment of the insecticide and carrying out on-the-ground verification.

In the dry seasons of 1977 and 1978 David participated in a series of field trials using a helicopter to apply insecticide to the fringing riverine forest of the Komoe River in the OCP area of Burkina Faso to see if the downdraft of the rotors could be used to direct the insecticide under the canopy to kill the tsetse fly *Glossina tachinoides*. This exercise was also monitored by OCP to see whether it would have any effect on adult *Simulium damnosum*.

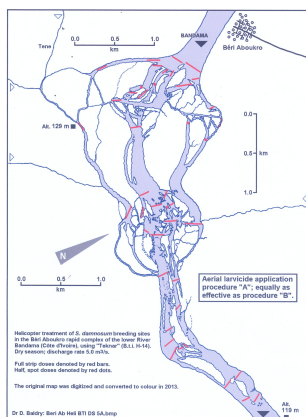
Later in 1978, an interagency transfer to FAO took David back to East Africa directing the control of animal trypanosomiasis for a joint UNDP/FAO project. In 1982, however David returned to OCP initially as coordinator for the Western Extension, where he and his staff mapped vast intervention areas. The Project HQ

alternated between Ouagadougou, Bamako and an aerial operations base in Odienné, Côte d'Ivoire." In 1986 he was reassigned to OCP/HQ in Ouagadougou, where he assumed functions that included Chief of Cartography, Chief Aviation Officer, and Chief of Administrative Liaison and Operational Management.

In 1989 he moved to Geneva as head of the OCP Liaison Office where he remained until his retirement in 1992.

Following retirement he was appointed as consultant to the WHO/HQ Division of Control of Tropical Disease and as consultant to the World Bank on aquatic environments in Africa, and adviser to local authorities and fishing associations in France where he resided. He produced 18 publications about fish and the crayfish in which he was particularly interested.

In 2014 David delivered a talk on mapping and vector control at the 6th International Simuliid Symposium, Turin, Italy; he received a standing ovation.



SCIENTIFIC PAPERS

Notes on black flies of the Júcar River and tributaries in Eastern Spain

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Abstract

During last years, black flies have become more and more important at Spanish public health panorama. This is due to the disturbance increase for cattle ranchers, hospitality industry and citizen complaints linked to biting behaviour of those insects. The objective of this article is contribute to the knowledge of diversity and distribution of Spanish simuliids present at Júcar river and its influence area at Ribera region, situated in Valencian Community, at the east part of Iberian Peninsula.

Key words: Black flies, entomology, aquatic insects, pest control, environmental health, Spain.

Introduction

In addition to the annoyances caused by the simuliid bite, their importance lies in their diseases transmission role since they can act as vectors of a large number of pathogens. Currently, in Spain, they are only involved in the transmission of diseases that affect cattle and wild animals like birds, equids, bovids and lagomorphs (Crosskey, 1993), but not humans until now. Some of the pathogens that can be associated with haematophagous behaviour of black flies are several protozoa such as *Leucocytozoon*, nematodes like *Onchocerca*, bacteria such as "anthrax" or viruses like myxomatosis.

In the Commonwealths of Ribera Baixa and Ribera Alta (Eastern Spain), the number of citizen complaints related with black flies activity has increased significantly in recent years. Similar situations have been recently described in

other regions of Spain (Ruiz-Arrondo, 2015), basically linked to ecological changes in rivers, streams and channels.

Not all species of simuliids feed on humans, many of them parasite almost exclusively birds or other mammals (Adler, 2004). Problems on cattle are very frequent, causing discomfort to animals and, in many cases, also economic losses for breeders due to the stress associated by the itching of these animals. This stress can cause weightloss, stop producing milk or even births reduction (Fredeen, 1977). The right identification of anthrophilic species as well as their distribution, ecology and phenology is essential to plan properly a surveillance and control programme against these insects of major concern for human and animal health.

Material and methods

Study area

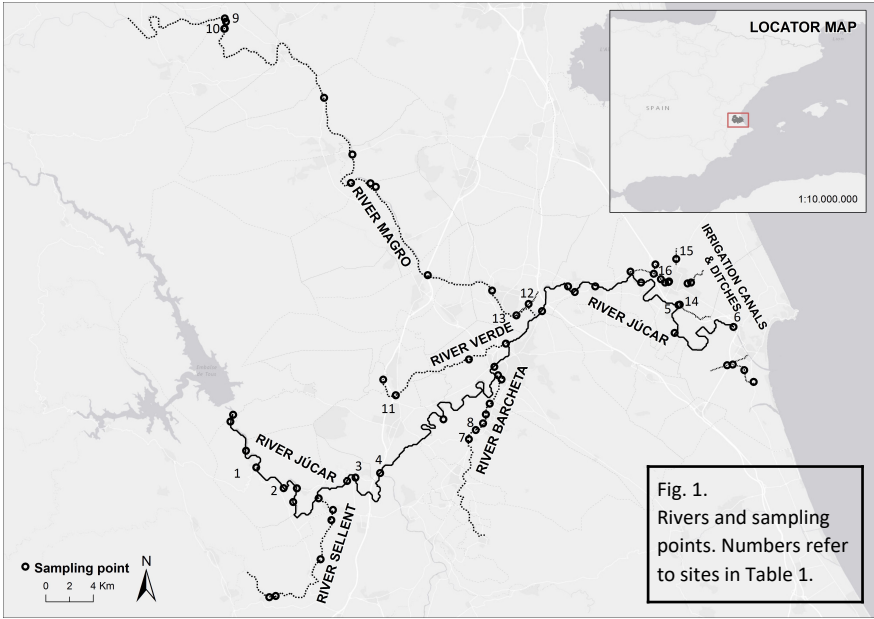
The study was carry out at the lower part of Júcar river between dam of Tous municipality and Júcar's river mouth in Cullera municipality, located at Ribera Alta and Ribera Baja Commonwealths. Four tributaries, namely Sellent, Barcheta, Magro and Verde rivers, as well as several irrigation ditches placed in Algesí, Cullera and Sueca municipalities were also included in the study. Consequently, 64 sampling points were distributed across 160 linear kilometers of these potential simuliid breeding sites (**Figure 1**). It should be mentioned that a strong anthropic regulation is carried out seasonally in Júcar River to irrigate crops (mainly rice fields) in the area of the Natural Park of L'Albufera. Other studies in the area have been reported by López Peña & Jimeniz-Peydró (2017a, 2017b).

Sampling methods

As has been previously mentioned, 64 sampling points were selected based on accessibility criteria. The average distance among sampling points was less than 5 km. The potential fixation substrates of aquatic stages of black flies, mostly macrophytes, were sampled for pupae through a preliminary visual inspection, vegetal material picking, transport to laboratory condition, separation of specimens, preservation in alcohol 70° and observation by stereoscopic microscope. For species identification taxonomic criteria of González (1997), Jensen (1997) and Belqat (2004) were followed. Monthly entomological collections were done, and here we present the faunistic results of the period August-December 2016.

Results and conclusions

Simuliids were found at 16 of the 64 sites sampled (Table 1)



The main positive fixation substrates were macrophytes, especially *Potamogeton pectinatus* L., although pupae were also found on leaves, canes, common club-rush and other helophytes. Aquatic stages of simuliids were also collected occasionally on non-helophytical vegetation temporarily submerged due to floods and even on artificial substrates (mainly plastic solid wastes).



Fig. 2



Fig. 3

Below some brief and concrete information about findings of 8 species collected is provided:

Simulium (Wilhelmia) sergenti (Edwards, 1923)

This species was widely distributed across the study area, being detected in 10 sampling points inside Júcar, Verde and Barcheta rivers, as well as several irrigation ditches. *Simulium sergenti* was always found in low riverbed sections, being only present at altitudes between 2 and 42 meters.

Simulium (Wilhelmia) pseudequinum (Seguy, 1921)

It's presence was recorded in 4 points distributed at Magro and Júcar river, but only in the highest sections, in altitudes oscilating between 39 and 160 meters. No specimens were collected near to coastal zones.

Simulium (Nevermannia) ruficorne (Macquart, 1838)

The species is widely present in Júcar river as well as in Magro and Barxeta rivers, registering observations from 2 to 157 meters.

Simulium (Eusimulium) complex

Has been detected in 6 sampling points at rivers Magro, Júcar and Barcheta, but only in the middle and upper zones of the characterized section, far away from the coast. The altitude range vary from 20 to 160 meters.

Simulium (Boophthora) erythrocephalum (De Geer 1776)

It was located only in 4 points of Júcar river and irrigation ditches, mainly in the lower section near the coast, at altitudes between 2 and 18 meters. It is important to note that this is a target species for control programmes due to its aggressive biting behavior registered with humans (Ruiz-Arrondo, 2017).

Simulium (Wilhelmia) lineatum (Meigen, 1804)

Findings were uncommon, detecting only 2 positive points in Júcar and Magro rivers, at 25 and 157 meters of altitude respectively.

Simulium (Simulium) xanthinum (Edwards, 1933)

The species was only found in 2 irrigation ditches placed in the municipality of Sueca, at very low altitudes ranging from 2 to 8 meters.

Simulium (Simulium) reptans (Linnaeus, 1758)

The unique collection of the species took place in Magro river, at the top of the characterization section at 157 meters.

Table 1. Data about positive samplings (August-December 2016).

No.	Municipality	River	Coordinates	Alt. (m)	spp.
1	Sumacàrcer	Júcar	39.094, -0.6278	42	<i>S.sergenti</i> , <i>S.pseudequinum</i> , <i>S.(Eusimulium)</i>
2	Antella	Júcar	39.08263, -0.60749	39	<i>S.pseudequinum</i> , <i>S.ruficorne</i> , <i>S.(Eusimulium)</i>
3	Gavarda	Júcar	39.08822, -0.55247	29	<i>S.sergenti</i> , <i>S.ruficorne</i>
4	Alberic	Júcar	39.09061, -0.5343	25	<i>S.sergenti</i> , <i>S.(Eusimulium)</i> , <i>S.lineatum</i>
5	Fortaleny	Júcar	39.18933, -0.30822	6	<i>S.ruficorne</i> , <i>S.erythrocephallum</i>
6	Cullera	Júcar	39.17672, -0.26663	2	<i>S.ruficorne</i> , <i>S.erythrocephallum</i>
7	Càrcer	Barcheta	39.11083, -0.46675	20	<i>S.sergenti</i> , <i>S.ruficorne</i> , <i>S.(Eusimulium)</i>
8	Càrcer	Barcheta	39.11707, -0.4608	20	<i>S.ruficorne</i>
9	Real de Montroy	Magro	39.35776, -0.6518	160	<i>S.pseudequinum</i> , <i>S.(Eusimulium)</i>
10	Real de Montroy	Magro	39.35583, -0.6509	157	<i>S.pseudequinum</i> , <i>S.ruficorne</i> , <i>S.(Eusimulium)</i> , <i>S.lineatum</i> , <i>S.reptans</i>
11	Massalavés	Verde	39.14597, -0.53183	23	<i>S.sergenti</i>
12	Algemesí	Irrigation ditch	39.19036, -0.4215	16	<i>S.sergenti</i>
13	Algemesí	Irrigation ditch	39.18408, -0.43127	18	<i>S.sergenti</i> , <i>S.erythrocephallum</i>
14	Sueca	Irrigation ditch	39.18769, -0.30447	6	<i>S.sergenti</i> , <i>S.erythrocephallum</i>
15	Sueca	Irrigation ditch	39.2168, -0.3098	2	<i>S.sergenti</i> , <i>S.xanthinum</i>
16	Sueca	Irrigation ditch	39.20763, -0.32433	8	<i>S.sergenti</i> , <i>S.xanthinum</i>

It should be noted that the presence of larvae and pupae was detected undistinguishably both sunny and shady sections, unlike other observation done with more heterogeneous data in different rivers of Spain (Villanúa-Inglada, 2013).

In relation to the substrate nature, apparently, there is a predilection for the macrophyte *Potamogeton pectinatus* L. (**Figure 2**), although larvae and pupae have also been found fixed to semi-submerged helophytes (such as bulrush, reeds, or common rush). In cases where *Potamogeton pectinatus* were not present at the sampling point, or population densities of aquatic stages were very high, then larval colonization processes of boulders of the river bottom at shallow depth have been observed (**Figure 3**).

No larvae or pupae have been detected in *Potamogeton natans* L. or *Myriophyllum* sp. L. However, larvae presence was relatively common on artificial substrates such as glass bottles, porcelain plates, clothing and, above all, plastic bags. An apparent preference for white or light colours in these artificial substrates has been observed.

All this information is very useful for the design of simuliid control programmes. Further studies with longer sampling periods where correlations of biotic and abiotic factors linked to black flies proliferation on aquatic environments can be done would be also very interesting for the management of those insects of major significance for public and animal health.

Acknowledgments

Authors state that this study has been conducted in the framework of a public contract focused on vector control and financed by Ribera's Consortium (Association of municipalities of Ribera Region)

References

- Adler, P.H., et al. 2004. The black flies (Simuliidae) of North America. Ithaca, New York, 941 pp.
- Belqat B., et al. 2004. Clés Analytiques des Simulies (Diptera) du Maroc. Identification keys of the black-flies (Diptera: Simuliidae) of Morocco. Vol. 15, 77-137.
- Crosskey, R.W. 1993. Blackflies (Simuliidae), Pp. 241-287, in Lane R.P. & Crosskey R.W. (eds.), Medical insects and arachnids. Chichester y New York, 740 pp.
- Fredeen, F.J.H. 1977. A review of economic importance of blackflies (Simuliidae) in Canada. *Questiones Entomologicae*, 13:219-229.
- González G. 1997. Claves para la identificación de la flora y la fauna de las aguas continentales de la Península Ibérica. Asociación Española de Limnología, publicación N°6.

- Jensen F. 1997. Aquatic insects of North Europe - A Taxonomic Handbook. Volume 2. Ed. Anders N. Nilsson.
- López-Peña, and Jiménez-Peydró R., 2017a. Contribución al conocimiento de las moscas negras (Diptera, Simuliidae) en la cuenca hidrográfica del Júcar. Boletín de la Asociación española de Entomología (AeE), 41(1-2): 167-196."
- López-Peña, and Jiménez-Peydró R., 2017b New data of the black flies (Diptera, Simuliidae) in the Júcar river basin (Valencia autonomous region, East of Spain). Poster in VIIIth EMCA Conference, 12-16 March 2017, Bečići, Montenegro, 2017"
- Ruiz-Arrondo, I., et al. 2015. Expansión de los simúlidos (Díptera Simulidae) en España: Un nuevo reto para la salud pública y la sanidad animal. 2014. Boletín de la Sociedad Entomológica Aragonesa (S.E.A), 54: 193-200.
- Ruiz-Arrondo, I., et al. Human-landing rate, gonotrophic cycle length, survivorship and public health importance of *Simulium erythrocephallum* in Zaragoza, northeastern Spain. Parasites & Vectors (2017) 10:175.
- Villanúa-Inglada, D., et al. Estudio de los simúlidos (Díptera, Simulidae) del río Flumen, Huesca (España). 2013. Boletín de la Sociedad Entomológica Aragonesa (S.E.A), **52**: 212-218.

Updated checklist and distribution maps of blackflies (Diptera: Simuliidae) of Spain

David López-Peña and Ricardo Jiménez-Peydró

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Editorial Note: This paper was accompanied by 53 distribution maps which are referred to in the text but could not be included due to space restrictions. However, the entire paper is available for viewing or downloading on the internet in the archives of the *Simuliid Bulletin* at URL: http://simuliid-bulletin.blogspot.co.uk/p/archive_30.html

Abstract

An updated checklist of the cited simuliid species in Spain is presented, together with maps, which show the provincial distribution of each of the known species.

Key words: Simuliids, checklist, provincial distribution, Spain.

Introduction

A number of papers have been published about the simuliids present in specific areas of Spain such as (CARLSSON, G., 1969) in southern Spain, (PUIG, et al., 1984) in Asturias, (GONZÁLEZ, 1985) in Barcelona, (CASADO et al., 1990) in Madrid, (CROSSKEY, 1991) in the Balearic Islands, (CROSSKEY et al., 1998) in the Canary Islands, among others.

However, at the national level, it has been realized scarce studies that collect all the species of Diptera Simuliidae present in Spain. The first one was the work of Strobl, G. (1906), followed by other articles such as GRENIER & BERTRAND (1954) or GONZÁLEZ et al. (2002), among others.

It is also important to take into account the valuable and admirable work of BELQAT & GARRIDO (2008), the most detailed so far about the Spanish simuliid fauna, as well as ADLER & CROSSKEY, (2016) which provides detailed and updated information about the worldwide taxonomy of the group.

Following the steps of the last two works cited, and after a comprehensive and thorough bibliographical consultation of the published works about the family of diptera aim of study that have been able to access. The objective of this article is to provide up to date information about the black fly species present in Spain, indicating also its presence at the provincial level. The Fig.0. shows the Spain map with all its provinces and their corresponding names.

Information from the distribution of species found during my doctoral research program has also been added to this as new citations, as well as provincial distribution maps of each species.

In a nutshell, the main target we pursue is to provide useful information for entomologists, blackfly control enterprises and public sanitary authorities.

Species recorded in Spain

From the comprehensive bibliography carried out, it can be concluded that a total of 53 blackfly species have been recorded in Spain. According to the nomenclatural criteria used by ADLER & CROSSKEY (2016), these 52 species are belonging to 5 genera, as follows: *Prosimulium* (4), *Urosimulium* (2), *Greniera* (1), *Metacnephia* (2), *Simulium* (43). Which also are grouped into 7 subgenera: *Eusimulium*, *Hellichiella*, *Nevermania*, *Rubzovia*, *Simulium*, *Trichodagmia* and *Wilhelmia*; and 11 species groups: *Hirtipes*, *Fabri*, *Congareenarum*, *Ruficorne*, *Vernum*, *Argenteostriatum*, *Bezzi*, *Ornatum*, *Reptans*, *Tuberosum*, *Variegatum*, *Albellum* and *Equinum*.

Taxonomic classification

Order Diptera Linnaeus
 Infraorder Culicomorpha Hennig
 Superfamily Simuliioidea Newman
 Family Simuliidae Newman, 1834
 Subfamily Parasimuliinae Smart, 1945
 Genus *Prosimulium* Roubaud, 1906
 Hirtipes species-group

- Prosimulium hirtipes* (Fries, 1824)
- Prosimulium latimucro* (Enderlein, 1925)
- Prosimulium rufipes* (Meigen, 1830)
- Prosimulium tomosvaryi* (Enderlein, 1921)
- Genus *Urosimulium* Contini, 1963
 - Urosimulium aculeatum* (Rivosecchi, 1963)
 - Urosimulium faurei* (Bernard, Grenier & Bailly-Choumara, 1972)
- Genus *Greniera* Doby & David, 1959
 - Fabri species-group
 - Greniera fabri* Doby & David, 1959
- Genus *Metacnephia* Crosskey, 1969
 - Metacnephia blanci* (Grenier (Theodorides, 1953)
 - Metacnephia nuragica* Rivosecchi, Raastad & Contini, 1975
- Genus *Simulium* Latreille, 1802
 - Subgenus *Boophthora* Enderlein, 1921
 - Simulium (Boophthora) erythrocephalum* (De Geer, 1776)
 - Subgenus *Eusimulium* Roubaud, 1906
 - Simulium (Eusimulium) angustipes* Edwards, 1915
 - Simulium (Eusimulium) aureum* Fries, 1824
 - Simulium (Eusimulium) guimari* Becker, 1908
 - Simulium (Eusimulium) petricolum* (Rivosecchi, 1963)
 - Simulium (Eusimulium) rubzovianum* (Sherban, 1961)
 - Simulium (Eusimulium) velutinum* (Santos Abreu, 1922)
 - Subgenus *Hellichiella* Rivosecchi & Cardinals, 1975
 - Congareenarum species-group
 - Simulium (Hellichiella) latipes* (Meigen, 1804)
 - Subgenus *Nevermannia* Enderlein, 1921
 - Ruficorne species-group
 - Simulium (Nevermania) angustitarse* (Lundström, 1911)
 - Simulium (Nevermania) lundstromi* (Enderlein, 1921)
 - Simulium (Nevermania) ruficorne* Macquart, 1838
 - Vernum species-group
 - Simulium (Nevermania) armoricanum* Doby & David, 1961
 - Simulium (Nevermania) bertrandi* Grenier & Dorier, 1959
 - Simulium (Nevermania) brevidens* (Rubtsov, 1956)
 - Simulium (Nevermania) carthusiense* Grenier & Dorier, 1959
 - Simulium (Nevermania) costatum* Friederichs, 1920
 - Simulium (Nevermania) cryophilum* (Rubtsov, 1959)
 - Simulium (Nevermania) naturale* Davies, 1966
 - Simulium (Nevermania) quasidocolletum* Crosskey, [1988] [1987]
 - Simulium (Nevermania) vernum* Macquart, 1826
 - Subgenus *Rubzovia* Petrova, 1983
 - Simulium (Rubzovia) lamachi* Doby & David, 1960
 - Simulium (Rubzovia) paraloutetense* Crosskey, 1988
 - Subgenus *Simulium* Latreille, 1802
 - Argenteostriatum species-group
 - Simulium (Simulium) argenteostriatum* Strobl, 1898
 - Simulium (Simulium) hispaniola* Grenier & Bertrand, 1954

Bezzi species-group

Simulium (Simulium) bezzi (Corti, 1914)

Ornatum species-group

Simulium (Simulium) intermedium Roubaud, 1906*Simulium (Simulium) ornatum* Meigen, 1818*Simulium (Simulium) trifasciatum* Curtis, 1839

Reptans species-group

Simulium (Simulium) reptans (Linnaeus, 1758)

Tuberosum species-group

Simulium (Simulium) tuberosum (Lundström, 1911)

Variegatum species-group

Simulium (Simulium) argyreatum Meigen, 1838*Simulium (Simulium) maximum* (Knoz, 1961)*Simulium (Simulium) monticola* Friederichs, 1920*Simulium (Simulium) variegatum* Meigen, 1818*Simulium (Simulium) xanthinum* Edwards, 1933Subgenus *Trichodagmia* Enderlein, 1934

Albellum species-group

Simulium (Trichodagmia) auricoma Meigen, 1818*Simulium (Trichodagmia) galloprovinciale* Giudicelli, 1963*Simulium (Trichodagmia) ibericum* Crosskey & Santos Grácio,

1985

Subgenus *Wilhelmia* Enderlein, 1921

Equinum species-group

Simulium (Wilhelmia) equinum (Linnaeus, 1758)*Simulium (Wilhelmia) lineatum* (Meigen, 1804)*Simulium (Wilhelmia) pseudequinum* Séguy, 1921*Simulium (Wilhelmia) quadrifila* Grenier, Faure & Laurent, 1957*Simulium (Wilhelmia) sergenti* Edwards, 1923**Species list and their Spanish provincial distribution**- Genus *Prosimulium* Roubaud, 1906

Hirtipes species-group

- ***P. hirtipes*** (Fries, 1824). Mentioned in the provinces of Barcelona, Lérida, Madrid (CASADO *et al.*, 1990, GONZÁLEZ, 1990; GONZÁLEZ, 1997; VINÇON & CLERGUE-GAZEAU, 1993; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Córdoba (GONZÁLEZ *et al.*, 1986, 1987), Gerona (PUIG *et al.*, 1984, 1987; GONZÁLEZ, 1990). Fig. 1.
- ***P. latimucro*** (Enderlein, 1925). Mentioned in the provinces of Almería (CARLSSON, 1969; VINÇON & CLERGUE-GAZEAU, 1993), Granada (GRENIER & BERTRAND, 1954; CARLSSON, 1969; BEAUCOURNU-SAGUEZ, 1975a; VINÇON & CLERGUE-GAZEAU, 1993; CROSSKEY & CROSSKEY, 2000), Huesca, Cantabria (GRENIER & BERTRAND, 1954), Jaén (CARLSSON, 1969; VINÇON & CLERGUE-GAZEAU, 1993; CROSS-

KEY & CROSSKEY, 2000), Lérida (GRENIER & BERTRAND, 1954; GONZÁLEZ-PEÑA, 1990), Madrid (GONZÁLEZ, 1990; GONZÁLEZ, 1997; GONZÁLEZ *et al.*, 2002). Fig. 2.

- ***P. rufipes*** (Meigen, 1830). Mentioned in the provinces of Cádiz (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Gerona (PUIG *et al.*, 1987; GONZÁLEZ, 1990), Lérida (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Madrid, Málaga (STROBL, 1906). Fig. 3.
- ***P. tomosvaryi*** (Enderlein, 1921). Mentioned in the provinces of Ávila, Burgos, Ciudad Real, Cuenca, León, Lérida, Madrid, Segovia (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Cádiz (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002). Fig. 4.

- Genus *Urosimulium* Contini, 1963.

- ***U. aculeatum*** (Rivosecchi, 1963). Mentioned in the provinces of Córdoba (GONZÁLEZ *et al.*, 1986), Islas Baleares (CROSSKEY, 1991; ADLER & CROSSKEY, 2016). Fig. 5.
- ***U. faurei*** (Bernard, Grenier & Bailly-Choumara, 1972). Mentioned in the provinces of Ciudad Real (GONZÁLEZ-PEÑA *et al.*, 1986; GONZÁLEZ, 1990; CROSSKEY & CROSSKEY, 2000), Córdoba (GONZÁLEZ-PEÑA *et al.*, 1986; CROSSKEY & CROSSKEY, 2000), Islas Baleares (GONZÁLEZ, 1990; GONZÁLEZ, 1997; GONZÁLEZ *et al.*, 2002). Fig. 6.

- Genus *Greniera* Doby & David, 1959

Fabri species-group

- ***G. fabri*** Doby & David, 1959. Mentioned its presence in the province of Ciudad Real (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002). Fig. 7.

- Genus *Metacnephia* Crosskey, 1969

- ***M. blanci*** (Grenier & Theodorides, 1953). Species mentioned in the provinces of Burgos, Ciudad Real, Lérida, Palencia, Salamanca, Soria, Valladolid (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Cádiz, Huelva, Jaén (CROSSKEY & CROSSKEY, 2000), Córdoba (GONZÁLEZ-PEÑA *et al.*, 1986), Málaga (CROSSKEY & CROSSKEY, 2000; GALLARDO-MAYENCO & TOJA, 2002; GONZÁLEZ *et al.*, 2002). Also in Castellón, Teruel and Valencia as a result of my PhD research. Fig. 8.
- ***M. nuragica*** Rivosecchi, Raastad & Contini, 1975. Cited in the provinces of Almería, Huelva (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Badajoz (MARTINEZ & PORTILLO, 1999), Cáceres (GONZÁLEZ, 1990; MARTINEZ & PORTILLO, 1999), Ciudad Real, Segovia (GON-

ZÁLEZ, 1990; GONZÁLEZ, 1997), Córdoba (CARLSSON, 1969; GONZÁLEZ-PEÑA *et al.*, 1986; CROSSKEY & CROSSKEY, 2000). Fig. 9.

- Genus *Simulium* Latreille, 1802.

Subgenus *Boophthora* Enderlein, 1921.

- ***S. erythrocephalum*** (De Geer, 1776). Mentioned in the provinces of Alicante (LESTÓN *et al.*, 2013; LESTÓN *et al.*, 2014), Badajoz (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Gerona (BEAUCOURNU-SAGUEZ, 1975b; PUIG *et al.*, 1987; GONZÁLEZ, 1990), Huesca (INGLADA, 2003), León, Palencia, Salamanca, Soria, Valladolid (GONZÁLEZ, 1990), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Zamora (BEAUCOURNU-SAGUEZ, 1975b; GONZÁLEZ, 1990), Zaragoza (INGLADA, 2003; RUIZ-ARRONDO *et al.*, 2017). Also in Alicante as a result of my PhD research. Fig. 10.

Subgenus *Eusimulium* Roubaud, 1906

- ***S. angustipes*** Edwards, 1915. Mentioned in the provinces of Ávila, Guadalajara, Madrid, Salamanca, Soria y Zamora (GONZÁLEZ, 1990, 1997), Barcelona (GONZÁLEZ, 1985; GONZÁLEZ, 1990, 1997), Badajoz, Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Gerona (PUIG *et al.*, 1987; GONZÁLEZ, 1990), La Coruña, Lugo y Pontevedra (LESTÓN *et al.*, 2014), La Rioja (RUBIO & RUIZ, 1999), León (BEAUCOURNU-SAGUEZ, 1975b), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017). Also in Alicante and Castellón as a result of my PhD research. Fig. 11.
- ***S. aureum*** Fries, 1824. Mentioned in the provinces of Asturias (PUIG *et al.*, 1984; BEAUCOURNU-SAGUEZ, 1975b), Badajoz (MARTÍNEZ & PORTILLO, 1999), Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Córdoba (GONZÁLEZ *et al.*, 1986; OBREGÓN *et al.*, 2016), Granada, Jaén, Murcia, Teruel (BEAUCOURNU-SAGUEZ, 1975a), Madrid (PUIG *et al.*, 1984; GONZÁLEZ *et al.*, 1987; CASADO *et al.*, 1990), Orense (BEAUCOURNU-SAGUEZ, 1975b). Fig. 12.
- ***S. guimari*** Becker, 1908. Mentioned in the provinces of Las Palmas y Santa Cruz de Tenerife (CROSSKEY, 1988; CROSSKEY & BAEZ, 2004). Fig. 13.
- ***S. petricolum*** (Rivosecchi, 1963). Mentioned in the provinces of Almería (VINÇON & CLERGUE-GAZEAU, 1993; GONZÁLEZ, 1997), Asturias, Madrid (GRENIER & BERTRAND, 1954; BEAUCOURNU-SAGUEZ, 1975b; GONZÁLEZ-PEÑA, 1985), Ávila (GRENIER & BERTRAND, 1954), Badajoz, Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Barcelona (GONZÁLEZ, 1990), Cádiz (CROSSKEY & CROSSKEY, 2000;

GONZÁLEZ *et al.*, 2002), Córdoba (OBREGÓN *et al.*, 2016), Granada (GRENIER & BERTRAND, 1954; CROSSKEY & CROSSKEY, 2000), Huesca (GRENIER & BERTRAND, 1954; GONZÁLEZ, 1990), Jaén (VINÇON & CLERGUE-GAZEAU, 1993; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002, RICOY-LLAVERO, 2015), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017). Also in Alicante, Castellón and Teruel as a result of my PhD research. Fig. 14.

- ***S. rubzovianum*** (Sherban, 1961). Mentioned in the provinces of Córdoba (OBREGÓN *et al.*, 2016), Islas Baleares (ADLER & CROSSKEY, 2016). Fig. 15.
- ***S. velutinum*** (Santos Abreu, 1922). Mentioned in the provinces of Alicante (LESTÓN *et al.*, 2013; LESTÓN *et al.*, 2014), Almería, Granada, Huelva, Sevilla (CROSSKEY & CROSSKEY, 2000), Asturias, Ávila, Barcelona, Burgos, Ciudad Real, Guadalajara, La Coruña, Lérida, Madrid, Palencia, Salamanca, Segovia, Soria, Tarragona, Teruel (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Badajoz, Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Cádiz (CROSSKEY & CROSSKEY, 2000; GALLARDO-MAYENCO & TOJA, 2002; GONZÁLEZ *et al.*, 2002), Córdoba (GONZÁLEZ-PEÑA *et al.*, 1986), Gerona (PUIG *et al.*, 1987; GONZÁLEZ, 1990), Jaén (BEAUCOURNU-SAGUEZ, 1975a; CROSSKEY & CROSSKEY, 2000; RICOY-LLAVERO, 2015), La Rioja (RUBIO & RUIZ, 1999), León, Zamora (BEAUCOURNU-SAGUEZ, 1975b; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ, 1990), Málaga (GONZÁLEZ-PEÑA *et al.*, 1987; GONZÁLEZ, 1990; CROSSKEY & CROSSKEY, 2000; GALLARDO-MAYENCO & TOJA, 2002), Santa Cruz de Tenerife (CROSSKEY, 1988; GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & BAEZ, 2004), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017). Also in Alicante and Castellón and as a result of my PhD research. Fig. 16.

Subgenus *Hellichella* Rivosecchi & Cardinals, 1975 Congareenarum species-group

- ***S. latipes*** (Meigen, 1804). Mentioned in the provinces of Ávila (GONZÁLEZ, 1990, 1997; GONZÁLEZ, *et al.*, 2002), Granada, Lérida, Madrid (GRENIER & BERTRAND, 1954). Fig. 17.

Subgenus *Nevermannia* Enderlein, 1921

Ruficorne species-group

- ***S. angustitarse*** (Lundström, 1911). Mentioned in the provinces of Albacete (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Cádiz, Granada, Jaén (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Ciudad Real, Guadalajara, La Coruña, Segovia, Valladolid, Zamora (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Córdoba (GONZÁLEZ *et al.*, 1986), Huesca,

Zaragoza (INGLADA, 2003), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017). Also in Alicante, Castellón and Teruel as a result of my PhD research. Fig. 18.

- ***S. lundstromi*** (Enderlein, 1921). Mentioned in the provinces of Badajoz (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Burgos, Lugo, Orense (BEAUCOURNU-SAGUEZ, 1975b), Cáceres (MARTÍNEZ & PORTILLO, 1999; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002). Fig. 19.
- ***S. ruficorne*** Macquart, 1838. Mentioned in the provinces of Alicante (LESTÓN *et al.*, 2013; LESTÓN *et al.*, 2014), Almería (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Cáceres (GONZÁLEZ, 1990), Córdoba (OBREGÓN *et al.*, 2016), Islas Baleares (GONZÁLEZ *et al.*, 2002), Jaén (BEAUCOURNU-SAGUEZ, 1975a, b), Las Palmas, Santa Cruz de Tenerife (CROSSKEY, 1988; CROSSKEY & BAEZ, 2004; ADLER & CROSSKEY, 2016), Málaga (GONZÁLEZ *et al.*, 1987; GONZÁLEZ, 1990; GONZÁLEZ, 1997; GALLARDO-MAYENCO & TOJA, 2002), Sevilla (MARTÍNEZ & PORTILLO, 1999). Fig. 20.

Vernum species-group

- ***S. armoricanum*** Doby & David, 1961. Mentioned in the provinces of Ciudad Real (GONZÁLEZ, 1990; VINÇON & CLERGUE-GAZEAU, 1993; GONZÁLEZ, 1997), Córdoba (GONZÁLEZ *et al.*, 1986), Granada (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Orense (BEAUCOURNU-SAGUEZ, 1975; GONZÁLEZ *et al.*, 1987). Fig. 21.
- ***S. bertrandi*** Grenier & Drier, 1959. Mentioned in the provinces of Lérida (GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002). Also in Castellón as a result of my PhD research. Fig. 22.
- ***S. brevidens*** (Rubtsov, 1956). Mentioned in the provinces of Lérida (GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002). Fig. 23.
- ***S. carthusiense*** Grenier & Drier, 1959. Mentioned in the provinces of Badajoz (MARTÍNEZ & PORTILLO, 1999), Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999; GONZÁLEZ *et al.*, 2002), Granada (GRENIER & BERTRAND, 1954; GRENIER & DRIER, 1959; CARLSSON, 1969; BEAUCOURNU-SAGUEZ, 1975a; VINÇON & CLERGUE-GAZEAU, 1993; CROSSKEY & CROSSKEY, 2000), Lérida (GONZÁLEZ, 1990; GONZÁLEZ, 1997). Also in Castellón as a result of my PhD research. Fig. 24.

- ***S. costatum*** Friederichs, 1920. Mentioned in the provinces of Burgos (VINÇON & CLERGUE-GAZEAU, 1993), Madrid (VINÇON & CLERGUE-GAZEAU, 1993; GONZÁLEZ, 1997; GONZÁLEZ *et al.*, 2002). Fig. 25.
- ***S. cryophilum*** (Rubtsov, 1959). Mentioned in the provinces of Almería (VINÇON & CLERGUE-GAZEAU, 1993), Ávila, Ciudad Real, Guadalajara, Lérida (GONZÁLEZ, 1990), Barcelona (GONZÁLEZ, 1985), Cádiz (CROSSKEY & CROSSKEY, 2000), Córdoba (GONZÁLEZ *et al.*, 1986), Gerona (PUIG *et al.*, 1987), Granada (GRENIER & BERTRAND, 1954; GRENIER & DORIER, 1959; VINÇON & CLERGUE-GAZEAU, 1993; CROSSKEY & CROSSKEY, 2000), Huelva (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Islas Baleares (ADLER & CROSSKEY, 2016), Jaén (VINÇON & CLERGUE-GAZEAU, 1993; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; RICOY-LLAVERO, 2015), Málaga (GONZÁLEZ *et al.*, 1987; GONZÁLEZ, 1990; CROSSKEY & CROSSKEY, 2000), Palencia (BEAUCOURNU-SAGUEZ, 1975a), Teruel (BEAUCOURNU-SAGUEZ, 1975a), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017). Also in Alicante as a result of my PhD research. Fig. 26.
- ***S. naturale*** Davies, 1966. Mentioned in the provinces of Lugo (BEAUCOURNU-SAGUEZ, 1975b), Orense (BEAUCOURNU-SAGUEZ, 1975a; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ, *et al.*, 2002). Fig. 27.
- ***S. quasidecolletum*** Crosskey, [1988] [1987]. Mentioned in the provinces of Badajoz (MARTÍNEZ & PORTILLO, 1999), Cáceres (MARTÍNEZ & PORTILLO, 1999; CROSSKEY & CROSSKEY, 2000), Huesca (GONZÁLEZ, 1990; GONZÁLEZ, 1997). Fig. 28.
- ***S. vernum*** Macquart, 1826. Mentioned in the provinces of Barcelona (GONZÁLEZ, 1990), Ciudad Real, Gerona, Lérida, Málaga, Tarragona (GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ, *et al.*, 2002), Córdoba (GONZÁLEZ *et al.*, 1986), Madrid (PUIG *et al.*, 1984; GONZÁLEZ *et al.*, 1987; CASADO *et al.*, 1990). Fig. 29.

Subgenus *Rubzovia* Petrova, 1983

- ***S. lamachi*** Doby & David, 1960. Mentioned in the provinces of Granada (CLERGUE-GAZEAU & VINÇON, 1990; VINÇON & CLERGUE-GAZEAU, 1993), Las Palmas (CROSSKEY *et al.*, 1998), Málaga (CLERGUE-GAZEAU & VINÇON, 1990). Fig. 30.

- ***S. paraloutetense*** Crosskey, 1988. Mentioned in the provinces of Las Palmas (CROSSKEY, 1988; CROSSKEY *et al.*, 1998; CROSSKEY & BAEZ, 2004). Fig. 31.

Subgenus *Simulium* Latreille, 1802

Argenteostriatum species-group

- ***S. argenteostriatum*** Strobl, 1898. Mentioned in the provinces of Gerona, Lérida (GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Huesca (GRENIER & BERTRAND, 1954). Fig. 32.
- ***S. hispaniola*** Grenier & Bertrand, 1954. Mentioned in the provinces of Asturias, Ávila, Cantabria (GRENIER & BERTRAND, 1954), Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), León (GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ, *et al.*, 2002). Fig. 33.

Bezzi species-group

- ***S. bezzi*** (Corti, 1914). Mentioned in the provinces of Almería (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ, *et al.*, 2002), Badajoz, Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Barcelona (GONZÁLEZ-PEÑA, 1985; GONZÁLEZ, 1990; GONZÁLEZ, 1997), Ciudad Real, Islas Baleares, Lérida, Palencia, Soria, Tarragona (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Córdoba (GONZÁLEZ *et al.*, 1986), Gerona (PUIG *et al.*, 1987; GONZÁLEZ-PEÑA, 1990), Granada (CARLSSON, 1969; VINÇON & CLERGUE-GAZEAU, 1993; CROSSKEY & CROSSKEY, 2000), Cantabria, Huesca (GRENIER & BERTRAND, 1954), Jaén (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ, *et al.*, 2002; RICOY-LLAVERO, 2015), La Rioja (RUBIO & RUIZ, 1999), León (BEAUCOURNU-SAGUEZ, 1975b; GONZÁLEZ, 1990). Also in Alicante, Castellón and Valencia as a result of my PhD research. Fig. 34.

Ornatum species-group

- ***S. intermedium*** Roubaud, 1906. Mentioned in the provinces of Albacete, Cuenca (BEAUCOURNU-SAGUEZ, 1975a), Alicante (LESTÓN *et al.*, 2013; LESTÓN *et al.*, 2014), Almería, Huelva, Sevilla (CROSSKEY & CROSSKEY, 2000), Asturias (BEAUCOURNU-SAGUEZ, 1975b; PUIG *et al.*, 1984; GONZÁLEZ, 1990; GONZÁLEZ, 1997), Badajoz y Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Barcelona, Ciudad Real, Gerona, Guadalajara, Soria, Tarragona (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Cádiz (CROSSKEY & CROSSKEY, 2000; GALLARDO-MAYENCO & TOJA, 2002; GONZÁLEZ, 2002), Córdoba (GONZÁLEZ *et al.*,

1986; CROSSKEY & CROSSKEY, 2000), Granada (CARLSSON, 1969; BEAUCOURNU-SAGUEZ, 1975a; VINÇON & CLERGUE-GAZEAU, 1993; CROSSKEY & CROSSKEY, 2000), Huesca (GRENIER & BERTRAND, 1954; SANZ *et al.*, 2000; INGLADA, 2003), Islas Baleares (CROSSKEY, 1988; CROSSKEY, 1991a; GONZÁLEZ *et al.*, 2002; ADLER & CROSSKEY, 2016), Jaén (BEAUCOURNU-SAGUEZ, 1975a; VINÇON & CLERGUE-GAZEAU, 1993; CROSSKEY & CROSSKEY, 2000; RICOY-LLAVERO, 2015), Las Palmas (CROSSKEY, 1988; GONZÁLEZ *et al.*, 2002; CROSSKEY & BAEZ, 2004; ADLER & CROSSKEY, 2016), La Rioja (RUBIO & RUIZ, 1999), León, Zamora (BEAUCOURNU-SAGUEZ, 1975b; GONZÁLEZ, 1985), Madrid (GRENIER & BERTRAND, 1954), Málaga (CARLSSON, 1969; GONZÁLEZ *et al.*, 1987; GONZÁLEZ, 1990; CROSSKEY & CROSSKEY, 2000; GALLARDO-MAYENCO & TOJA, 2002), Murcia, Teruel (BEAUCOURNU-SAGUEZ, 1975a), Santa Cruz de Tenerife (CROSSKEY, 1988; GONZÁLEZ *et al.*, 2002; CROSSKEY & BAEZ, 2004; ADLER & CROSSKEY, 2016), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Zaragoza (INGLADA, 2003). Also in Alicante, Castellón and Teruel as a result of my PhD research. Fig. 35.

- ***S. ornatum*** Meigen, 1818. Mentioned in the provinces of Albacete (CROSSKEY & CROSSKEY, 2000), Alicante (LESTÓN *et al.*, 2013; LESTÓN *et al.*, 2014), Asturias (BEAUCOURNU-SAGUEZ, 1975b), Badajoz, Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Barcelona (STROBL, 1906; GONZÁLEZ-PEÑA, 1985; GONZÁLEZ-PEÑA, 1990; GONZÁLEZ, 1997), Cádiz (STROBL, 1906; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Huelva (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Córdoba (GONZÁLEZ *et al.*, 1987; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002; OBREGÓN *et al.*, 2016), Gerona (PUIG *et al.*, 1984; GONZÁLEZ-PEÑA, 1990), Granada (CARLSSON, 1969; BEAUCOURNU-SAGUEZ, 1975a; VINÇON & CLERGUE-GAZEAU, 1993; CROSSKEY & CROSSKEY, 2000), Guadalajara, Lérida, Soria, Tarragona (GONZÁLEZ-PEÑA, 1990; GONZÁLEZ, 1997), Huesca, (GRENIER & BERTRAND, 1954; INGLADA, 2003), Jaén (CARLSSON, 1969; BEAUCOURNU-SAGUEZ, 1975a; VINÇON & CLERGUE-GAZEAU, 1993; CROSSKEY & CROSSKEY, 2000; RICOY-LLAVERO, 2015), La Coruña, Lugo y Pontevedra (LESTÓN *et al.*, 2014), La Rioja (RUBIO & RUIZ, 1999), Madrid (GONZÁLEZ-PEÑA, 1990; CASADO *et al.*, 1990), Málaga (CARLSSON, 1969; GONZÁLEZ *et al.*, 1987; GONZÁLEZ, 1990; CROSSKEY & CROSSKEY, 2000; GALLARDO-MAYENCO & TOJA, 2002), Salamanca (GONZÁLEZ, 1990), Teruel (BEAUCOURNU-SAGUEZ, 1975a; GONZÁLEZ, 1990), Valencia (GONZÁLEZ, 1990; LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Zamora (BEAUCOURNU-SAGUEZ, 1975b; GONZÁLEZ, 1985; GONZÁLEZ, 1990), Zaragoza (INGLADA, 2003). Also in Alicante, Castellón and Teruel as a result of my PhD research. Fig. 36.

- ***S. trifasciatum*** Curtis, 1839. Mentioned in the provinces of Asturias, Lugo (BEAUCOURNU-SAGUEZ, 1975b), Alicante (LESTÓN *et al.*, 2013; LESTÓN *et al.*, 2014), Badajoz, Cáceres (MARTÍNEZ & PORTILLO, 1999; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Barcelona, Lérida (GONZÁLEZ, 1990; VINÇON & CLERGUE-GAZEAU, 1993), Córdoba (OBREGÓN *et al.*, 2016), Gerona (PUIG *et al.*, 1987), La Coruña (LESTÓN *et al.*, 2014), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017). Also in Alicante, Castellón, Teruel and as a result of my PhD research. Fig. 37.

Reptans species.group

- ***S. reptans*** (Linnaeus, 1758). Mentioned in the provinces of Alicante (STROBL, 1906), Asturias (GRENIER & BERTRAND, 1954; PUIG, *et al.*, 1984; PUIG *et al.*, 1987; GONZÁLEZ, 1990), Cádiz (STROBL, 1906), Gerona (PUIG, *et al.*, 1984; GONZÁLEZ, 1990), La Coruña, Lugo y Pontevedra (LESTÓN *et al.*, 2014), León, Lérida, Salamanca, Segovia (GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Soria (STROBL, 1906), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017). Also in Alicante as a result of my PhD research. Fig. 38.

Tuberosum species-group

- ***S. tuberosum*** (Lundström, 1911). Mencionada en las provincias de Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Cantabria, Huesca (GRENIER & BERTRAND, 1954), Lérida (GRENIER & BERTRAND, 1954; GONZÁLEZ, 1990), Madrid (GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002). Fig. 39.

Variegatum species-group

- ***S. argyreatum*** Meigen, 1838. Mentioned in the provinces of Asturias (PUIG *et al.*, 1984), Barcelona (GONZÁLEZ, 1985; GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Burgos, Granada, Guadalajara, León, Lérida, Segovia, Soria (GONZÁLEZ, 1990; GONZÁLEZ-PEÑA, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Gerona (PUIG *et al.*, 1987; GONZÁLEZ, 1990), Jaén (GONZÁLEZ, 1990; GONZÁLEZ-PEÑA, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002; RICOY-LLAVERO, 2015), Madrid (PUIG *et al.*, 1984; GONZÁLEZ *et al.*, 1987; CASADO *et al.*, 1990). Also in Valencia as a result of my PhD research. Fig. 40.
- ***S. maximum*** (Knoz, 1961). Mentioned in the provinces of Granada (VINÇON & CLERGUE-GAZEAU, 1993), Salamanca (VINÇON &

CLERGUE-GAZEAU, 1993; GONZÁLEZ-PEÑA, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002). Fig. 41.

- ***S. monticola*** Friederichs, 1920. Mentioned in the provinces of Asturias (PUIG *et al.*, 1984; GONZÁLEZ, 1990; GONZÁLEZ, 1997), Badajoz, Cáceres (MARTÍNEZ, 1996; GONZÁLEZ, 1997; MARTÍNEZ & PORTILLO, 1999), Cantabria (GRENIER & BERTRAND, 1954), Barcelona (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Granada (GRENIER & BERTRAND, 1954; GRENIER & DORIER, 1959; CARLSSON, 1969; VINÇON & CLERGUE-GAZEAU, 1993; CROSSKEY & CROSSKEY, 2000), Jaén (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Lérida (GRENIER & BERTRAND, 1954; GONZÁLEZ, 1990), Madrid (GRENIER & BERTRAND, 1954; GONZÁLEZ, 1990; GONZÁLEZ, 1997), Pontevedra (LESTÓN *et al.*, 2014), Teruel, Orense (BEAUCOURNU-SAGUEZ, 1975a). Fig. 42.
- ***S. variegatum*** Meigen, 1818. Mentioned in the provinces of Almería, Cádiz, Jaén, Sevilla (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Asturias (GRENIER & BERTRAND, 1954; PUIG *et al.*, 1984; GONZÁLEZ, 1990; GONZÁLEZ, 1997), Badajoz (MARTÍNEZ & PORTILLO, 1999), Barcelona (GONZÁLEZ-PEÑA, 1985; GONZÁLEZ, 1990; GONZÁLEZ, 1997), Burgos, Ciudad Real, Guadalajara, Palencia, Teruel (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Cantabria (BEAUCOURNU-SAGUEZ, 1975b), Córdoba (GONZÁLEZ *et al.*, 1986; CROSSKEY & CROSSKEY, 2000), Gerona (PUIG *et al.*, 1987; GONZÁLEZ, 1990), Granada (GRENIER & BERTRAND, 1954; BEAUCOURNU-SAGUEZ, 1975a; VINÇON & CLERGUE-GAZEAU, 1993; CROSSKEY & CROSSKEY, 2000), Huesca (GRENIER & BERTRAND, 1954), La Rioja (RUBIO & RUIZ, 1999), León (BEAUCOURNU-SAGUEZ, 1975b; GONZÁLEZ, 1990), Lérida (GRENIER & BERTRAND, 1954; GONZÁLEZ, 1990), Málaga (CARLSSON, 1969; GONZÁLEZ, 1987; GONZÁLEZ, 1990). Fig. 43.
- ***S. xanthinum*** Edwards, 1933. Mentioned in the provinces of Barcelona, Gerona, Tarragona, Teruel (GONZÁLEZ-PEÑA, 1990), Cádiz (EDWARDS, 1993; GONZÁLEZ, 1990; CROSSKEY, 1991b; CROSSKEY & CROSSKEY, 2000; GALLARDO-MAYENCO & TOJA, 2002), Jaén (CROSSKEY, 1991b; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002; RICOY-LLAVERO, 2015), Málaga (CROSSKEY, 1991b; GONZÁLEZ, 1997; GONZÁLEZ *et al.*, 2002), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017). Also in Castellón as a result of my PhD research. Fig. 44.

Subgenus *Trichodagmia* Enderlein, 1934

Albellum species-group

- ***S. auricoma*** Meigen, 1818. Mentioned in the provinces of Barcelona (GONZÁLEZ, 1985; GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Cantabria (BEAUCOURNU-SAGUEZ, 1975b), Gerona (PUIG *et al.*, 1987; GONZÁLEZ, 1990), Huesca (GRENIER & BERTRAND, 1954), Lérida (GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002). Fig. 45.
- ***S. galloprovinciale*** Giudicelli, 1963. Mentioned in the provinces of Badajoz, Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999; GONZÁLEZ *et al.*, 2002), Jaén (CROSSKEY & SANTOS-GRÁCIO, 1985; GONZÁLEZ, 1990; GONZÁLEZ, 1997; CROSSKEY & CROSSKEY, 2000). Fig. 46.
- ***S. ibericum*** Crosskey & Santos Grácio, 1985. Mentioned in the provinces of Badajoz (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Cáceres (CROSSKEY & SANTOS-GRÁCIO, 1985; GONZÁLEZ, 1990; MARTÍNEZ & PORTILLO, 1999), Orense (GONZÁLEZ, 1990; GONZÁLEZ, 1997). Fig. 47.

Subgenus *Wilhelmia* Enderlein, 1921

Equinum species-group

- ***S. equinum*** (Linnaeus, 1758). Mentioned in the provinces of Albacete (BEAUCOURNU-SAGUEZ, 1975a), Asturias (PUIG *et al.*, 1984; GONZÁLEZ, 1990; GONZÁLEZ, 1997), Badajoz, Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Barcelona, Burgos, Gerona, Lleida, León, Palencia, Salamanca, Segovia, Soria, Teruel, Valladolid, Zamora (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Cuenca (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002; LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Granada (BEAUCOURNU-SAGUEZ, 1975a; CROSSKEY & CROSSKEY, 2000), Jaén (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), La Coruña, Lugo y Pontevedra (LESTON *et al.*, 2014), La Rioja (RUBIO & RUIZ, 1999), Madrid (GRENIER & BERTRAND, 1954; CASADO *et al.*, 1990; GONZÁLEZ, 1990), Málaga (GONZÁLEZ *et al.*, 1987; CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017). Also in Castellón and Teruel as a result of my PhD research. Fig. 48.
- ***S. lineatum*** (Meigen, 1804). Mentioned in the provinces of Albacete, Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Ávila, Burgos, Guadalajara, León, Palencia, Soria, Valladolid, Zamora (GONZÁLEZ, 1990;

GONZÁLEZ, 1997), Badajoz, Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Córdoba, Huelva, Sevilla, Zaragoza (CROSSKEY & CROSSKEY, 2000; GOZÁLEZ, 2002), Cuenca (BEAUCOURNU-SAGUEZ, 1975a; CROSSKEY & CROSSKEY, 2000; LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Granada (CARLSSON, 1969; CROSSKEY & CROSSKEY, 2000), Jaén (CARLSSON, 1969; BEAUCOURNU-SAGUEZ, 1975a; CROSSKEY & CROSSKEY, 2000), La Coruña (LESTÓN *et al.*, 2014), La Rioja (RUBIO & RUIZ, 1999), Madrid (GRENIER & BERTRAND, 1954; LUNA DE CARVALHO, 1963; CASADO *et al.*, 1990), Málaga (CARLSSON, 1969; BEAUCOURNU-SAGUEZ, 1972; GONZÁLEZ *et al.*, 1987; GONZÁLEZ, 1990; CROSSKEY & CROSSKEY, 2000; GALLARDO-MAYENCO & TOJA, 2002), Teruel (BEAUCOURNU-SAGUEZ, 1975a). Also in Castellón as a result of my PhD research. Fig. 49.

- ***S. pseudequinum*** Séguy, 1921. Mentioned in the provinces of Albacete (BEAUCOURNU-SAGUEZ, 1975a; LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Alicante (LESTÓN *et al.*, 2013; LESTÓN *et al.*, 2014), Almería (CARLSSON, 1969), Badajoz y Cáceres (MARTÍNEZ, 1996; MARTÍNEZ & PORTILLO, 1999), Barcelona, Ciudad Real, Gerona, Palencia, Segovia, Valladolid (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Cádiz (CROSSKEY & CROSSKEY, 2000; GALLARDO-MAYENCO & TOJA, 2002), Córdoba (GONZÁLEZ *et al.*, 1986; CROSSKEY & CROSSKEY, 2000; OBREGÓN *et al.*, 2016), Cuenca (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002; LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Granada (CARLSSON, 1969; BEAUCOURNU-SAGUEZ, 1975a; CROSSKEY & CROSSKEY, 2000), Huelva, Sevilla, Toledo (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Huesca (SANZ *et al.*, 2000; INGLADA, 2003), Jaén (BEAUCOURNU-SAGUEZ, 1975a, CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002; RICOY-LLAVERO, 2015), Las Palmas, Santa Cruz de Tenerife (CROSSKEY, R. W., 1988; CROSSKEY & BAEZ, 2004), La Rioja (RUBIO & RUIZ, 1999), Madrid (PUIG *et al.*, 1984; GONZÁLEZ *et al.*, 1987; CASADO *et al.*, 1990), Málaga (CARLSSON, 1969; GONZÁLEZ *et al.*, 1987; GONZÁLEZ, 1990; CROSSKEY & CROSSKEY, 2000; GALLARDO-MAYENCO & TOJA, 2002), Salamanca (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Teruel (BEAUCOURNU-SAGUEZ, 1975a; GONZÁLEZ, 1990; GONZÁLEZ, 1997), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Zamora (BEAUCOURNU-SAGUEZ, 1975b; GONZÁLEZ, 1990), Zaragoza (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002; INGLADA, 2003). Also in Alicante, Castellón and Teruel as a result of my PhD research. Fig. 50.
- ***S. quadrifila*** Grenier, Faure & Laurent, 1957. Mentioned in the provinces of Albacete (BEAUCOURNU-SAGUEZ, 1975a; LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Cuenca, Toledo, Zaragoza (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Valladolid (GONZÁLEZ, 1990;

GONZÁLEZ, 1997), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017). Fig. 51.

- ***S. sergenti*** Edwards, 1923. Mentioned in the provinces of Albacete (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Barcelona, Madrid (SÉGUY, 1925, 1930; BEAUCOURNU-SAGUEZ, 1975a), Cádiz (CROSSKEY & CROSSKEY, 2000), Córdoba (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002), Cuenca (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002; LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Granada (CARLSSON, 1969; CROSSKEY & CROSSKEY, 2000), Huesca (SANZ *et al.*, 2000; INGLADA, 2003), Jaén (BEAUCOURNU-SAGUEZ, 1975a; CROSSKEY & CROSSKEY, 2000), Málaga (GONZÁLEZ, 1987; GONZÁLEZ, 1990; CROSSKEY & CROSSKEY, 2000; GALLARDO-MAYENCO & TOJA, 2002), Palencia, Soria, Zamora (GONZÁLEZ, 1990; GONZÁLEZ, 1997), Teruel (BEAUCOURNU-SAGUEZ, 1975a), Valencia (LÓPEZ-PEÑA & JIMÉNEZ-PEYDRÓ, 2017), Zaragoza (CROSSKEY & CROSSKEY, 2000; GONZÁLEZ *et al.*, 2002; INGLADA, 2003). Also in Alicante and Castellón as a result of my PhD research. Fig. 52.

REFERENCES

- ADLER, P.H. & CROSSKEY, R.W., 2016. World Blackflies (Diptera: Simuliidae): A Comprehensive Revision of the Taxonomic and Geographical Inventory [2016]. 126 pp.
- BEAUCOURNU-SAGUEZ, F., 1975a. Récoltes de Simulies (Diptera Simuliidae) dans le Sud-Est de l'Espagne. *Annales de la Société Entomologique France*, 11(1): 73-89.
- BEAUCOURNU-SAGUEZ, F., 1975b. Sur quelques Simulies (Diptera, Simuliidae) du Nord-Ouest de l'Espagne. *Annales de Parasitologie Humaine et Comparée*, 50(1): 105-122.
- BELQAT, B. & Garrido, J., 2008. Inventaire faunistique et bibliographique des Simulies d'Espagne (Diptera, Simuliidae). *Nouvelle Revue d'Entomologie*, 24(3): 201-219.
- CARLSSON, G., 1969. Some Simuliidae (Diptera) from Southern Spain. *Entomologiske Meddelelser*, 37: 202-206.
- CASADO, C., MONTES, C., DE JALÓN, D. G., & SORIANO, O., 1990. Contribución al estudio faunístico del bentos fluvial del río Lozoya (Sierra de Guadarrama, España). *Limnetica*, 6: 87-100.
- CLERGUE-GAZEAU, M., & VINÇON, G., 1990. Importance of the discovery of *Simulium (Rubzovia) lamachi* Doby and David in the Iberian Peninsula (Diptera, Simuliidae). *Nouvelle Revue d'Entomologie*, 7(3): 303-306.
- CROSSKEY, R. W. & SANTOS-GRACIO, A. J., 1985. New species and new records of the blackfly subgenus *Simulium (Obuchovia)* from Spain and Portugal (Diptera: Simuliidae). *Aquatic Insects*, 7(3): 149-160.

- CROSSKEY, R. W., 1988. Taxonomy and geography of the blackflies of the Canary Islands (Diptera: Simuliidae). *Journal of Natural History*, 22(2): 321-355.
- CROSSKEY, R. W., 1991a. The blackfly fauna of Majorca and other Balearic Islands (Diptera: Simuliidae). *Journal of Natural History*, 25: 671-690.
- CROSSKEY, R. W., 1991b. On *Simulium xanthinum*, a curious yellow-bodied blackfly of the southwestern Palaearctic region (Diptera: Simuliidae). *Journal of Natural History*, 25(3): 691-702.
- CROSSKEY, R. W., MALMQVIST, B., & NILSSON, A. N., 1998. A review of the Palaearctic blackfly subgenus *Simulium* (*Rubzovia*) with the emphasis on *S.(R.) paraloutetense*, a species confined to Gran Canaria Island (Diptera: Simuliidae). *Insect Systematics & Evolution*, 29(4): 383-393.
- CROSSKEY, R. W. & CROSSKEY, M., 2000. An investigation of the blackfly fauna of Andalusia, southern Spain (Diptera: Simuliidae). *Journal of Natural History*, 34: 895-951.
- CROSSKEY, R. W. & BAEZ, M., 2004. A synopsis of present knowledge of the Simuliidae (Diptera) of the Canary Islands, including keys to the larval and pupal stages. *Journal of Natural History*, 38(16): 2085-2117.
- LÓPEZ-PEÑA, D. & JIMÉNEZ-PEYDRÓ, R., 2017. Contribución al conocimiento de las moscas negras (Diptera, Simuliidae) en la cuenca hidrográfica del Júcar. *Boletín de la Asociación española de Entomología (AeE)*, 41(1-2): 167-196.
- EDWARDS, F. W., 1933. On three European species of *Simulium*. *Annalen des naturhistorischen Museums in Wien*, 46: 255-256.
- GALLARDO-MAYENCO, A. & TOJA, J., 2002. Spatio-temporal Distribution of Simuliids (Diptera) and Associated Environmental Factors in two Mediterranean Basins of Southern Spain. *Limnética*, 21(1-2): 47-57.
- GONZÁLEZ, G., 1985. Distribución de los Simuliidae (Diptera) en dos ríos de régimen mediterráneo afectados por la contaminación: Besós y Foix. *Boletín da Sociedade Portuguesa de Entomologia*, 4(1): 187-196.
- GONZÁLEZ, G., M. FERRERAS & A. GARCÍA, 1986. Introducción al estudio de los simúlidos (Diptera) de Sierra Morena (Sur de España): Río Yeguas. *Actas de las VIII Jornadas Asociación española de Entomología, Sevilla*, 733-744.
- GONZÁLEZ, G., M. GONZÁLEZ TANAGO & D. GARCÍA DE JALÓN, 1987. Los Simúlidos (Diptera) de los ríos Guadalhorce y Guadiaro (Málaga, SE España). *Actas IV Congreso Español Limnología*: 233-242.
- GONZÁLEZ, G., 1997. Claves para la identificación de las larvas y pupas de los Simúlidos (Diptera) de la Península Ibérica. Barcelona. *Asociación Española de Limnología*, 77 p.
- GONZÁLEZ, G., 1990. *Sistemática y ecología de los Simuliidae (Diptera) de los ríos de Catalunya y de otras cuencas hidrográficas españolas*. Tesis de Licenciatura. Departamento de Ecología. Facultad de Biología. Universidad de Barcelona. 451 pp.
- GONZÁLEZ, G., R. CROSSKEY & M. BAEZ 2002. Simuliidae. In CARLES-TOLRA HJORTH-ANDERSEN, M. (coordinador) (Ed.): Catálogo de los Díptera de España, Portugal y Andorra (Insecta). *Monografías SEA*, 8: 75-77. Gorfi S.A. Zaragoza (España).

- GRENIER, P. & BERTRAND, H., 1954. Simuliidae d'Espagne. *Annales de Parasitologie*. Paris, XXIV (4): 447-459.
- GRENIER, P. & DORIER, A., 1959. Deux Simulies nouvelles (*S. bertrandi* n. sp. et *S. carthusiense* n. sp.) du groupe *latipes*, récoltées en France et en Espagne. *Travaux de Laboratoire d'Hydrobiologie et de Pisciculture de l'Université de Grenoble*, 49(50): 205-223.
- INGLADA, D. V., 2003. *Dinámica poblacional y biotopo de los simúlidos en la cuenca monegrina del Flumen*. Tesina de Licenciatura. Departamento de Patología Animal de la Universidad de Zaragoza. 94 pp.
- LESTÓN, V., DÍAZ, J., QUIRCE, C., & COBO, F., 2013. Los Simuliidae (Diptera) de la cuenca del río Serpis (SE, España). Estudio faunístico. *Boletín de la Asociación Española de Entomología*, 37(3): 285-300.
- LESTÓN, V., DÍAZ, J., QUIRCE VÁZQUEZ, C., & COBO, F., 2014. Distribución y selección de sustrato de los Simuliidae (Diptera) en el tramo medio del río Serpis (sureste de España). *Boletín de la Sociedad Entomológica Aragonesa*, 55: 153-158.
- LUNA DE CARVALHO, E., 1963. Contribuição para o estudo dos Simúlidos de Portugal (Diptera Simuliidae). *Memorias e Estudos do Museu Zoologico da Universidade de Coimbra*, 287: 5-11.
- MARTÍNEZ, R., 1996. *Estudio faunístico y ecológico de los simúlidos (Diptera, Simuliidae) de Extremadura*. Tesina. Facultad de Biología. Universidad de Salamanca. pp 264.
- MARTÍNEZ, R. E. & PORTILLO, M., 1999. Faunistic and Ecological study of Simuliid (Black-flies) (Diptera: Simuliidae) in a zone in Southeast Spain. In Contributions to the knowledge of Diptera. *Memories on Entomology, International*, 14: 605-623.
- OBREGÓN, R., D. JORDANO, R. VILLAR & E. FLORES, 2016. Implementation of a Simuliidae (Diptera, Nematocera) monitoring and control program in Córdoba (southern Spain). Poster communication. *VII International Simuliidae Symposium*, Zaragoza.
- PUIG, M. A., GONZÁLEZ, G. & SORIANO, O., 1984. Introducción al estudio de las comunidades macrobentónicas de los ríos asturianos: Efemerópteros, Plecópteros, Tricópteros, Simúlidos y Quironómidos. *Limnética*, 1: 187-196.
- PUIG, M. A., GONZÁLEZ, G. & RECASENS, L., 1987. Modelos de distribución de Plecópteros, Efemerópteros, Tricópteros y Simúlidos en el río Ter. *Limnética*, 3: 125-132.
- RICOY-LLAVERO, E., 2015. *Estudio de la dinámica poblacional de la comunidad de simúlidos en la Sierra de Segura*. Universidad de Jaén, Facultad de Ciencias Experimentales, Grado en Biología, Trabajo Fin de Grado.
- RUBIO, M. P., & RUIZ, R. E. M., 1999. Estudio faunístico y ecológico de los simúlidos (Diptera, Simuliidae) del río Cidacos a su paso por La Rioja. *Zubía*, (11): 61-80.
- RUIZ-ARRONDO, I., GARZA-HERNÁNDEZ, J. A., REYES-VILLANUEVA, F., LUCIENTES-CURDI, J. & RODRÍGUEZ-PÉREZ, M. A., 2017. Human-landing rate, gonotrophic cycle length, survivorship, and public health importance of *Simulium erythrocephalum* in Zaragoza, northeastern Spain. *Parasites & Vectors*, 10(1): 175.

- SANZ, G., ESCUDERO, M., ZAPATER, M. J., POLITE, J. I. A., ZARATE, J. J., & LUCIENTES, J., 2000. *Simulium (Wilhelmia) pseudoequinum* Séguy, 1921: Una nueva especie de simúlido (Diptera: Simuliidae) para Los Monegros. *Boletín de la Sociedad Entomológica Aragonesa*, 27: 78.
- STROBL, G., 1906. Spanische Dipteren. II Beitrag. *Memorias de la Real Sociedad Española de Historia Natural*, 1905. Madrid: 271-422.
- VINÇON, G. & CLERGUE-GAZEAU, M., 1993. Les Simulies (Diptera: Simuliidae) du Sud-Ouest de l'Europe: le crénal et l'épirhithral. *Annales de Limnologie*, 29: 157-169.

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