

Ectoparasites on bats (Gamasida, Ixodida, Diptera) in Biscay (N Iberian peninsula)

E. Imaz, J. R. Aihartza & M. J. Totorika

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Ectoparasites on bats (Gamasida, Ixodida, Diptera) in Biscay (N Iberian peninsula).— A study on ectoparasites infesting Chiroptera in Biscay (N Iberian peninsula) was carried out during a distribution survey of bats. 160 potential hosts were examined and 664 ectoparasites were found, collected manually from living bats by means of pointed tweezers. The ectoparasites belonged to 12 species and 2 subspecies: 5 species and 2 subspecies of Gamasida, 2 species of Ixodida and 5 species of Diptera. First records in the study area were obtained for *Eyndhovenia euryalis euryalis*, *Eyndhovenia euryalis oudemansi*, *Argas vespertilionis* and *Penicillidia dufouri*. *Spinturnix plecotina* on *Rhinolophus ferrumequinum* and *Rhinolophus euryale* and *Ixodes vespertilionis* on *Myotis nattereri* are reported for the first time in the Iberian peninsula; *Basilia nattereri* is new on *Myotis nattereri* in Biscay. Associations between parasites and hosts are also reported.

Key words: Chiroptera, Gamasida, Ixodida, Diptera, N Iberian peninsula.

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Introduction

Most papers on bat ectoparasites are descriptive and about most groups little is known about their world-wide distribution and biology and/or ecology. The few studies in the Iberian peninsula are fragmentary and the only records on bat ectoparasites in Biscay were assembled during the 50's and 60's by Dr. BALCELLS (1968), some of which were later reexamined by ESTRADA-PEÑA et al. (1988, 1989, 1990, 1991).

This paper shows the results of a survey carried out in Biscay. Studied groups belong

to the following families of Arthropoda: Spinturnicidae (Acari, Gamasida), Ixodidae (Acari, Ixodida), Argasidae (Acari, Ixodida) and Nycteribiidae (Diptera). Different taxa found on bats and associations between parasites and hosts are reported.

Material and methods

During a distribution survey 12 bat species were examined for ectoparasites. Batflies (Diptera) were collected from 160 individuals from July 1994 to June 1995. Mites (Acari,

Table 1. Number of examined bats and number of associated ectoparasites. Ectoparasites: EEE. *E. e. euryalis*; EEO. *E. e. oudemansi*; EES. *E. e. subsp*; SPL. *S. plecotina*; SMY. *S. myoti*; SPS. *S. Psi*; PRH. *P. rhinolophinus*; IVE. *I. vespertilionis*; AVE. *A. vespertilionis*; NBI. *N. biarticulata*; NSC. *N. schmidii*; BNA. *B. nana*; BNT. *B. nattereri*; PDU. *P. dufouri*. Hosts: Rhf. *R. ferrumequinum*; Rhe. *R. euryale*; Rhh. *R. hipposideros*; Pp. *P. pipistrellus*; Pn. *P. nathussii*; Pk. *P. kuhlii*; Ms. *M. screibersii*; Mm. *M. myotis*; Me. *M. emarginatus*; Mn. *M. natterii*; Paur. *P. auritus*; Paus. *P. austriacus*. Nb. Number of bats examined; Np. Number of parasites found.

Número de murciélagos estudiados y número de ectoparásitos asociados. (Para las abreviaturas ver arriba.)

Hosts	Nb	Np	Ectoparasites													
			Arachnida							Insecta						
			Gamasida			Ixodida				Diptera						
EEE	EEO	EES	SPL	SMY	SPS	PRH	IVE	AVE	NBI	NSC	BNA	BNT	PDU			
Rhf	24	65	5	30	3	9	0	0	7	4	0	7	0	0	0	0
Rhe	23	44	14	0	2	1	0	0	0	0	0	24	3	0	0	0
Rhh	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pp	26	20	0	0	0	0	0	0	0	0	20	0	0	0	0	0
Pn	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pk	19	11	0	0	0	0	0	0	0	0	11	0	0	0	0	0
Ms	33	273	2	0	0	0	0	251	0	0	0	0	19	0	0	1
Mm	2	34	0	0	0	0	33	0	0	0	0	0	0	0	0	1
Me	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Mn	4	6	0	0	0	0	0	0	0	1	0	0	0	3	2	0
Paur	12	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Paus	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	160	458	21	30	5	13	33	251	7	5	31	31	22	3	2	4

Gamasida) and ticks (Acari, Ixodida) were sampled in 135 potential hosts from January to June in 1995. When more than one bat was captured at the same time they were kept in separate bags. Ectoparasites were collected manually from living bats by means of pointed tweezers. Consequently, only the most conspicuous parasites on fur and the largest on the patagium were removed. Bats were then released. Samples were stored in ethyl acetate and identified under microscope.

Even if the sampling method is biased an equal bias for all the species is accepted. Thus, we calculated associations between parasites and hosts from data in table 1, excluding bat species on which no parasites were found, by mean of Pi-square measure to estimate similarity and the unweighted pair-group method (UPGNA) for clustering (NORUSIS, 1993).

Results

A total of 664 ectoparasites were collected, from which 12 species and 2 subspecies were identified: 5 species and 2 subspecies of Gamasida, 2 species of Ixodida and 5 species of Diptera (table 1). Besides groups studied here, many macronyssids (Gamasida, Macronyssidae) and fleas (Siphonaptera, Ischnopsyllidae) were also collected but have not been included in this work. Information about each locality is shown in table 2.

Class Arachnida
Order Parasitiformes
Suborder Gamasida (= Mesostigmata)
Family Spinturnicidae

Genus *Eyndhovenia* Rudnick, 1960

Eyndhovenia euryalis (Canestrini, 1884)

A total of 56 individuals of this species was collected. Five of them could not be identified at subspecies level, due to hard asymmetry on setae distribution and their poor preservation status. Three of them were collected from one *Rhinolophus ferrumequinum* (Schreber, 1774) in cave N° 0028, where colonies of *R.*

Table 2. Localities where ectoparasites were sampled, including locality number, type, municipality and UTM coordinates for 10x10 km squares (all included in the 30T zone): C. cave; Ch. Church; H. House; Mt. Mine tunnel; Oa. Open areas; Ob. Other buildings.

Localidades donde se han muestreado los parásitos, incluyendo número de la localidad, tipo, término municipal y coordenadas UTM para cuadrícula de 10x10 km (todas ellas correspondientes a la zona 30T): C. Cueva; Ch. Iglesia; H. Casa; Mt. Tunel de una mina; Oa. Áreas abiertas; Ob. Otros edificios.

Locality	Type	Township	UTM
0004	C	Busturia	WP20
0006	H	Kortezubi	WN39
0028	C	Aulesti	WN39
0031	C	Galdames	VN98
0051	C	Truzios	VN79
0055	Mt	Karrantza	VN78
0056	C	Karrantza	VN68
0066	C	Ramales	VN68
0071	Ob	Gatika	WP00
0073	Ch	Ipazter	WP30
0090	Ob	Leioa	WN09
0234	Ch	Markina	WN49
0243	Ch	Atxondo	WN37
0266	Ch	Gatika	WP10
0272	Ch	Balmaseda	VN88
0288	Ch	Arrieta Libao	WN19
0292	Ch	Lemoiz	WP00
0295	C	Karrantza	VN79
0297	C	Karrantza	VN79
0326	Ch	Mungia	WP10
0336	Oa	Amurrio	WN06
0340	Oa	Gueñes	VN98
0358	Oa	Bedia	WN18

ferrumequinum, *Rhinolophus euryale* Blasius, 1853, *Miniopterus schreibersii* (Kuhl, 1817) and *Myotis emarginatus* (E. Geoffroy, 1806) can be found. Two more were found on *R. euryale* in roost N° 0006; this roost is used by small breeding colonies of *R. ferrumequinum* and *M. emarginatus*, but *R. euryale* is only an occasional visitor.

Eyndhovenia euryalis euryalis (Canestrini, 1884)

This subspecies is recorded for the first time in Biscay, where 21 individuals were found. *R. euryale* seems to be its main host (see table 1), even though all the individuals carrying this parasite were caught in the same temporary colony, in cave N° 0004, which is also used by *R. ferrumequinum*, *M. schreibersii* and *M. emarginatus*. It was also collected from *R. ferrumequinum* in cave N° 0028, and from *M. schreibersii* in cave N° 0031, where this species forms temporary groups.

Eyndhovenia euryalis oudemansi (Eyndhoven, 1941)

This species is reported on *R. ferrumequinum*, on which it was found in 30% of checked individuals. Recorded for the first time in Biscay, where it shows a high specificity for this bat species (table 1). Found in the attic of church N° 0266, in cave N° 0028 and in a small breeding colony in farm house N° 0006.

Genus *Spinturnix* Von Heyden, 1826

Spinturnix plecotina Koch, 1839

This species was collected on *Plecotus auritus* (Linnaeus, 1758) in churches N° 0243 and 0326, and on *R. ferrumequinum* in church N° 0266, and from *R. euryale* in cave N° 0004. Horseshoe bats are new hosts in the Iberian peninsula.

Spinturnix myoti Kolenati, 1856

The *myoti* species group is conflictive within the *Spinturnix* genera (UCHIKAWA et al., 1994). The species was identified according to the description given by UCHIKAWA et al. (1994) for *S. myoti*.

Although some other mouse-eared bats

(genus *Myotis*) were examined, it was only found occurring on one *Myotis myotis* (Borkhausen, 1797).

Spinturnix psi Kolenati, 1856

A total of 251 individuals were collected, all occurring on *Miniopterus schreibersii*. All hosts were caught from two temporary colonies in caves N° 0004 and 0031.

Genus *Paraperiglischrus* Rudnick, 1960

Paraperiglischrus rhinolophinus Koch, 1841

It is recorded for the first time in Biscay. Seven specimens were collected, all from a single sample of the 44 *R. ferrumequinum* host species checked. It was found in an old farm house, N° 0006, where small colonies of *R. ferrumequinum* and *M. emarginatus* breed.

Suborder Ixodida (= Metastigmata)

Family Ixodidae

Genus *Ixodes* Latreille

Ixodes (Eschatocephalus) vespertilionis Koch, 1844

This parasite was found occurring on *R. ferrumequinum* and *Myotis nattereri* (Kuhl, 1817). The latter is recorded for the first time in the Iberian peninsula. All these records were obtained from hosts caught in underground roosts: caves N° 0295, 0297 and 0028, and mine tunnel N° 0055.

Family Argasidae

Genus *Argas* Latreille, 1796

Argas (Carios) vespertilionis (Latreille, 1802)

These parasites were collected from *Pipistrellus pipistrellus* (Schreber, 1774) and *Pipistrellus kuhlii* (Kuhl, 1819). Hosts were caught both in roosts and foraging sites, localities N° 0234, 0288, 0292, 0340 and 0336 for *P. pipistrellus*, and N° 0090 and 0358 for *P. kuhlii*.

Class Insecta (= Hexapoda)
Order Diptera
Family Nycteribiidae

Genus *Nycteribia* Latreille, 1796

Nycteribia biarticulata Hermann, 1804

They had been collected occurring on *R. ferrumequinum* and *R. euryale*. For the former host species, this parasite was found in 6 roosts, four caves and two breeding places in houses, localities N° 0006, 0028, 0066, 0272, 0295, and 0297. It was also collected from *R. euryale* in three caves and one house, N° 0004, 0006, 0056 and 0066.

Nycteribia (Listropodia) schmidli Scheiner, 1853

Almost all of them were collected from *M. schreibersi*. Three specimens found occurring on one *R. euryale* can not be considered as valid data, as this bat was not isolated after capture, but was in contact with other Schreiber bats. Thus it can be considered as a casual parasitism. *M. schreibersi* bearing this species were caught in three temporary roost caves, N° 0004, 0028 and 0031. The specimen of *R. euryale* was taken in cave N° 0066, which is also used as a temporary roost by *M. schreibersi*.

Genus *Basilia* Ribeiro, 1903

Basilia nana Theodor & Moscona, 1954

These parasites were collected on *M. nattereri* in two artificial underground sites, N° 0055 and 0073, used as occasional roosts.

Basilia nattereri Kolenati, 1857

Collected from *M. nattereri*, this is a new host for this batfly in the Biscay locality N° 0055.

Genus *Penicillidia* Kolenati, 1863

Penicillidia dufouri Westwood, 1835

Collected on *M. schreibersi*, *M. myotis* and *M. emarginatus*. The former two host species were

caught in caves 0004 and 0051, and the latter in buildings number 0006 and 0071.

Affinities between species

Figure 1 shows the affinities between parasite species depending on host species.

A preliminary view enables identification of a large block of parasites which includes the first seven taxa arranged in the cluster. The first group is formed by *Eyndhovenia euryalis oudemansi* and *Paraperiglischus rhinolophinus*, with high affinity, followed by *Spinturnix plecotina* and *Ixodes vespertilionis*. The second group in this big block is formed by *Eyndhovenia euryalis euryalis*, *Nycteribia biarticulata* and *Eyndhovenia euryalis* subsp.

Remaining parasite taxa do not seem to be so clearly inter-related further than at level of small groups. Thus, *Basilia nana* and *Basilia nattereri* appeared very close. *Nycteribia schmidli* is also linked to *Spinturnix psi* but the affinity is lower. Finally, *Spinturnix myotis* and *Penicillidia dufouri* are not clearly included in any group, and *Argas vespertilionis* appears notably alone.

Figure 2 shows association between host species depending on their parasites. Affinity is low except for *P. pipistrellus* and *P. kuhlii*. The second group is constituted by *R. ferrumequinum*, *P. auritus* and *R. euryale*, and the third by *M. myotis*, *M. emarginatus* and *M. schreibersi* with lower affinity. Finally, *M. nattereri* appears alone.

Discussion

These data confirm the presence of five species and two subspecies of Gammasiids in Biscay, of which one species and one subspecies are recorded for the first time. Among them, *Eyndhovenia euryalis* is a typical parasite of horseshoe bats (genus *Rhinolophus*) in Europe, in which three subspecies have been described according to different measurements for different forms and morphological aspects related with the idiosoma, dorsal shield, seta, peritreme, tritosternum, sternal shield, and legs (UCHIKAWA & DUSBABEK, 1978): *E. euryalis euryalis*, *E. euryalis oudemansi*, and *E. euryalis cornuti*. Only the first two were found in this work. Regarding

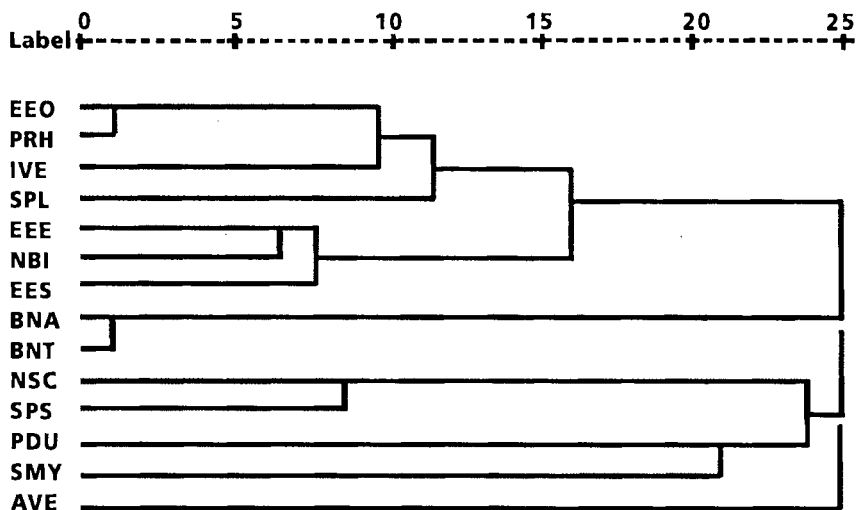


Fig. 1. Affinities between parasites species depending on the bat species they infest. (For abbreviations see table 1.)

Afinidades entre especies de parásitos dependiendo de las especies de murciélago que infestan. (Para las abreviaturas ver la tabla 1.)

the first, our data agree with previous works stating horseshoe bats are the usual host of *E. euryalis euryalis* in other countries of Europe and the Iberian peninsula, where it also occurs on *M. schreibersii* (DEUNFF, 1977; UCHIKAWA & DUSBABEK, 1978; PERIBÁÑEZ-LÓPEZ et al., 1989). However, *E. euryalis oudemansi* was found only on *R. ferrumequinum*. This also agrees with other authors' data for Europe and the Iberian peninsula (UCHIKAWA & DUSBABEK, 1978; PEREIRA, 1989; ESTRADA-PEÑA et al., 1991), and it differs considerably from the North African pattern, where *E. e. oudemansi* was also reported on *R. mehelyi* and *R. euryale* (ESTRADA-PEÑA et al., 1991).

Three species of genus *Spinturnix* were confirmed in Biscay *S. plecotina*, *S. myoti* and *S. psi*, whose presence was unclear from the bibliography available (ESTRADA-PEÑA et al., 1989; ESTRADA-PEÑA et al., 1991; CORDERO DEL CAMPILLO et al., 1994). On the first hand, horseshoe bats are new hosts for *S. plecotina* in the Iberian peninsula. *P. auritus* is its most usual host in Europe, although it occurs on *R. ferrumequinum*, *Eptesicus serotinus*

(Schreber, 1774), *Eptesicus nilssonii* (Keyserling et Blasius, 1839), *Nyctalus noctula* (Schreber, 1774), *Myotis nattereri*, *Myotis mystacinus* (Kuhl, 1817), *Myotis brandtii* (Eversmann, 1845) and *Myotis daubentonii* (Kuhl, 1817) (DEUNFF, 1977; ESTRADA-PEÑA et al., 1989; STANJUKOVICH, 1990). Furthermore, *Spinturnix myoti* was previously found in all checked *Myotis* species in the Iberian peninsula (ESTRADA-PEÑA et al., 1991), as well as in genera *Barbastella*, *Eptesicus*, *Vespertilio*, *Plecotus*, *Rhinolophus* and *Pipistrellus* in other European areas (DEUNFF, 1977; STANJUKOVICH, 1990). Lastly, *Spinturnix psi*, appears specific for *M. schreibersii*, and even individuals of *R. euryale* caught in the same roosts were free of it. This agrees with data from other authors in Europe (RUDNICK, 1960; BERON, 1971; DEUNFF, 1977; ESTRADA-PEÑA et al., 1989, 1991; PERIBÁÑEZ-LÓPEZ et al., 1993), and although this parasite has been found on *Pipistrellus*, *Rhinolophus* and *Myotis* bat species, these cases were considered occasional contamination (DEUNFF, 1977).

The last gammasid, *Paraperiglischrus*

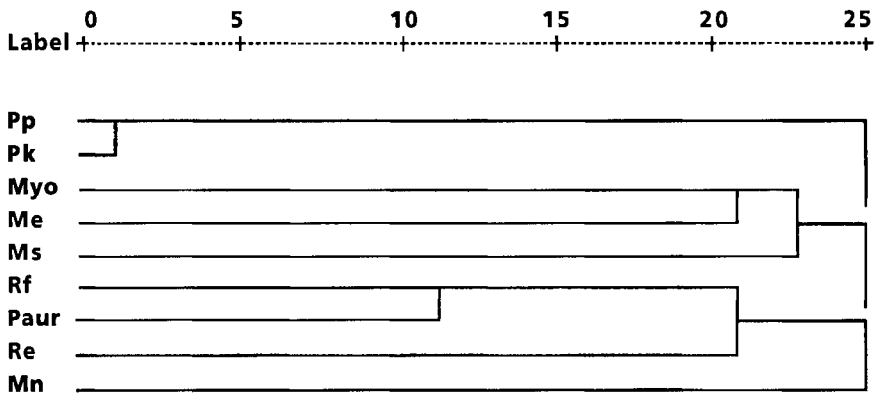


Fig. 2. Affinities between bat species depending on the parasite species they support. (For abbreviations see table 1.)

Afinidades entre especies de murciélago dependiendo de las especies de parásitos que soportan. (Para las abreviaturas ver la tabla 1.)

rhinolophinus, which was found only on *R. ferrumequinum* during this work, has been reported showing high specificity as a parasite of other horseshoe bats (DEUNFF, 1977; ESTRADA-PEÑA et al., 1989; CORDERO DEL CAMPILLO et al., 1994). Some lack of observations about this species could happen due to the more inexhaustive examination methods of lateral and wing membranes. Individuals of this species, mainly females and nymphs, prefer to be on tail membranes (DEUNFF & BEAUCOURNU, 1981).

Among Ixodida, *Ixodes (Eschatocephalus) vespertilionis* was reported previously occurring on *R. ferrumequinum* and *P. auritus* in Biscay (ESTRADA-PEÑA et al., 1989; CORDERO DEL CAMPILLO et al., 1994), where it does not seem to be an abundant species. *R. ferrumequinum* has been considered its main host in Europe, but it has been detected on several bat species, showing high infestation level in some cases (ARTHUR, 1963; BEAUCOURNU, 1967; HUTSON, 1971; ESTRADA-PEÑA et al., 1989; CORDERO DEL CAMPILLO et al., 1994). Although it had also been considered as a "winter species" (BEAUCOURNU, 1967) only five individuals were collected from February to June. No *Ixodes simplex* Neumann, 1906, was recorded. This parasite is widespread in Central and Eastern

Europe on *M. schreibersii* but is rare in the Iberian peninsula (ARTHUR, 1956; BEAUCOURNU, 1967; ESTRADA-PEÑA et al., 1991). *Argas (Carios) vespertilionis*, recorded for the first time in Biscay, is a widely distributed species (Europe, Asia and Africa), which prefers pipistrelle bats but can occur on all bat species except on horseshoe bats (BEAUCOURNU, 1961; CORDERO DEL CAMPILLO et al., 1994; DUSBABEK & ROSICKY, 1976). It can also occur on people in human buildings when no bat host is present (COLAS-BELCOUR, 1933; HOOSTRAAL, 1956).

Concerning batflies, the occurrence of *Nycteribia biarticulata* on *R. ferrumequinum* and *R. euryale* agrees with data from other countries, where this insect was also reported on other horseshoe bats, but mainly on these two species (THEODOR & MOSCONA, 1954; BALCELLS, 1968; KRISTOFIK, 1982; ESTRADA-PEÑA et al., 1991; CORDERO DEL CAMPILLO et al., 1984). In the same way, the high amount of *Nycteribia schmidli* found over *M. schreibersii* agrees with the general view that considers this batfly as a typical constituent of this bat parasite fauna, even if occasionally small numbers are found on other species (THEODOR & MOSCONA, 1954; KRISTOFIK, 1982; ESTRADA-PEÑA et al., 1991).

The first record of *Basilia nana* in Biscay and its occurrence on *M. nattereri*, agrees with previous knowledge about this parasite in the Iberian peninsula, where this bat species is its main host. It has also been recorded occurring on *Myotis bechsteini* (Bechstein's bat), *Myotis dasycneme* (pond bat), *Myotis blythi* (lesser mouse-eared bat), *Myotis myotis*, *Myotis emarginatus* (Geoffroy's bat), *R. ferrumequinum*, *P. auritus* as well as on *M. schreibersii* (THEODOR & MOSCONA, 1954; HUTSON, 1984). BEAUCOURNU (1961) noted *M. bechsteini* as its main host in Western France. On the other hand, the occurrence of *Basilia nattereri* together with *B. nana* on the same individual of *M. nattereri* shows an intermediate position between previous northern and southern records. In fact, *M. nattereri* is a common host of *Basilia nattereri* in Central Europe where it also infests other small *Myotis* bats and *E. serotinus* but on the Iberian peninsula this bat is usually parasited by *Basilia nana* (ESTRADA-PEÑA et al., 1991).

The last species, *Penicillidia dufouri*, is recorded first on *M. emarginatus* in the Iberian peninsula. It seems to be a nonspecific parasite, since it was previously recorded mainly on *M. myotis* and *M. blythii*, but also on other several species such as *M. nattereri*, *Myotis capaccini*, *R. mehelyi*, *R. euryale*, *R. ferrumequinum*, *E. serotinus* and *M. schreibersii* (FALCOZ, 1923; BALCELLS, 1968; KRISTOFIK, 1982; ESTRADA-PEÑA et al., 1991; CORDERO DEL CAMPILLO et al., 1994).

It is difficult to draw conclusions concerning the affinities between the parasite species and host species shown in figures 1 and 2 as there is an insufficient quantity of data available for many parasite and host species. In figure 1, the large block formed by the first seven taxa is related to parasites of horseshoe bats (genus *Rhinolophus*), though *Spinturnix plecotina* is known as parasite on several bat species, and its occurrence in this group can be an artifact (DEUNFF, 1977; ESTRADA-PEÑA et al., 1989; STANJUKOVICH, 1990). The highest affinity between *Eyndhovenia euryalis oudemansi* and *Paraperiglischrus rhinolophinus* reflects that they were recorded only on *R. ferrumequinum*, but only the former has a high specificity for this host, while the latter is a typical parasite of horseshoe bats (DEUNFF, 1977; ESTRADA-PEÑA et al., 1989; CORDERO DEL CAMPILLO et al., 1994). The same can be argued for *Eyndhovenia euryalis*

and *Nycteribia biarticulata*, which following our data can be identified as the parasite group of *R. euryale*, though they are also found also in other rhinolophids in Europe (THEODOR & MOSCONA, 1954; BALCELLS, 1968; DEUNFF, 1977; UCHIKAWA & DUSBABEK, 1978; KRISTOFIK, 1982; CORDERO DEL CAMPILLO et al., 1984; PERIBÁÑEZ-LÓPEZ et al., 1989; ESTRADA-PEÑA et al., 1991).

About the remainder, the only consistent group is formed by *Nycteribia schmidli* and *Spinturnix psi*, which are considered as the typical parasite fauna of *M. schreibersii* (THEODOR & MOSCONA, 1954; KRISTOFIK, 1982; ESTRADA-PEÑA et al., 1991). The higher affinity of *Basilia nana* and *Basilia nattereri* is explained by the scarcity of data. Even if they have only been found on *M. nattereri* during this work, they are known to occur on several bat species in Europe (THEODOR & MOSCONA, 1954; HUTSON, 1984; BEAUCOURNU, 1961). The same occurs with *Spinturnix myoti* and *Penicillidia dufouri*, which are not clearly included in any group. And the last case, *Argas vespertilionis*, which in this work was found only on *Pipistrellus*, can also be found on other vespertilionids but it shows preference for this bat genus (BEAUCOURNU, 1961; CORDERO DEL CAMPILLO et al., 1994; DUSBABEK & ROSICKY, 1976).

About the affinities between host species, the first group formed by *P. pipistrellus* and *P. kuhlii* and the high affinity it shows is a consequence of the ixodid *Argas vespertilionis*, which has a documented preference for this host genus (BEAUCOURNU, 1961; CORDERO DEL CAMPILLO et al., 1994; DUSBABEK & ROSICKY, 1976). The second group includes *M. myotis*, *M. emarginatus* and *M. schreibersii*, but it could be the consequence of data scarcity, specially about the first two bat species. In fact, the parasite species that can explain this grouping in our data is *P. dufouri*, and many host species have been recorded for it in previous works. Moreover, despite occasional cases, *M. schreibersii* has an own parasite fauna, including species such as *S. psi* and *N. schmidli*. Thus, we can suppose that more data about ectoparasites of *M. myotis* and *M. emarginatus* would change this grouping. The third group, formed by *R. ferrumequinum*, *P. auritus* and *R. euryale*, to be more clear, being a consequence of typical parasites of horseshoe bats such as *N. biarticulata*, *E. euryalis euryalis*,

and *S. plecotina*, which is the link between rhinolphids and *P. auritus*. Finally, the seclusion of *M. nattereri* must be explained in the same way as for the other *Myotis* species, as a consequence of the scarcity of data, and more information is needed before a clear view about their affinity pattern is obtained.

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Resumen

Ectoparásitos de quirópteros en Bizcaya (N península ibérica)

Durante un estudio de distribución de murciélagos se ha desarrollado un estudio sobre ectoparásitos de quirópteros en Bizkaia (N península ibérica). Se han examinado 160 hospedadores potenciales hallándose 664 parásitos. Estos fueron recogidos manualmente sobre murciélagos vivos mediante pinzas afiladas, y conservados en acetato de etilo para su posterior análisis microscópico. Una vez recogidas las muestras los murciélagos fueron puestos nuevamente en libertad. Los ectoparásitos recogidos pertenecen a 12 especies y 2 subespecies (tabla 1) (se han excluido de este trabajo los macronisidos e ischnpsillidos recogidos). Entre los gamásidos se han capturado *Eyndhovenia euryalis euryalis* y *Eyndhovenia euryalis oudemansi*, los cuales constituyen primeras citas para el área de estudio, *Spinturnix plecotina* citado por primera vez sobre *Rhinolophus ferrumequinum* y *Rhinolophus euryale* en la península Ibérica, y sobre *Plecotus auritus* en Bizkaia, *S. myoti*, *S. psi* y *Paraperiglischrus rhinolophinus*. Entre los ixódidos se aporta la primera observación de *Argas vespertilionis* en Bizkaia, y la primera de *Ixodes vespertilionis* sobre *Myotis nattereri* en la península Ibérica. Por último, entre los nictéribidos se han recogido *Nycteribia*

biarticulata, *N. schmidli*, *Basilia nana*, *B. nattereri* observado por primera vez sobre *M. nattereri* en Bizkaia, y *Penicillidia dufouri* primera cita en Bizkaia. También se comenta la afinidad entre especies de parásitos dependiendo de las especies de murciélagos que infestan (fig. 1) y la afinidad entre especies de murciélagos dependiendo de las especies de parásitos que soportan (fig. 2).

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