

## PARASITIC ZONOSSES IN SPAIN

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The veterinary surgeon is half-way between caring for the health of animals and that of humans. Whereas the doctor is involved with only one species, the veterinary surgeon has a broader scope, as he deals with a wider range of species. Therefore, he is in a better position to understand the nature of communicable diseases.

The importance of zoonoses lies in the fact that they are usually occupational diseases with far-reaching social effects. As far as Spain is concerned, by Decree number 792/61 of the Ministry of Labour, and Ministerial Order of the same Department of the 9th of May, 1962, the following diseases are considered to be occupational: anthrax, tetanus, leptospirosis, brucellosis, tularaemia, toxoplasmosis, tuberculosis and ancylostomiasis. As far as zoonoses are concerned, that list is by no means complete.

In Spain there exists an abundant literature about zoonoses and we shall be only concerned with those parasitic diseases which have so far been described in this country.

### 1. PROTOZOOSSES

A complete review of literature dealing with this topic concerning Spain, has been prepared by Cordero Del Campillo *et al.* (1974).

*Entamoeba histolytica* is common in the Mediterranean and South-Atlantic provinces, from Gerona to Huelva, with a few other scattered foci in Madrid, southern Galicia and Biscay. Naturally, sanitary measures have been carried out in the last few years, and incidence of parasitism has considerably fallen.

*Giardia lamblia* is common, with various foci situated in Granada, Valencia, Zaragoza and Madrid, although we feel certain that it must be even more abundant. It has been found in pigs and has been experimentally transmitted to rats and mice, but the carrying role of these animals is doubtful. Man is probably the principal host, together with the higher apes.

*Chilomastix granatensis* López-neyra and Suárez Peregrin, 1933 is a human parasite but, according to its discoverers, also possibly affects rats and rabbits. It is a typically Iberian species, the spread of which occurs through cysts, as happens with *Ch. mesnili*.

*Leishmania donovani* and *L. tropica* have both been found in Spain, in no fewer than 25 provinces. The greater incidence occurs on all Mediterranean and Andalusian



shores, but the disease is also present in both Mesetas, the Ebro and Guadalquivir valleys and Extremadura. Their distribution coincides exactly with that of their vectors (*Phlebotomus papatasi*, *P. perniciosus* and *P. sergenti*).

*Balantidium coli* is a common protozoon in Spanish pigs and also in anthropoid apes. Many human cases have been described in Spain. Apart from chance contagions, balantidiosis is considered a professional disease, common among pig-breeders.

The epidemiology of toxoplasmosis has been recently reviewed in Spain (Cordero Del Campillo, 1973). Pork, mutton and beef, in that order, cause most human contagions. Up to 43% of pigs examined in Spain have shown positive titers in some parts of the country. About 30-40% of sheep have antibodies. Cattle are not so important and neither is poultry. Reports of high positive incidences in Galicia, must be received with caution, as it is not clear whether it was a matter of *Toxoplasma gondii* or *Lankesterella* (= *Atoxoplasma* spp.).

For years, no connection has been established between *Sarcocystis lindemani* and *Isospora hominis* and *I. belli*. Anyway, recent papers by Boch (1973) and his coworkers Rommel and Heydorn (1974), have shown that *Sarcocystis* are muscular phases of Coccidia akin to *Isospora* spp. *Sarcocystis fusiformis* of cattle carries on its cycle in the human small intestine giving rise to oocysts similar to those which we have so far called *Isospora hominis*, a coccidian found for the first time in Spain by Vasallo Matilla (1971a). The relationship which there may be between these discoveries and other human coccidians akin to them, such as *Isospora belli*, about which Abril and Darriba (1935) published a report in Alicante, is unknown. Similarly, this discovery again poses the problem of the relationships between *Isospora hominis* and *Isospora bigemina*, the latter being a dog parasite, which Fantham (1917) considered as possibly one and the same species. In fact, Fayer and Leek (1973) and Mahrt (1973) have established the same cycle for *Sarcocystis fusiformis* in the dog and *vice versa* (dog-cattle).

*Malaria* is no longer a problem in Spain, although could be reintroduced, as the *Anopheles* spp which transmit it have not been eliminated.

*Pneumocystis carini*, whose protozoan nature is denied by some specialists, is now considered to be a fungus (Protophyta, Haplosporidia). There are at least three human cases on record in Spain, one of which was recently diagnosed in Santiago de Compostela (La Coruña) by Martínez Fernández (pers. com.).

## 2. HELMINTHOSES

### 2.1. Trematodoses

*Fasciola hepatica* infection is the most important trematodosis in Spain. It is also a ubiquitous parasite of mammals, whose distribution is becoming widespread as new irrigation projects have come about, allowing the spread of the intermediate host (*Lymnaea truncatula* and, under certain conditions, *L. palustris*).



Human contagion mostly occurs as a result of eating watercress (*Nasturtium officinale*) and other water plants (*Samolus valerandi*), salad foods etc. Dozen of cases have been described in Spain. The first one (fatal) was published by Martin de la Calle (1890). Since then, many others have also made reports. Undoubtedly, the most complete contributions are those of Gonzalez Castro (1947, 1948).

Human fascioliasis have been diagnosed at least in the provinces of Albacete, Avila, Barcelona, Castellón, Ciudad-Real, Gerona, Granada, Guadalajara, León, Lérida, Madrid, Orense, Palencia, Pontevedra, Salamanca, Segovia, Sevilla, Teruel and Zamora. We have personal experience of five cases in León.

*Dicrocoelium dendriticum* have been found in humans by López-Neyra (1947b) (one positive fecal find among 2,000 analyses) and Vasallo Matilla (1971), also by fecal examination; on the other hand, we lack information about the finding of flukes in the liver. Good information on this parasite is to be found in the paper written by Del Río Lozano (1967), in our laboratory.

*Opistorchis tenuicollis* (= *O. felineus*) was found in Bilbao by López Albo (1932). López Neyra (1947b) have also published a work on this trematode, which is to be considered rare in this country. Contagion is caused by eating undercooked fish. *Leuciscus* spp. in Córdoba, were found harbouring metacercariae by López-Neyra, (1947b).

López-Neyra and Guevara Pozo (1932) described some human fugacious cases, caused by what they thought was *Metagonimus romanicus*. Later, López-Neyra (1947b) corrected the diagnosis considering the agent to have been *Metagonimus yokogawai*, whose metacercariae have been found in the goldfish (*Carassius auratus*). It is rare in this country.

*Heterophyes* spp. have not been found in humans in Spain. However, López-Neyra (1947b) points out that he studied metacercariae of some *Heterophyes* sp. recovered from mullets (*Mugil* sp.)

There is evidence to show that bilharziosis existed in Spain during the Moorish domination and until a short while ago, the disease was considered present in the South of Portugal. López-Neyra (1947b) gathered information about human cases of foreigners or Spaniards who have spent part of their lives abroad. The agents were *Schistosoma haematobium* and *Sch. mansoni*. To them, there must be added *Sch. japonicum* in a Spaniard who had lived in Indonesia (Mulinas Sarrión, 1973).

However, it is not altogether clear that bilharziosis is absent from Spain. Two years ago, Cordero Del Campillo and Martínez Fernández (unpubl. data) diagnosed a human case in a Leonese, who had never left Spain. The case is backed up by photomicrographs (eggs) and, furthermore, it was confirmed by rectal biopsy at a clinic in Madrid, where it was treated satisfactorily. If to this we add the discovery of *Schistosoma bovis* in goats in Avila (Sánchez Botija, 1954) and above all, the work done by Simón Vicente (1969) and Ramajo Martín (1972) on cattle in Salamanca, where the role of *Planorbarius metidjensis* as an intermediate host was



demonstrated, we must be careful about excluding bilharziosis as a problem among humans here.

## 2.2. Cestodoses

### 2.2.1. Adult Tapeworms

*Diphyllobothrium latum* is uncommon in this country, the first data having been offered by García Solá (1884), although his diagnosis was one of fascioliasis, corrected later by López-Neyra and Grisoliá (1933). Guardiola Mira found another case in Granada and Pittaluga (cit. López-Neyra, 1947b) pointed out the existence of a few more in Asturias, Galicia, Aragón and Catalonia. Finally, between 1957 and 1963, from a total of 8,145 fecal analyses carried out, González Castro and Guevara Benítez (1966) discovered two new cases in Granada.

The rareness of this parasite in Spain is mainly due to the culinary habits of the people, who do not like undercooked freshwater fish. There can be no other explanation, as the deficiencies in sanitation would allow a wider spread of the eggs eliminated by man. Moreover, like species are just as common here, for example, López-Neyra (1947b) mentions that he frequently found plerocercoids in frogs from Granada. Lizcano Herrera (1958) found spargana in rabbits. Álvarez Pellitero (1973) has found plerocercoids in barbels in León. Lastly, Sáiz Moreno (1970) has also identified plerocercoids in pike taken from the Gasset Reservoir, in Ciudad-Real. More details about the life cycle of *Diphyllobothrium latum* and the most interesting species of fish involved may be found in works published by Sáiz Moreno (1956, 1970) and Cordero Del Campillo (1961).

*Dipylidium caninum* is a common tapeworm among dogs throughout the country, infection rates ranging from 4 to 48%. It occasionally occurs in children, Camacho Alexandre (1917) having described the first case in Spain.

*Hymenolepis nana* is especially widespread in the southern and eastern parts of the country, yet not so common in the north. The first cases were reported by López-Neyra and thereafter by S. de Buen and Luengo, the information being well summarized by López-Neyra (1944). This worm is frequently found in children of under 14. In affected areas between 1.1-4.0% of people are thought to be infected (up to 12% of children).

*Hymenolepis diminuta* is much less common in man, cases having been studied in Spain by S. de Buen (1914), in Mallorca, Puerta Díez-Canseco (1941) in Valencia and Guevara pozo and Domínguez Martínez (1955) in Granada, etc.

*Taenia solium*. There is a wide literature on the species, which has been grouped together by López-Neyra (1947a). It is to be found all over the country being especially common in rural areas. Bosch Millares and Gómez Bosch (1932) working in the Canary Islands, noticed that *Taenia solium* was to be found in 8% of cases, whereas *Taenia saginata* reached 13%. In Granada, González Castro y Guevara Benítez (1966) confirmed the situation, the proportion of *Taenia saginata* parasitism being 0.02%, as opposed to 0.2% for *Taenia saginata* in 8,145 fecal



analyses. Nevertheless, the reverse occurs in the northwestern mountainous districts, where pig cysticercosis is quite common. Fernández Fernández (1971) found 0.37% of 60,000 pigs studied in León to be infected. This figure agrees with the data of the Dirección General de Sanidad for the slaughterhouse at Mérida (Badajoz). In another part of Extremadura, however, percentages of between 10–15% have been recorded (Díaz Díaz, 1949). Talegón Heras (1961) gathered the following data: Murcia, 0.6%; Cádiz, 0.8%; Cáceres, 1.7%; Toledo, 1.2%; Tenerife, 2.3%; Madrid (1951–1955), 0.4–0.5%.

Some cases of brain cysticercoses have been reported (Fernández Nafria, 1955).

*Taenia saginata* is becoming more and more of a problem. Talegón Heras (1961) reported that, between 1953 and 1956, the rates of infection in cattle rose from 1.9% to 2.0%. Fernández Fernández (1971) found 0.29% of 53,000 head of cattle slaughtered in León to be infected. Human infection is low (0.2% in Granada and much less in other areas). (For general information see Sáiz Moreno, 1972).

### *Larval tapeworms*

In addition to cysticercoses, several human cases of *Coenurus cerebralis* infection have been reported in Avila, Madrid, Valencia and Alicante (Rodríguez Gallego, 1957). Doubtlessly, this is a rare parasitosis, but given that *Multiceps multiceps* may be very common among the dog population (8–21%), we must face up to reality. Infection is also rare in sheep (0.46%, Talegón Heras, 1961).

### Hydatid infection

In the Iberian Peninsula there is only one species: *Echinococcus granulosus granulosus*, as *E. intermedius* Lopez-Neyra and Soler Planas, 1943, seems to be only a variety. López-Neyra (1947b) and López-Neyra and Soler Planas (1944, 1945) review the abundant literature published in Spain.

Carda Aparici (1973) studying the incidence of human hydatidosis gives the figure of 6 cases per 100,000 people, as a mean. Nevertheless, its distribution varies largely from region to region: in both Castiles, Extremadura and western Andalusia the rate is very high (8–12/100,000), followed by the Ebro valley (6–8/100,000) and the rest of the country (1–6/100,000).

The most common sites of the infection are the lungs (over 50% of cases), followed by the liver (30–35%). It must be pointed out that about 3% of patients with signs of brain tumors, turned out to be suffering from encephalic hydatidosis. Obrador *et al.* (1960) found that among 1,700 patients operated on for brain "tumors", 2% harboured hydatid cysts.

While not regarded as such under Spanish law, hydatid disease in most cases must be considered occupational, the incidence being higher in the country than in the towns. The main reservoir for human contagion is the dog, and for the dog, sheep, followed by swine. Sáiz Moreno (1954, 1957), Pinedo (1962), González



Castro *et al.* (1962) and others may be consulted for geographic distribution in this country.

Echinococcosis is also an occupational disease for dogs: house dogs are the least affected (5.0–6.4%), followed by strays (10–17%), hunting dogs, butchers' dogs, sheep dogs etc. (20% onwards). In the worst affected districts figures of up to 24% may be encountered, and even higher figures have been known to occur (Ciudad Real, 40%; Avila, 30%; Teruel, 27%). The national average has been estimated as 12.6%.

Sheep are very commonly affected (60% of adult animals in Ciudad-Real; 70% in Soria; 40% in Logroño, 15.7% in Zaragoza etc), and up to 90% of their cysts are fertile in Spain. On the other hand, the national mean may appear low (1.18% Anonymous, 1949), but this is because the figures are obtained from slaughterhouses, where most of the animals killed are lambs. The mean rate of infection in swine has been given as 1.13% (*Ibid.*, 1949), although higher incidences are on record (8.5–8.7% in Logroño and Zaragoza, 4–5% in Segovia and Teruel etc).

Cattle are also frequently infected, but fortunately only a little more than 10% of their cysts are fertile in Spain. The incidence of hydatid disease in cattle differs substantially from that of sheep, according to the number of animals in any given area. In certain parts of Galicia, where cows are the main farm animal, sheep parasitization is relative low (Lugo, 8.4%), while cattle are more seriously affected (12.2% in Lugo). Yet, in basically sheep areas, where dairy cattle are kept near cities for convenience of milk production, high rates of infection have been found: 61% in Valladolid; 55.5% in Zaragoza; 30% in Ciudad Real. In these cases cattle act as biological indicators of dog infection.

Finally, it may be added that horses are without importance as far as the epidemiology of the disease is concerned. The same must be said for goats, as a result of the reduction in their numbers.

As far as prophylaxis is concerned, papers written by Carda Aparici (1973), Sáiz Moreno (1954, 1957, 1961) and Cordero Del Campillo (1973) may be consulted.

### 2.3. Nematodoses

#### Trichinellosis

The epidemiology of trichinellosis in Spain has been recently reviewed by Cordero *et al.* (1970). The principal source of infection for humans is pork, although the incidence of infection in swine is considered to be generally low (0.0007% in Spain). However, higher rates may be found in particular areas (0.21–0.43%). The most important source of swine infection is the rat, which in some places may have a very high rate of infection (7% in Madrid, García Izcara, 1927; 0.8% in Cáceres, Herrero Martín and Martín Calama, 1961; up to 42.2% in some foci in Ciudad-Real, Sáiz Moreno, 1957). Nevertheless, other mechanisms may be involved (refuse, offal etc). Dogs may also play some role in the synanthropic cycle, some animals having



being found infected in Córdoba (39%, Pozo Lora, 1963).

The sylvatic cycle of *T. spiralis* has been investigated in Asturias and León (Rodríguez García, 1964a, b, and Cordero *et al.* 1970). The following wild species have been found infected: badgers (*Meles meles*, 40%), genets (*Ginetta ginetta*, 38.8%), foxes (*Vulpes vulpes*, 31.6%), wild cats (*Felis sylvestris*, 31.5%), ferrets (*Putorius furo*, 25%), wolves (*Canis lupus*, 20%), and martens (*Martes martes*, 5.5%). Connections between sylvatic and synanthropic cycles have been observed.

Because of several serious epidemics towards the end of the last century, in 1879 a Royal Decree made microscopic inspection of pork compulsory, and this law remains in force. Although this measure has been largely successful, sporadic epidemics have occurred owing to illegal slaughtering.

#### *Larva migrans complex*

Infections by cutaneous larva migrans is mostly due to III stage larvae of *Ancylostoma caninum* which occurs in Granada, Madrid, Navarra, Barcelona, Asturias and León (López-Neyra, 1947a, b; Jiménez Millán, 1959, in 2.4% in cats in Madrid; Gállego Berenguer and Pumarola Busquets, 1950, in 26.5% of stray dogs in Barcelona; González Castro *et al.* 1962; Lizcano Herrera y Romero Rodríguez, 1969; Cordero Del Campillo and Rojo Vazquez, unpublished data, from Asturias).

Other like nematodes, such as *Uncinaria stenocephala* and *Bunostomum phlebotomum* are less important.

Visceral larva migrans infections by *Toxocara canis* and *Toxocara cati* are more frequently found. *Toxocara canis* is widespread in Spain, our personal experience at the Clinics of the Veterinary Faculty in León having demonstrated a rate of 40% in local dogs. *Toxascaris leonina* has been found in 25-35% of dogs in our University clinics. *Toxocara cati* is also present in the country, but is rarer. No cases of human Anisakiosis have been reported in Spain. However it is possible that it may have occurred without being diagnosed López-Neyra (1958) found *Anisakis typica* and *Anisakis phyteris* in Mediterranean dolphins (*Hiperoodon (Ziphius) cavirostris*). The same author had also found nematodes of the same group, such as *Contracoecum clavatum* in surmullets (*Mullus barbatus*) and hake (*Merluccius vulgaris*) in the Mediterranean. In the Cantabrian Sea, Madariaga De La Campa (1970) found *Contracoecum lophii* and *C. auctum* in the angler fish (*Lophius piscatorius*) and Pardo (1917) what he called *Ascaris clavata* (= *Contracoecum clavatum*) in pout (*I. luscus*).

Lastly, there may be added some rare cases of visceral larva migrans caused by *Capillaria hepatica* (= *Eucoleus hepaticus*), which is a common parasite of rats, mice, rabbits, hedgehogs, dogs etc. in Spain (López-Neyra, 1947b; Gállego Berenguer y Puramola Busquets, 1952; Vasallo Matilla, 1961).

#### Filariosis

Lopez-Neyra (1953) summarized the information on filariosis in Spain, showing



that *Dirofilaria repens* infection is the commonest of the type originating from animals. Several human cases have been reported by López-Neyra and Balcázar Rubio (1951), López-Neyra and Arandes Adán (1953), López-Neyra (1955). As is common practice in medical papers, the description has been given under the name of *Dirofilaria conjunctivae*. *Dirofilaria immitis*, *Setaria equina* and *Thelazia rhodesi* are not uncommon in animals, but up to now no human cases have been recorded.

#### 2.4. Acantocephaloses

The same applies to *Moniliformis moniliformis* (Jiménez Millán, 1960), and *Macracanthorhynchus hirudinaceus* (Cordero Del Campillo, 1967).

### 3. HIRUDINOSIS

*Hirudo medicinalis* and *H. troctina* abound in southern Spain, attacking the skin of both animals and man. The same is true for *Placobdella catenigera*. *Limnatis nilotica* and *Haemopsis sanguisuga* are widespread in southern and eastern districts, where they also attack the mucous membranes of animals and man. They are popularly called "donkey leeches" (Blanchard, 1893; Rivas Mateos, 1901; López-Neyra, 1947b).

### 4. ARTHROPODOSES

#### 4.1. Pentastomidoses

*Linguatula serrata* (= *L. rhinaria*) abound in dogs, their larval and nymphal stages being frequently found in mesenteric lymph glands and lungs of cattle and sheep (Ruiz Prieto, 1951). González De La Vega *et al.*, (1949, 1962) reported two human cases of lung infection, which he diagnosed by means of X-rays.

#### 4.2. Acariosis

Fugacious scabies have been observed in humans in contact with animals. In the old days they were not uncommon among cavalymen, and even to-day they are by no means rare in people who work with camels in the Canary Islands and the Spanish Sahara.

*Ornithodoros erraticus* (= *O. maroccanus*) exists in western and southern Spain, where it plays an important role as a reservoir for *Borrelia hispanica* (S. de Buen, 1933; Munoz Cosín, 1953) and the African swine fever virus. *O. coniceps* invades doves and sometimes attacks man. Occasionally, *Argas persicus* and *A. reflexus* attack man too.

*Ixodes ricinus* and similar species, may also affect man.

#### 4.3. Insecta

##### 4.3.1. Myiasis

Gil Collado (1956, 1960) carried out a magnificent review of Diptera in Spain. Apart from its zoological interest, his publication is also of great importance to the physician because the classification is arranged according to the site of infections:



## —Traumatic myiasis

*Fannia canicularis*, *Megaselia ruftipes*, *Chrysomia albiceps*, *Phormia regina*, *Calliphora*, *Lucilia*, *Phoenicia*, *Sarcophaga* and *Musca* spp., *Wohlfartia magnifica*, *Muscina stabulans* and *Stomoxys calcitrans*.

## —Nasal, oral and sinus myiasis

*Wohlfartia magnifica*, *Sarcophaga carnaria*, *Piophilha casei*, *Calliphora vomitoria* and *Musca domestica*.

## —Ocular myiasis

*Gasterophilus intestinalis*, *Oestrus ovis*, *Rhinoestrus purpureus*, *Hypoderma* sp., *Megaselia scalaris*, *W. magnifica* and *Sarcophaga carnaria*.

## —Otomiasis

*Oestrus ovis* and *W. magnifica*.

## —Anal and vaginal myiasis

*W. magnifica*, *Sarcophaga carnaria* and *Sarcophaga haemorrhoidalis*.

## —Urinary myiasis

*Fannia scalaris*, *F. canicularis*, *Musca domestica*, *Th. fusca*, *Psychoda albipennis* and *Telmatoscopus meridionalis*.

## —Furuncular myiasis

*Hypoderma* spp.

## —Migratory myiasis

*Hypoderma* spp., *Hypoderma diana*, *Gasterophilus haemorrhoidalis* and *G. intestinalis*.

## —Intestinal myiasis

*Psychoda alternata*, *Phryne fenestralis*, *Fannia scalaris*, *F. canicularis*, *Tubifera* sp., *Drosophila* sp., *Piophilha casei*, *S. haemorrhoidalis*, *Calliphora* sp., *Muscina stabulans* and *Stomoxys calcitrans*.

In other interesting papers there are set out: list of Iberian Muscidae by Peris Torres (1945); differentiation between III stage larvae of *Lucilia* and *Calliphora* spp. by Guevara Pozo and Gómez Fernández (1955); description of tabanidae and Calliphoridae found in the Pyrenean part of Huesca and Lérida by Leclercq (1970, 1971).

As far as specific cases are concerned, Gállego Berenguer (1955) described the first one in Spain—and perhaps in the world—of human infestation, in a man's urethra caused by *Telmatoscopus meridionalis*. There are furthermore, abundant reports of *Wohlfartia magnifica* infestations. Nájera Angulo (1935) and Macias y Macias (1935), both claimed to have described the first Spanish case of otomyiasis. Later, Nájera Angulo (1942) went to describe a case of ocular myiasis by *W.*



*magnifica* and López-Neyra and Santiago Estévez (1949) reported one of urethromyiasis caused by larvae of the same fly.

Spanish Oestridae have been described by Gil Collado (1955). Among papers dealing with human infestations we may cite those of Perez Bufill (1918) on queratoconjunctivitis caused by *Rhinoestrus nasalis* (= *Rh. purpureus*); Gómez Fernández's (1946a) critical revision of Spanish cases of ophthalmomyiasis caused by *Oestrus* and *Rhinoestrus* spp. and his later work (1955) on 19 Spanish cases of occulo-nasal myiasis provoked by *Oestrus ovis*. Other cases have been recorded by García Garrido and Medina García (1946) and Guevara Benítez *et al.* (1971).

On *Hypoderma* spp. there are many published works available, Gómez Fernández's paper (1946b) being especially worthy of mention because of its summary of human cases of *Hypoderma bovis* infestation in this country. Other papers dealing with subcutaneous (Sanjurjo Díaz, 1946), and ocular (Gómez Fernández, 1946b); Forniellés Ulivarri and Gil Collado (1962) infestation by *Hypoderma bovis* maggots have also been published.

#### 4.3.2. Other Insecta of especial importance to Spain

As a good general book on insecta and acari of domestic animals and man we recommend Gil Collado's work (1960). Important papers have also been written by: Gil Collado (1930, 1937, 1938, 1940) and Lozano Morales (1944) on Spanish Anopheline; Torres Canamares on Anopheline and Psocodidae of Cáceres (1932) and Culicidae (1944); Nájera Angulo (1943b) on Aedinae; Fernández (1946, 1951) on Anophelinae in the Canary Islands; Clavero Del Campo and Romero Viamonte (1948) on the distribution of *Anopheles* spp. in Spain; Romero Viamonte (1950) on Anophelinae in Spain and the old Moroccan Protectorate; Gil Collado (1957) on the Heleidae (= Ceratopogonidae); Contreras Pozas (1971) on Culicidae in Guipúzcoa, etc.

On Phlebotomi much has also been written. Pittaluga and S. De Buen (1917, 1918), Torres Cañamares (1932), Nájera Angulo (1939, 1943), Zariquey Alvarez (1944), Prada (1947) and Vives Sabater (1954a, b, 1958) have all studied Spanish species and their distribution within the country. There are also foreign papers dealing with Spanish Phlebotomi, the most modern of which is that by Rioux *et al.* (1974) which summarizes the topic well.

On Simuliidae, Gil Collado (1962) also affords a good summary.

The Brachycera-Tabanidae have been studied by Gil Collado (1960), Codina (1921) and most recently by Leclercq (1970), the last two of which papers deal with northeastern Spain.

Lastly, fleas have called the attention of Gil Collado who studied those Spanish species (1948) and specifically those affecting rodents (1949).

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