

Phthiraptera from some wild carnivores in Spain

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Abstract

During 1987 and the first months of 1988, several carnivores were surveyed for ecological studies by means of radio-tracking techniques and in order to identify the ischnoceran species parasitising these animals. The hosts belonged to the following species: *Felis pardina*, *Felis silvestris*, *Herpestes ichneumon*, *Genetta genetta*, *Vulpes vulpes* and *Meles meles*. While no lice were found on the two first species, the remaining ones were parasitised by *Felicola* (*Felicola*) *inaequalis*, *Loricicola* (*Paradoxuroecus*) *genettae* n. comb., *Felicola* (*Suricatoecus*) *vulpis* and *Trichodectes* (*Trichodectes*) *melis*, respectively. Descriptions of these species are included.

Introduction

The original description of *Felicola* (*F.*) *genettae* Fresca by Fresca (1924) was inadequate by modern standards, and the most recent full descriptions of the others dealt with in the present study are in Werneck (1948) which is no longer readily available. For these reasons we have redescribed the species in this paper.

The family Trichodectidae includes 351 phthirapteran species and subspecies, all of which parasitize mammals (Lyal, 1985). These share a set of morphological features which distinguish them from other ischnoceran species, such as the presence of three-jointed antennae and tarsi bearing a single claw.

A few papers on trichodectids have appeared in the Spanish literature. Fresca (1924) described the specimens (a male and a female) collected on a common genet (*Genetta genetta*) from Northern Spain, and named them *Eurichophilus genettae*.

Martin Mateo (1977) studied, amongst other species, *Trichodectes* (*T.*) *melis* and *Felicola genettae*. These, together with three more parasites of *Mustela nivalis*, *Felis catus* and *Canis familiaris*, appeared in Cordero del Campillo *et al.* (1978) as parasites of carnivores in Spain. Soler *et al.* (1989) recorded *F. (F.) inaequalis* in Spain on the basis of three adult females and seven nymphs from a male mongoose (*Herpestes ichneumon*) from Córdoba. In this paper morphological features exhibited by females belonging to this species are briefly summarised.

Nitzsch described the genus *Trichodectes* in 1818. In 1902 Newmann described two ischnoceran species. One of these was *T. acuticeps*, found on a genet in Abyssinia. In 1929 Ewing described the genus *Felicola* (see Lyal, 1985). Bedford (1932) studied the trichodectid species on several African carnivores, and noted the variability in the number of abdominal spiracles in these species, questioning the generic significance

of this feature in trichodectids. In this paper, he also described the genus *Suricatoecus* and designated the male holotype of *F. rammei* Stobbe, 1913, now a synonym of *F. (F.) inaequalis*. The genus *Loricicola* was described by Bedford in 1936 (Lyal, 1985). Conci (1942) established the subgenus *Paradoxuroides* (see Lyal, 1985). Werneck (1936, 1948) carried out a large study on lice from mammals. Amongst the species he studied were *Trichodectes melis* (specimens collected on *Meles meles* from several European countries, *M. chinensis* from China and *Erinaceus europaeus* from Italy), *Suricatoecus vulpis* (on material from Europe, India and North America) and *Felicola inaequalis* (specimens collected on species belonging to genus *Herpestes*). This author considered *S. vulpis* as an intermediate form between the type-species of the genera *Trichodectes* and *Felicola*. With regard to *F. genettae*, he only made some observations on Fresca's description as he was unable to examine material belonging to this species. *F. inaequalis* was also studied by other authors (Hopkins, 1948; Emerson & Price, 1972) on African material. Emerson (1972) recorded *Suricatoecus vulpis* on *Vulpes fulva* as an American parasite. Rekasi (1979) found *T. melis* in Hungary. In 1986 Beaucournu & Aubert included *T. melis* and *F. vulpis* amongst other species in a study of the Trichodectidae on wild carnivores in France. In 1985 Lyal devised a general key for this lice family. In his paper a complete taxonomic history of the Trichodectidae is given. In 1987 this author studies the co-evolution of trichodectid species and their hosts by means of a cladistic analysis.

According to Honacki *et al.* (1982) the distributions of hosts on which lice are found are as follows. *Herpestes ichneumon* is distributed throughout Africa, the Middle East as far as southern Turkey and southwestern Liberian Peninsula. *Genetta genetta* occupies North Africa, Portugal, Spain (including the Balearic Islands) and France (to the west of the Loire and Rhone rivers). *Vulpes vulpes* is a Holarctic canid distributed throughout Europe, continental Asia (excepting the tundra), northern India, continental Indochina, Japan, North Africa and much of North America. *Meles meles* has a Palaearctic distribu-

tion extending from southern Siberia to Israel. It is also present in China, Korea, Japan, Ireland, Great Britain, Crete and Rhodes.

After noting the relative confusion with regard to the terminology used by the authors consulted (mainly involving the pieces of the copulatory apparatus and gonapophyses), we have adopted that proposed by Lyal (1985).

Materials and methods

A total of 256 lice specimens, including both adults and juvenile forms, were collected from 38 sampled hosts in southern Spain. An adult male of *Herpestes ichneumon* was found in Córdoba, and three wildcats (*Felis silvestris*) came from the Sierra Morena Mountains (Jaen). The remaining host specimens were collected in the Doñana National Park.

The animals were trapped and immobilised before study. The lice collected were taken to the laboratory and examined as described in Soler *et al.* (1979).

Cephalic index (Ce. I.)

$$= \frac{\text{Cephalic length (Ce. L.)}}{\text{Cephalic width (Ce. W.)}}$$

Corporal index (Co. I.)

$$= \frac{\text{Total length (To. L.)}}{\text{Abdominal width (A. W.)}}$$

Felicola (Felicola) inaequalis (Piaget, 1880) (Figs 1-4, 16-17)

Type-host: *Herpestes ichneumon* (L.)

Material studied

45 adult specimens (24 males and 21 females) and 83 nymphs. 15 mongooses were surveyed: 6 males (5 adult and one juvenile) and 9 females (6 adult and 3 immature). Lice were found on 10 of these animals. Almost all lice specimens were found in the ventral zone of the hosts, especially on the axillas and the inguinal regions.

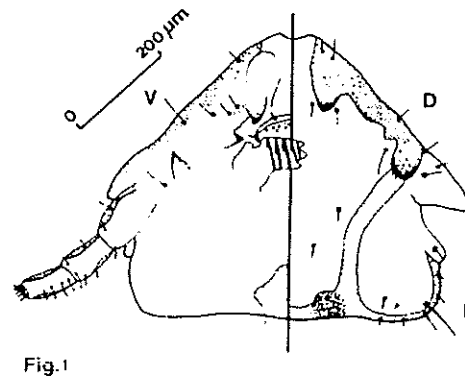
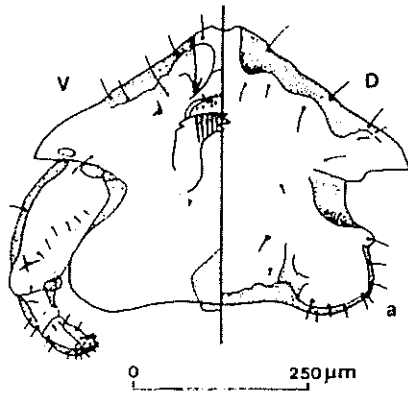


Fig. 1

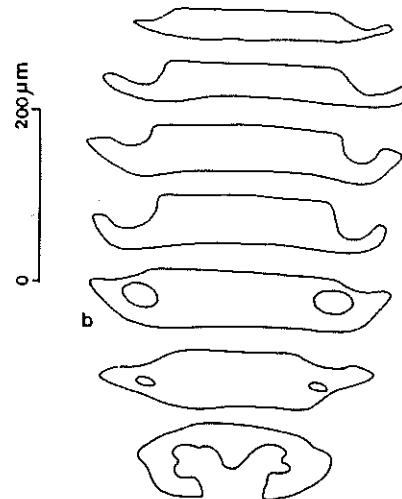
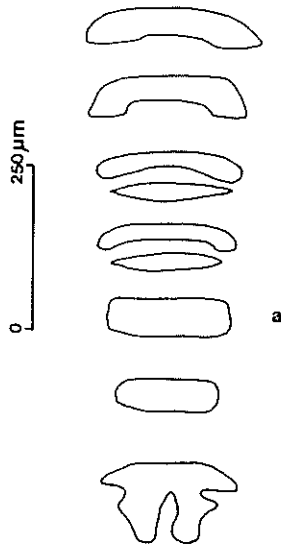


Fig. 2

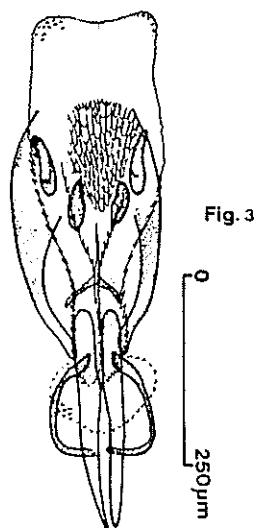


Fig. 3

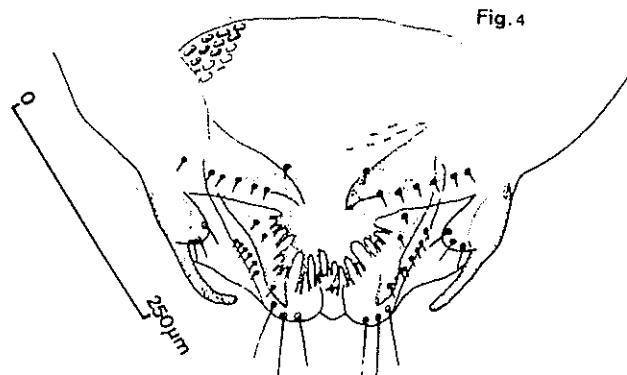


Fig. 4

Figs 1–4. *Felicola (Felicola) inaequalis*. 1. Head: a, male; b, female; V, ventral; D, dorsal. 2. Abdominal tergites: a, male; b, female. 3. Male genital apparatus. 4. Female genital region.

Description

Head pentagonal (Fig. 1). Clavi more prominent in males than in females. Male antennae more robust with scape markedly developed with respect to remaining articles, and flagellum bears 3 non-articulated teeth. Female antennae filiform. Thorax shows no important variations from other ischnoceran species.

Abdomen piriform in males and oval in females; bears 3 pairs of respiratory spiracles on segments III–V. Fig. 2 shows abdominal tergites: in male, those corresponding to segments V and VI are divided into anterior and posterior plates. Male copulatory apparatus (Fig. 3) bears characteristic endophallus with large number of spines. Parameres long and robust, with tapered end. Mesomeres thin and curved, in some cases fusing apically. Female genital region as depicted in Fig. 4. Gonapophyses long, thin and curved with acuminate posterior ends: each one of these has inner lobe bearing 3 setae. Subgenital lobe not bifurcate in its terminal region and appears "branched".

Table I presents biometric data from the specimens studied.

Loriscicola (Paradoxuroecus) genettae (Fresca, 1924) n. comb. (Figs 5–8, 18–19)

Type-host: *Genetta genetta* (L.).

Material studied

Three adult specimens (one male and 2 females) collected from the dorsal region of a genet.

Description

This is a small sized species (Table I). Shape of head similar in both sexes, with exception of frontal region, which is straight in males and rounded in females (Fig. 5). Antennal flagellum in male bears 2 non-articulated teeth. Occipital region shows characteristic sinuous shape (Fig. 5). Spiracles absent on oral abdomen. Tergites as shown in Fig. 6. In males, tergites of segments III–VII

Table I. Biometry of specimens studied (in micrometres)

	<i>F. (F.) inaequalis</i>			<i>L. (P.) genettae</i>			<i>F. (S.) vulpis</i>			<i>T. (T.) melis</i>			<i>Females (n = 48)</i>		
	Males (n = 24)	Min	Max	Males (n = 1)	Females (n = 2)	Min	Max	Females (n = 3)	Min	Males (n = 18)	Min	Max	Min	Max	Min
Cephalic length (C.L.)	408	345	380	317	340	321	331	354	378	386	528	504	516	572	516
Cephalic width (C.W.)	558	493	530	373	401	389	395	448	495	509	833	784	811	938	838
Cephalic index (C.I.)			0.72				0.84								
Thoracic length (T.L.)	258	211	237	145	167	155	161	181	181	185	352	298	335	347	267
Thoracic width (T.W.)	410	385	399	260	350	331	341	404	457	465	610	551	583	692	624
Abdominal length (A.L.)	1.032	910	972	610	866	838	852	793	943	908	1.117	1.013	1.058	1.260	1.053
Abdominal width (A.W.)	671	617	644	434	570	558	564	605	781	762	1.056	950	1.013	1.304	1.114
Total length (To.L.)	1.684	1.497	1.590	1.072	1.361	1.326	1.344	1.328	1.530	1.496	1.978	1.826	1.909	2.132	1.881
Corporal index (Co.I.)			2.47				2.38						1.88		1.66

Fig. 5

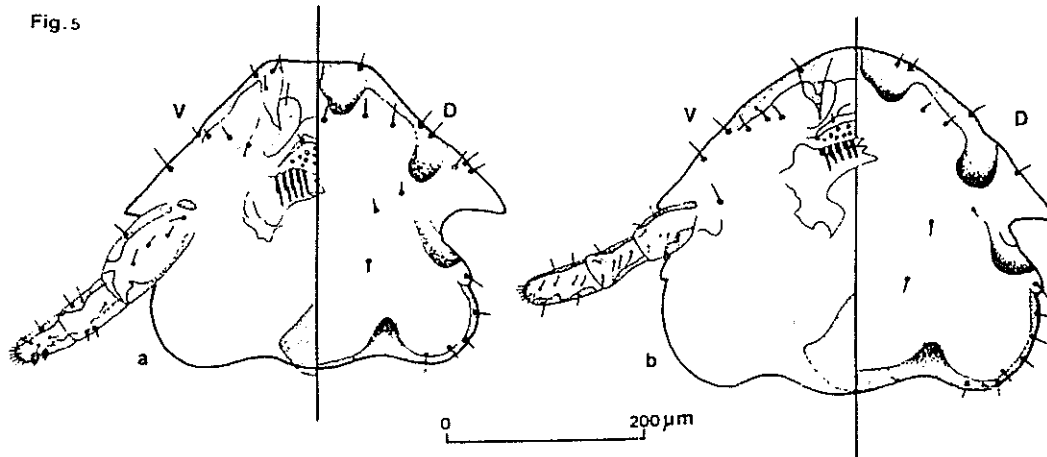


Fig. 6

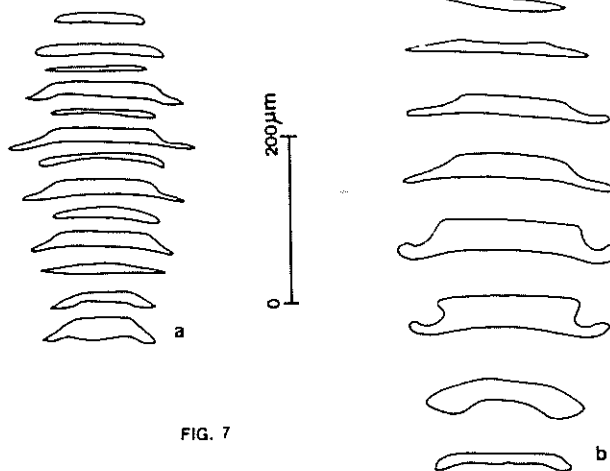
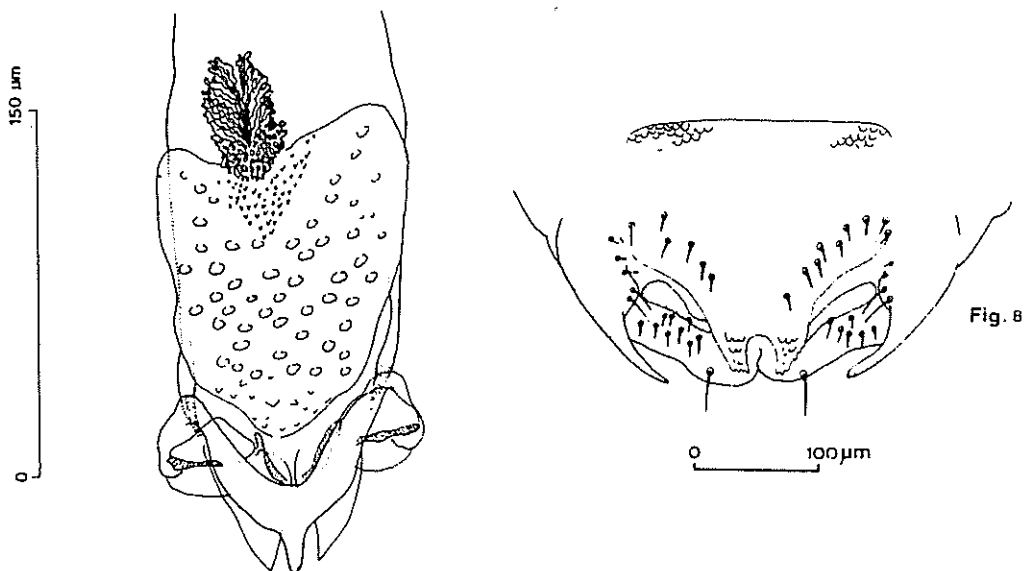
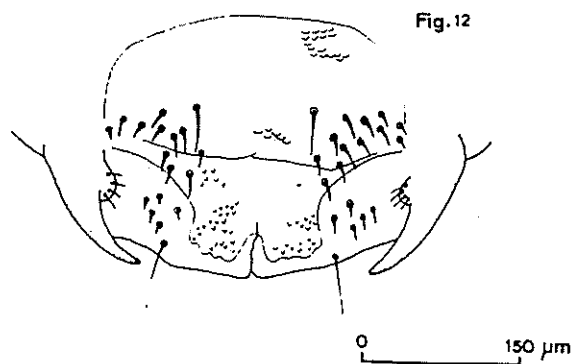
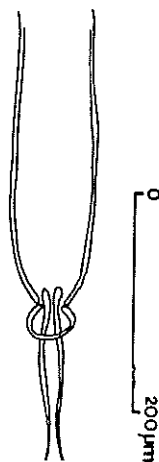
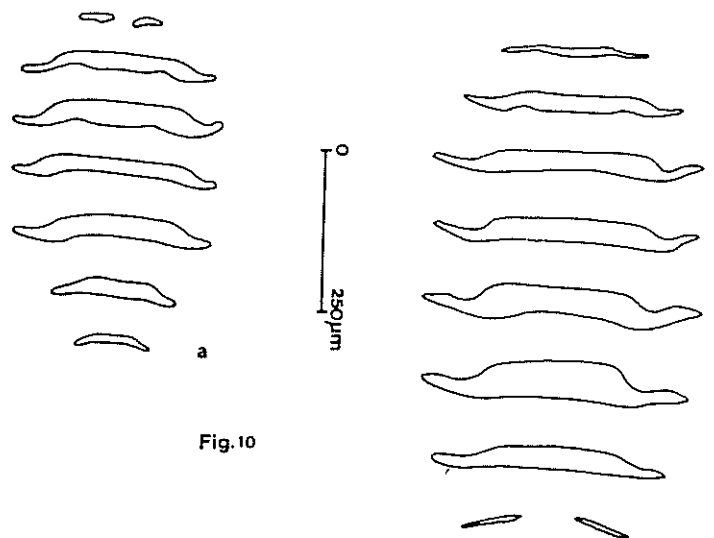
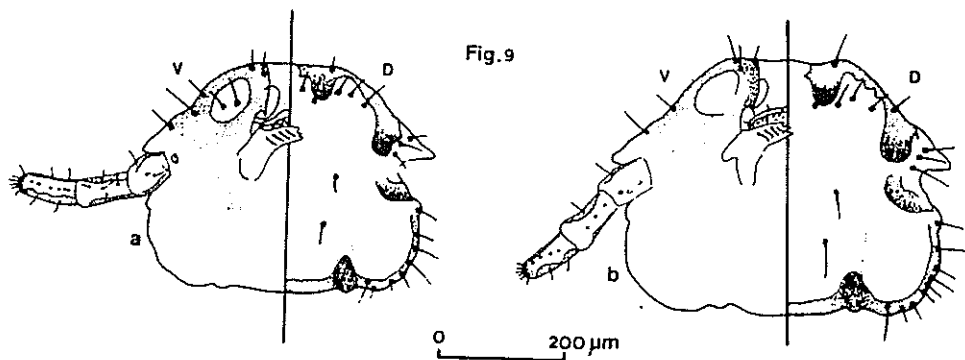


FIG. 7



Figs 5-8. *Loricicola (Paradoxuroecus) genetae*. 5. Head: a, male; b, female; V, ventral; D, dorsal. 6. Abdominal tergites: a, male; b, female. 7. Male genital apparatus. 8. Female genital region.



Figs 9–12. *Felicola (Suricataeacus) vulpis*. 9. Head: a, male; b, female: V, ventral; D, dorsal. 10. Abdominal tergites: a, male; b, female. 11. Male genital apparatus. 12. Female genital region.

appear divided into anterior and posterior plates. Copulatory apparatus as shown in Fig. 7. Mesomeres fused apically. Median extension of mesomeral arch present. Male gonopore surrounded by spicular patch. Parameres triangular and acuminate.

Fig. 8 illustrates chaetotaxy and morphology of female genital region. In inner lobe of gonapophyses several setae of different length are inserted. Subgenital lobe clearly divided posteriorly, bearing overlapping scales.

Comment

Loricicola (Paradoxuroecus) genettae can be distinguished from *L. (P.) acuticeps* by the curved exterior margins of the parameres, the shape of the abdominal tergites and the overall shape of the abdomen.

Felicola (Suricatoecus) vulpis (Denny, 1842) (Figs 9–12, 20–21)

Type-host: *Vulpes vulpes* (L.).

Material studied

Four adult specimens (one male and 3 females) and 10 nymphs from a fox. Five of these canids were sampled. Lice were found on both dorsal and ventral regions of the host body.

Description

Head shape similar in both sexes (Fig. 9). Frontal margin straight, although osculum appears slightly more marked in females. Antennae filiform in both sexes. In males no teeth seen on flagellum. In occipital region small lateral protuberances present near temples. Mesothoracic spiracles larger than those in other species studied. Abdomen with 3 pairs of spiracles. Fig. 10 illustrates shape of abdominal tergites. Male abdomen ends in terminal protuberance (as simple lobe). Copulatory apparatus (Fig. 11) with narrow basal apodeme; mesomeres narrow, curved, fusing to form structure which surrounds anterior portion of parameres dorsally; parameres long and narrow. Female

genital region (Fig. 12) with characteristic chaetotaxy. Subgenital lobe bifurcate and rectangular posteriorly. Gonapophyses often bear 4 setae.

In Table I biometric data from the material studied are shown.

Trichodectes (Trichodectes) melis (Fabricius, 1805) (Figs 13–15, 22–23)

Type-host: *Meles meles* (L.).

Material studied

Two adult badgers were sampled, a male and a female. Lice were connected from both animals: 66 adult forms (18 males and 48 females) and 55 nymphs. Practically all body regions on the hosts were occupied by these ectoparasites.

Description

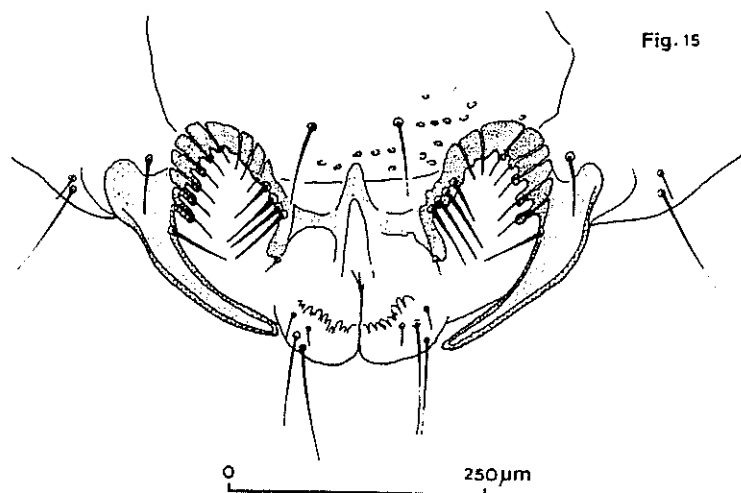
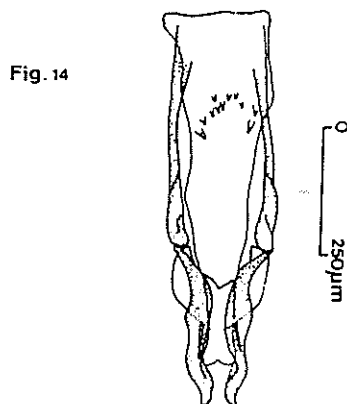
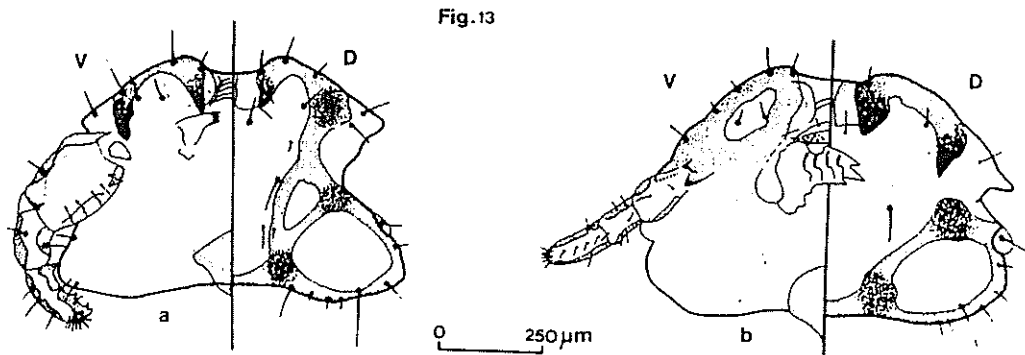
Head characteristically shaped (Fig. 13), being more angular in male, mainly at level of temples. In this sex antennae strongly developed, with flagellum bearing 4 teeth. In both sexes head wider than long with clear osculum. Abdomen lightly sclerotized in both sexes and nearly round in shape. Abdomen with 6 pairs of spiracles. In males rectangular protuberance seen at posterior end of abdomen. Copulatory apparatus as shown in Fig. 14 with long parameres. Endophallus bears typical spinulation. In Fig. 15 both chaetotaxy and sclerotization of female genital region are shown. Presence of tuberculate setae in inner anterior margin of gonapophyses also visible.

Table I gives the biometric data of this species.

Discussion

The subgeneric determinations used herein follow those of Lyal (1985). The differentiating features of *Felicola (Felicola)* and *F. (Suricatoecus)* can be summarized as follows:

(1) In *Felicola*, non-articulated teeth on the male antennal flagellum, numbering 1, 2, 3 or 4 if pre-



Figs 13–15 *Trichodectes* (*Trichodectes*) *melis*. 13. Head: a. male; b. female; V. ventral; D. dorsal. 14. Male genital apparatus. 15. Female genital region.

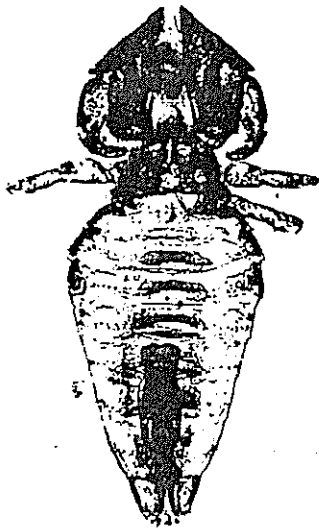
sent; and in *Suricatoecus*, 1 or 3 teeth articulated basally to the flagellum, or teeth absent.

(2) Gonapophysial lobe never rectangular in *Felicola*; in *Suricatoecus* sometimes rectangular.

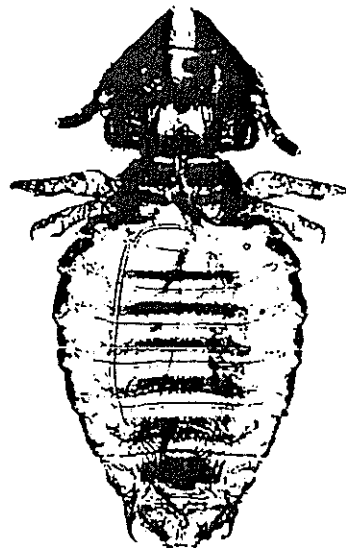
(3) In both subgenera, subgenital lobe can be bifid. If bifid, margins are sometimes rectangular in *Suricatoecus*, but never in *Felicola*.

(4) The number of abdominal spiracles may be a

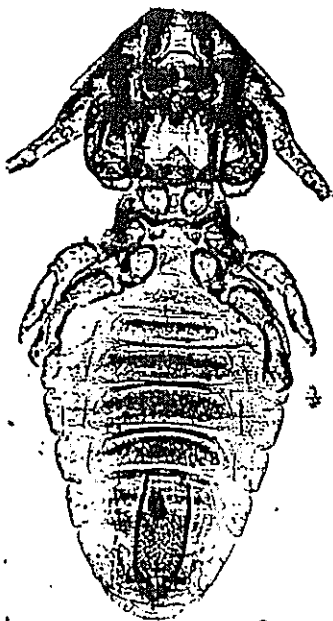
16



17



18



19



Figs 16–19. 16. *Felicola (Felicola) macqualis*. Male. 17. *F. (F.) inaequalis*. Female. 18. *Loricicola (Paradoxiroecus) genettae*. Male. 19. *L. (P.) genettae*. Female.

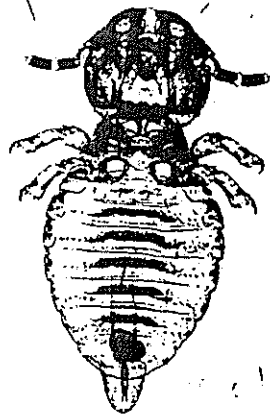
differential feature between these taxa: 0, 2 or 3 in *Felicola*, and 0, 1 or 3 in *Suricatoecus*.

(5) In *Suricatoecus*, abdominal tergites never appear divided into anterior and posterior plates.

Fresca's description of *Eurichophilus genettae*

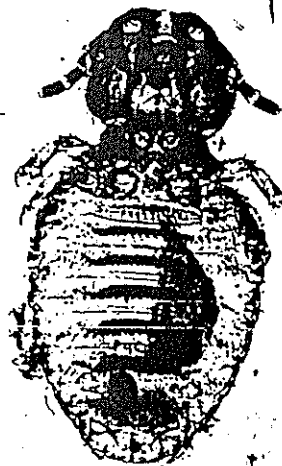
(= *Felicola genettae*) is inadequate in that it doesn't provide sufficient information on features with taxonomic importance, such as the shape of the abdominal tergites. The female "abdominal appendages" (gonapophyses) are described as

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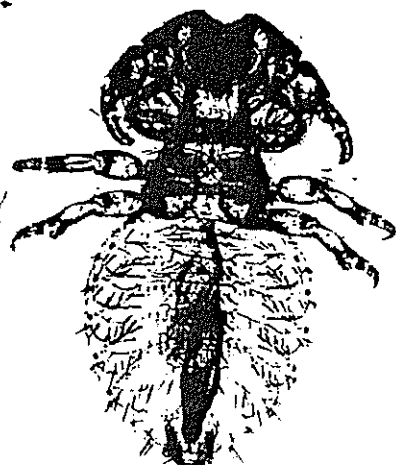
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21



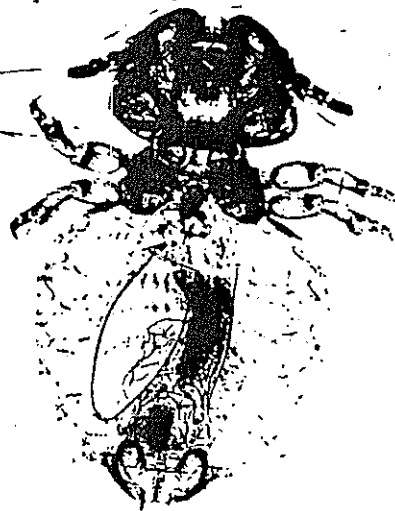
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23



0 300 μ m

Figs 20–23. 20. *Felicola* (*Suricatoecus*) *vulpis*, Male. 21. *F. (S.) vulpis*, Female. 22. *Trichodectes* (*Trichodectes*) *melis*, Male. 23. *F. (T.) melis*, Female.

long, thin and curved. The copulatory apparatus is described as follows: "... basal plate wide; with margins convex, slightly curved, poorly thickened and bearing a large number of short and

thick teeth. Parameres long and angulate at level of their insertion. There is an "V"-shaped hypomere". The last structure described is the apically-fused mesomeres (mesomeral arch). These

specific morphological features, as well as the shape of head and abdomen in both sexes, coincide with those exhibited by our specimens.

Further details of this species are given by Martín Mateo (1977): head pentagonal, abdominal tergites present, abdominal spiracles absent, presence of a lobe in the inner margin of the gonapophyses, and marked sexual dimorphism with regards to antennae; photographs are also included. The specimens collected by us on *Genetta genetta* agree with Martín Mateo's description and are similar to those appearing in the photographs. Although not conclusive, this evidence has led us to identify our specimens as *Loricicola* (*Paradoxuroecus*) *genettae*. This new combination is supported by the following features: the presence of a median extension on the mesomer al arch (never found in *Felicola*), a spicular patch surrounding the male gonopore and a female subgenital lobe with overlapping scales (never found in *Felicola*) (Lyal, 1985).

With regard to the subgenus *Trichodectes*, the following features are worth pointing out: two or four basally articulated teeth on the male antennal flagellum, abdominal pleurae without projections and tergites generally unsclerotised.

Acknowledgements

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