

## NEW FINDINGS ON THE HELMINTH FAUNA OF THE COMMON EUROPEAN GENET (*GENETTA GENETTA* L.): FIRST RECORD OF *TOXOCARA GENETTAE* WARREN, 1972 (ASCARIDIDAE) IN EUROPE

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### SUMMARY

The helminth fauna of fifteen specimens of *Genetta genetta* L. (Carnivora : Viverridae) from Northwest Spain was studied. Two species were found: *Taenia parva* (80 %) and *Toxocara genettæ* (73 %). This is the first report of *T. genettæ* in Europe. The actual

life cycle of *Taenia parva* in its european hosts seems to support the hypothesis that the migration of the genet from the african continent to Europe is quite recent.

RÉSUMÉ : Nouvelles découvertes sur l'helminthofaune de la genette commune européenne (*Genetta genetta* L.) : première notification pour *Toxocara genettæ* Warren, 1972 (Ascarididae) en Europe.

On a réalisé une étude sur l'helminthofaune de 15 spécimens de *Genetta genetta* L. (Carnivora: Viverridae) provenant du Nord-Ouest de l'Espagne. On a trouvé deux espèces : *Taenia parva* (80 %) et *Toxocara genettæ* (73 %). Ce travail constitue donc

la première notification de *T. genettæ* en Europe. Le cycle biologique de *Taenia parva* sur ses hôtes européens semble appuyer l'hypothèse que la migration de la genette du continent africain vers l'Europe est relativement récente.

### INTRODUCTION

The common genet (*Genetta genetta* L.) is widely distributed throughout the African continent, where it has its origin (Schauenberg, 1966; Delibes, 1983), from where it entered in Europe through the Iberian Peninsula. The way by which this migration was carried out is much discussed. In Europe, it is found basically in the Iberian Peninsula, Balearic Islands and Southwest France, although the presence of some wandering specimens has been reported in countries of Central Europe (Barnes, 1983; Delibes, 1983; Pareja Mayo, 1984).

In the Iberian Peninsula, the reports on the helminth fauna of the genet consist of only two works (Brefia *et al.*, 1989; Cordero del Campillo *et al.*, 1980). This study contributes to the knowledge of the helminth fauna of this

host in Spain and, on this basis, tries to give a new point of view on the question of the entry of the genet in Europe.

### MATERIALS AND METHODS

A total of 15 specimens of *Genetta genetta* L. from different sites in Northwest Spain were studied.

The helminths found were washed in physiological saline solution, relaxed and fixed in Berland's fluid (Gibson, 1984), and conserved in 70° alcohol (nematodes) or 4 % formol (cestodes). Some nematodes were mounted following the usual techniques; others were dissected for detailed observation of certain taxonomically important structures (oral lips, ventricular region, eggs, etc.). Transverse sections were also made at the level of the esophagus. Cestodes were stained with alum or ferroacetic carmine and mounted in the usual way.

### RESULTS

Only two species of helminths were found, both of them parasitizing the intestine with a high prevalence.

*Toxocara genettæ* Warren, 1972 (Nematoda: Ascarididae).

N° infected hosts: 11.

Prevalence: 73 %.

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TABLE I. — Measurements of *Toxocara genettae* (in mm).

	Male	$\bar{X}$		Female	$\bar{X}$
	Range		Range		
Body length	18'000-34'000	24'300	23'000-43'000	35'400	
Maximum width	0'600- 0'940	0'780	0'870- 1'320	1'100	
Œsophagus length	1'650- 2'420	1'970	2'170- 2'860	2'400	
Œsophagus max. width	0'210- 0'380	0'270	0'280- 0'530	0'340	
Ventriculus length	0'190- 0'300	0'220	0'230- 0'320	0'260	
Ventriculus width	0'190- 0'290	0'230	0'240- 0'340	0'270	
Dorsal lip length	0'140- 0'160	0'150	0'130- 0'140	0'135	
Dorsal lip width	0'160- 0'200	0'185	0'160- 0'210	0'180	
Subventral lip length	0'130- 0'160	0'150	0'120- 0'150	0'140	
Subventral lip width	0'150- 0'200	0'180	0'150- 0'200	0'170	
Tail length	0'100- 0'160	0'130	0'400- 0'560 4'200- 6'170	0'480 5'040	
Vulva-Anterior end	—	—	0'071-0'096 × 0'045-0'070	0'077 × 0'056	
Eggs	—	—	—	—	
Spicule length	1'670- 2'200	2'010	—	—	
Nº precloacal papillae	15-17	16	—	—	

Measurements of the specimens are given in *Table I*. Whitish nematodes, without cervical alae but with two very narrow longitudinal lateral ridges (*fig. 1b*) running up to the tail, supported by V-shaped cuticular bars (*fig. 1f*).

One large dorsal (*fig. 1c*), and two slightly smaller subventral (*fig. 1d*) perioral lips, the anterior rim of each internally fringed with a row of denticles. Dorsal lip presents two large lateral papillae. Subventral lips have one large ventrolateral papilla and a small lateral one. Amphids are located close to the last of these.

Esophagus muscular with globular ventriculus where it meets intestine (*fig. 1a*).

Female oviparous and opisthodelphous. Vulva opens close to the end of the esophagus. Uterus has one simple region and one double of approximately the same length. Eggs (*fig. 1e*) are slightly ovoid and with pitted surface.

The male, smaller than the female, has a tail curved ventrally (*fig. 1h*) which ends in a conical terminal appendage finishing with a small, hook-like structure (*fig. 1g*). Generally 16 pairs of preanal papillae. Five postanal pairs distributed as follows: one pair of double papillae just behind the cloaca, and four simple pairs — two ventrolateral and two lateral — on terminal appendage (*fig. 1i, 1g*). Phasmids placed among the four papillae on each side of this appendage. Spicules long, alate and subequal (*fig. 1h*).

*Taenia parva* Baer, 1926 (Cestoda: Taeniidae).

Nº hosts infected: 12.

Prevalence: 80 %.

Short and thick cestodes, with segments whose width exceeds length except in final gravid proglottids.

Scolex relatively large, with short, wide rostellum (*fig. 2b, e*). Two rows of 16-22 hooks each one, unequal

in size (*fig. 2c*), 267-310.m in the anterior and 192-239.m in the posterior row.

Bilobulate ovary seen in second half of mature segments (*fig. 2a*). Poral lobe somewhat smaller than aporal. Vitellary gland enlarged and posterior to ovary. Mature segments contain 389-424 rounded testes that occupy all free space between excretory channels, except that which holds female sex organs, passing behind vitellary gland. Cirrus pouch extends to dorsal excretory vessels, without going beyond them.

Gravid uterus shows 8-12 principle branches leaving central trunk (*fig. 2d*).

## DISCUSSION

The description of *T. genettae* corresponds with Warren's (1972) original description, with certain minor differences. Turning to other species of this genus that parasite Viverridae (Warren, 1970, 1972), *T. vincenti* has a terminal hook similar to that of our specimens, but is distinguished by the presence of well developed cervical alae and of 2-4 denticles in the central zone of the indented lip edge. The characteristics of the uterus of our samples (1: 1 relation for the simple and double zones) rule out both *T. sprenti* (a relation slightly minor than 1: 2) and *T. suricattae* (1: 2 relation), although both do lack cervical alae. In Spain, the species *T. mystax* (Cordero del Campillo *et al.*, 1980) has been detected in the genet, but differs from our description in that it has large cervical alae, more similar to those of *T. vincenti*.

*Toxocara genettae* was found in South Africa infecting *Genetta felina* (Warren, 1972) (= *Genetta genetta felina* sensu Crawford-Cabral, 1980-1981), and probably exists in all Africa infecting different species and subspecies of

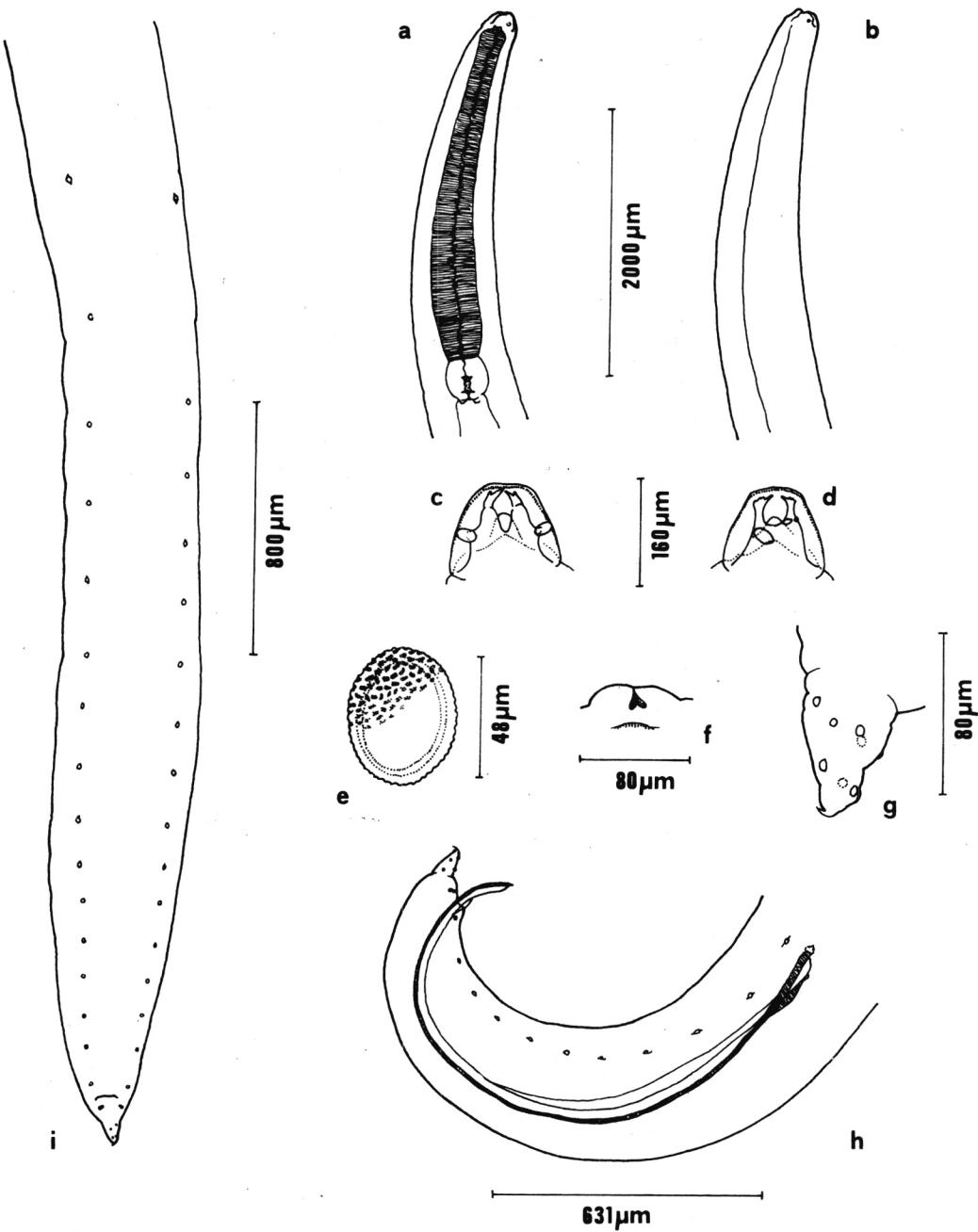


FIG. 1. — Morphology of *Toxocara genettae*. a) Anterior end showing esophagus and ventriculus, b) Anterior end, detail of longitudinal lateral ridges, c) Dorsal lip, d) Subventral lip, e) Egg, f) Transversal section of ridge showing cuticular bar, g) Terminal appendage of the male tail, h) Lateral view of male tail with spicule, i) Male, ventral view with pre- and postcloacal papillae.

*Genetta*, from where it certainly passed into Spain with its host. The appearance of *T. genettae* in Northwest Spain constitutes the first description of the nematode in Europe.

In the case of *Taenia parva*, the description is in keeping with those given for this species by Abuladze (1964) and Verster (1969) except that the number of testes seems much smaller in our case, which is probably due to the

difficulty of counting with certainty such a large number of testes arranged in 2-3 layers.

This species has been detected in larval form in *Apodemus sylvaticus* and in *Mus domesticus* (single case) in Galicia (Alvarez et al., 1987). In the rest of Spain and in France, up to the present it has only been found in *A. sylvaticus* (Bernard, 1963; Mas-Coma and Feliú, 1977;

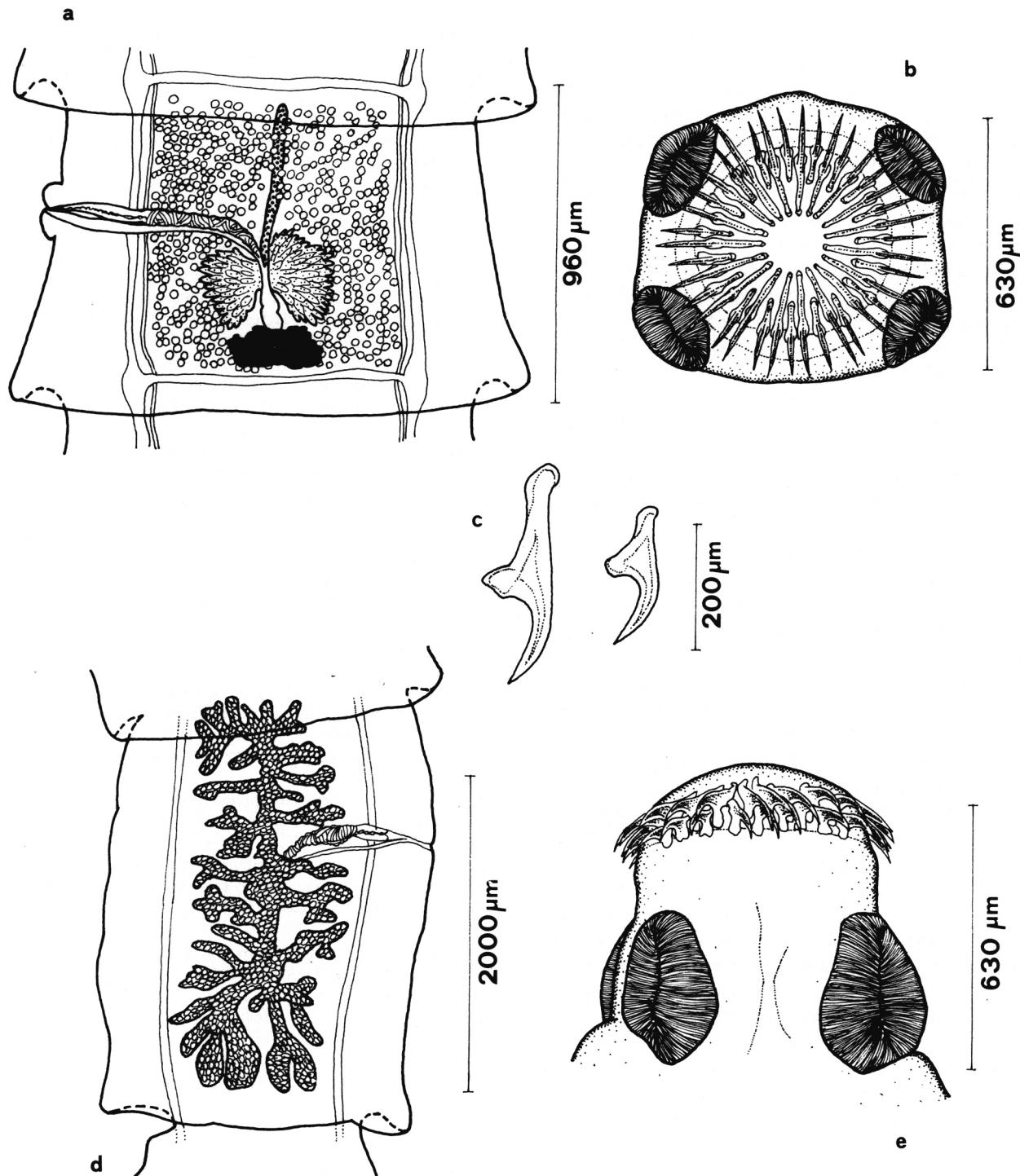


FIG. 2. — Morphology of *Taenia parva*. a) Mature segment, b) Scolex, frontal view, c) Detail of rostellar hooks, d) Gravid segment, e) Scolex, lateral view.

Feliú, 1980; Cordero del Campillo *et al.*, 1980; Feliú *et al.*, 1984). According to Calviño *et al.* (1984) and Ariagno (1985), the genet feeds predominantly on *A. sylvaticus* in the wild in both countries. This has created close ties between the parasite and its two hosts, and is probably why

it does not occur in larval form in other possible intermediary hosts.

According to the authors consulted (Cordero del Campillo *et al.*, 1980; Breña *et al.*, 1989), the parasite fauna detected in genets in Spain includes a variety of species,

up to a total of 11, of which we only detected *T. parva*. For reasons unknown, in Galicia the parasite fauna of this host shows very little variety, appearing only two of the parasitic species that in all likelihood crossed the Strait of Gibraltar with their host. Note also that the prevalence of these is very high.

Subspecies of *Genetta genetta* exist throughout Africa, from the South to the Mediterranean, from where the genet entered Europe. As to the way in which the migration took place, Schauenberg (1966) thinks that the genet crossed the Gibraltar landbridge in the Miocene or in the Pliocene, at the end of the Tertiary, before the Strait of Gibraltar was formed. Pareja Mayo (1984) and Crawford-Cabral (1980-1981) believe that the genet entered the Iberian Peninsula more recently, arising from its use as a domestic animal, later adapting itself to all the available habitats. The existing parasitological data appear to fit the second case.

*A. sylvaticus* inhabits both Northern Africa and Europe where it is found infected by the larval form of *T. parva* (Bernard, 1963). Furthermore, the host appeared in Central Europe in the Pleistocene-Holocene (Niethammer, 1978), later extending to the Mediterranean coast as fits, amongst other things, its parasite fauna (Feliú, 1980). These two premises and the fact that the Gibraltar landbridge was broken at the beginning of the Pliocene, suggest that if the genet had crossed this bridge together with its parasite *T. parva*, on arrival in the Iberian Peninsula this cestode would have chosen as intermediary hosts other rodents present at that time, or would have disappeared in the absence of adequate rodent species. In other words, if Schauenberg's hypothesis were true, *T. parva* in Spain and France would have to infect other intermediary hosts, although it might have also appeared in *A. sylvaticus*. Hence, it seems more logical that having crossed the Strait of Gibraltar after its formation, probably in historical times (Crawford-Cabral, 1980-1981; Pareja Mayo, 1984), *T. parva*, which already utilized *A. sylvaticus* as an intermediary host in North Africa, continued to do so in its new environment where this host already existed.

The fact that *Toxocara genettae* has been found in Northwest Spain, with a very small number of morphological changes, seems to support the hypothesis that the appearance of the genet in the Iberian Peninsula is recent.

#### REFERENCES

- Abuladze K. J. : Taeniata of animals and man and diseases caused by them (K. J. Skrjabin, Ed.). *Academy of Sciences of the USSR*, Moscow (Translated to English by the Israel Program for Scientific Translations Jerusalem 1970), 1964, 549 p.
- Alvarez M. F., Quinteiro Alonso P., Outeda Macias M., Sanmartin Duran M. L. : Larvas de cestodos en los múridos gallegos. *Rev. Iber. Parasitol.*, 1987, Vol. Extraordinario, 91-96.
- Ariagno D. : Régime alimentaire de la genette *Genetta genetta* dans le département du Rhône. *Bièvre*, 1985, 7, 115-126.
- Barnes D. : Reportage of the genet, *Genetta genetta*. *SANHS Journal*, 1983, 2, 38-42.
- Bernard J. : Cysticerques polycéphales chez le mulot. *Arch. Institut Pasteur Tunis*, 1963, 40, 269-277.
- Brefia M., Acosta I., Perez E., Mayoral A. J., Nieto C. G., Serrano F. J., Navarrete I. : Parasitofauna en mamíferos de vida libre de la provincia de Cáceres. *VI Congreso Nacional y I Congreso Ibérico de Parasitología* (Cáceres, 25-29 Sept., 1989), 181.
- Calviño F., Canals J. L. S., Bas S., de Castro A., Guitian J. : Régimen alimenticio del zorro (*Vulpes vulpes* L.) en Galicia, Noroeste de la Península Ibérica. *Bol. Estación Central Ecol.*, 1984, 13, 83-89.
- Cordero del Campillo M. et al. : Índice-Catálogo de zooparásitos ibéricos. Ministerio de Sanidad y Seguridad Social, Servicio de Publicaciones, Madrid, 1980, 579 p.
- Crawford-Cabral J. : The classification of the genets (Carnivora, Viverridae, genus *Genetta*). *Bolm. Soc. Port. Cienc. Nat.*, 1980-1981, 20, 97-114.
- Delibes M. : The genet. *Naturopa*, 1983, 45, 13.
- Feliú C. : Contribución al conocimiento de la helmintofauna de micromamíferos ibéricos. Helmintos de Gliridae y Muridae (Rodentia). *Doctoral Thesis*, University of Barcelona, 1980, 556 p.
- Feliú C., Mas-Coma S., Gallego J. : Contribución al conocimiento de la helmintofauna de micromamíferos ibéricos VIII Nuevos datos sobre parásitos de *Apodemus sylvaticus* Linnaeus, 1758 (Rodentia: Muridae). *Rev. Iber. Parasitol.*, 1984, 44, 109-128.
- Gibson D. J. : Technology as applied to museum collections, fixation and conservation of helminths. *Systematic Parasitol.*, 1984, 6, 241-245.
- Mas-Coma S., Feliú C. : Contribución al conocimiento de la helmintofauna de micromamíferos ibéricos IV Parásitos de *Apodemus sylvaticus* Linnaeus, 1758 (Rodentia: Muridae). *Rev. Iber. Parasitol.*, 1977, 37, 301-317.
- Niethammer J. : Handbuch der Säugetiere Europas. Band 1. Nagetiere. *Akademische Verlagsgesellschaft*, Weisbaden, 1978, 325-337.
- Pareja Mayo P. : La gineta: agilidad, belleza y astucia. *Vida Silvestre*, 1984, 50, 84-91.
- Schauenberg P. : La genette vulgaire (*Genetta genetta* L.). Répartition géographique en Europe. *Mammalia*, 1966, 30, 371-393.
- Verster A. : A taxonomic study of the genus *Taenia* Linnaeus, 1758 s. str. *Onderspoort. J. Vet. Res.*, 1969, 36, 3-58.
- Warren E. G. : Studies on the morphology and taxonomy of the genera *Toxocara* Stiles, 1905 and *Neoascaris* Travassos, 1927. *Zool. Anz. Leipzig*, 1970, 185, 393-442.
- Warren E. G. : Two new species of *Toxocara* from viverrid hosts. *Parasitology*, 1972, 65, 179-187.