

Preliminary study of the helminths of the chicken digestive tract in Somalia

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Key words

Poultry - Chicken - Helminth - Digestive tract - Free-range husbandry - Intensive husbandry - Nematoda - Cestoda - Acanthocephala - Somalia.

Summary

An epidemiological survey was carried out on helminths in the digestive tract of chickens (*Gallus gallus domesticus*) in Somalia. One hundred and forty chickens of a local breed and originating from two different types of rearing systems were used: 125 had been free-range chickens taken to a slaughterhouse in Mogadishu, 15 were obtained from an intensive rearing farm. Of the 140 chickens examined 110 were infected (79%): 104 were from free-range flocks and 6 from the intensive-rearing farm. Therefore, 83% of the chickens of the first group and 40% of the second were infected. Differences in prevalence of endoparasites in both management systems were statistically significant ($p < 0.01$). The identified parasite species were: *Ascaridia galli*, *Subulura suctorica*, *Raillietina (Raillietina) tetragona*, *Raillietina (Raillietina) echinobothrida*, *Raillietina (Skrjabinia) cesticillus*, *Raillietina (Paroniella) sp.*, *Raillietina (Raillietina) sp.*, *Raillietina sp.*, *Cotugnia sp.* and *Mediorhynchus gallinarum*. No trematodes were found. The parasites presented various associations.

INTRODUCTION

Livestock breeding is traditionally the main economic resource in Somalia, and poultry production has been increasing from 1993 until now. In 1997, Somalia had 3,000,000 chickens for meat production and 1,200,000 egg laying hens (11). Large and small intensive modern poultry farms were established, but rural and family ones remained the most widespread type.

Parasitic infections are common in intertropical areas, where husbandry standards are poor and climatic conditions are propitious to parasite development. It is therefore necessary to investigate the most common chicken parasites in this country in order to establish poultry-breeding requirements regarding prophylactic and therapeutic measures. Surveys dealing with chicken helminths have already been carried out in other African

countries (1, 8, 10, 12-15, 17, 21, 28, 29), but never in Somalia. The present preliminary research on helminths in chicken digestive tracts is intended to increase the knowledge of the etiology and epidemiology of poultry diseases in this country.

MATERIALS AND METHODS

Survey area

The investigation was carried out on animals coming from the Mogadishu province of Somalia. This region has a hot, humid climate with average annual temperatures of 27°C and a relative humidity of 73%.

Study animals

In the study, 140 chickens (*Gallus gallus domesticus*) of a local breed from two different types of rearing systems were used. They comprised: 1) 125 free-range chickens obtained from a slaughterhouse in Mogadishu. They had been raised in small family-type farms using rudimentary equipment and sheds without permanent litter. They were slaughtered at various ages depending on the farmer's needs and the market, the range was however between three months and one year; 2) 15 chickens from an intensive-rearing farm. In this type of farm birds are kept in naturally-ventilated poultry houses containing suspended drinkers and feeders and shaving litter is changed each cycle, and they are slaughtered at approximately three months of age.

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Sample collection and examination procedure

The samples were collected over a period of one year. The digestive tracts were examined for helminths. First, the viscera were separated from the mesentery, then the esophagus, ingluvies included, the proventriculus, ventriculus, *intestinum tenue* and *intestinum crassum* with caeca and rectum were opened to examine the lumen.

The alimentary tracts were cut into segments and placed in tap water to make parasite removal easier. The gut mucosae were scraped and washed gently in petri dishes and their content was examined for worms with a binocular dissecting microscope. The collected parasites were stored in 70° ethyl alcohol containing 5% glycerine.

A sample of 53 positive specimens was utilized for parasite identification (47 from rural farms and 6 from the intensive farm). Soulsby's (27) lactophenol clarification technique and Euzéby's (9), Kasimov's (18) and Barus's (3, 4) keys were used for nematode species identification. Acanthocephalans were mounted using the same technique as that used for nematodes, and identification was made according to Schmidt and Kuntz (25). The cestodes were stained using carmine dye. Schmidt's (24), Reid's (22) and Kasimov's (18) keys were used for identification of these parasites.

Epidemiological indexes such as prevalence, mean intensity and mean abundance were calculated according to Bush *et al.* (5). Comparative statements concerning infection rates were based on statistical analysis using Fisher's exact test (26).

RESULTS

Of the 140 chickens examined for worms, 110 were infected (79%). The parasites were found in the *intestina* (*tenue* and *crassum*) and in the caeca contents. Of the infected specimens 104 were from free-range flocks and the remaining 6 from the intensive rearing farm. Therefore, 83% of the chickens in the first group and 40% of those in the second group were infected. The differences in the observed prevalence values were statistically significant ($p < 0.01$). No helminths were found in the esophagus, ingluvies, roventriculus and ventriculus.

In 47 specimens coming from the free-range chickens, it was possible to calculate the prevalence, mean abundance and mean intensity for each worm species (table I). The helminth species identified consisted in two nematodes, *Ascaridia galli* and *Subulura suctorica* (figure 1), eight cestodes, *Raillietina* (*Raillietina*) *tetragona* (figure 2), *Raillietina* (*Raillietina*) *echinobothrida* (figure 3), *Raillietina* (*Skrjabinia*) *cesticillus*, *Raillietina* (*Paroniella*) sp. (figure 4), *Raillietina* (*Raillietina*) sp., *Raillietina* sp., *Cotugnia* sp. (figure 5), Hymenolepididae. The only acanthocephalan species recorded was *Mediorhynchus gallinarum* (figure 6). No trematodes were found.

Only one nematode species, *Subulura suctorica*, was found in the intensively-reared chickens. Due to the poor state of preservation and lack of scolices further classification of the parasites identified as Hymenolepididae was impossible. Parasitic associations of the samples examined showed that 27 chickens (57%) had a single infection, 13 (28%) a double infection, 6 (13%) a triple infection and 1 (2%) was infected with four different species (table II).

DISCUSSION

The present preliminary survey regarding helminth parasites of the chicken showed a high parasitic prevalence in rural poultry rearing as compared with modern intensive poultry rearing, and this difference was statistically significant. This is most likely due to

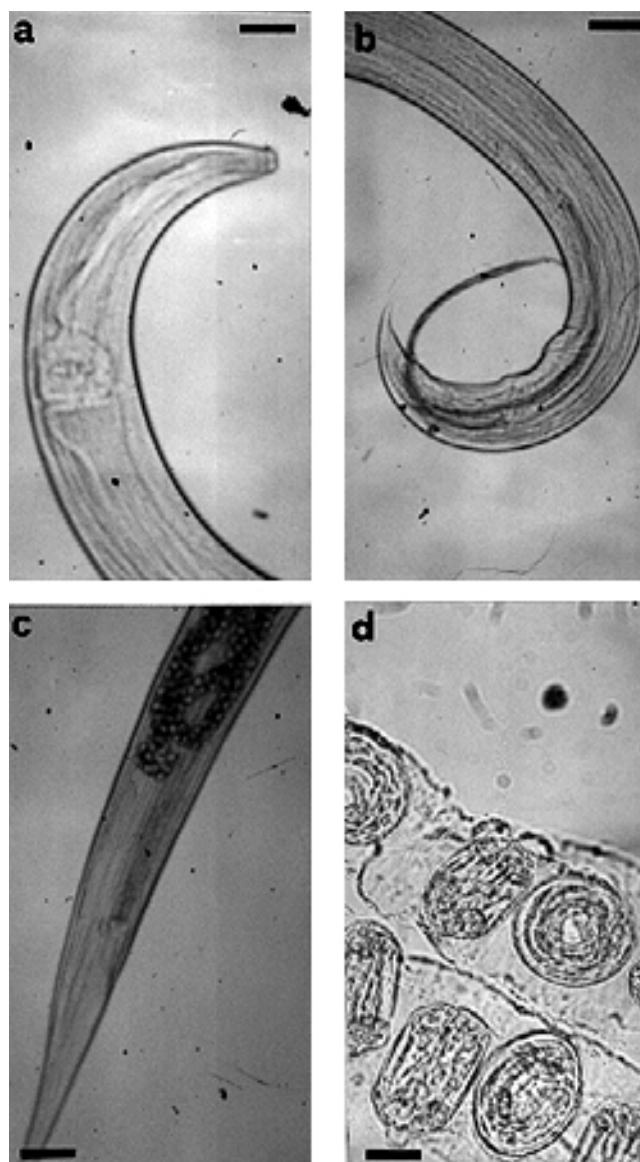


Figure 1: *Subulura suctorica*; (a) anterior portion of body, (b) male posterior end, (c) posterior portion of female body with eggs in the uterus (bar = 150 μ); (d) particular of the eggs (bar = 25 μ).

differences in hygienic and sanitary conditions and, consequently, to differences in the eventual completion of the helminth life cycle in the above-mentioned rearing systems. Free-range chickens are usually subjected to few hygienic practices (for instance prophylactic treatments and disinfection) and they are free to scratch about and to swallow small invertebrates that can allow transmission of parasites with diheteroxenous cycles. In fact, only one nematode species (*Subulura suctorica*), which has a direct cycle, was found in the intensive rearing system.

In Somalia, *Subulura suctorica*, *Raillietina* sp., *Mediorhynchus gallinarum* have been previously reported by Cancrini *et al.* (6), and *Raillietina* (*Raillietina*) *solensis* and *Cotugnia shohoi* in the vulture guinea fowl (*Acryllium vulturinum*) by Sawada (23).

Among the worms found there were species whose presence is widespread in Africa as reported in previous studies done in various African countries on fowl parasites. Among them *Ascaridia galli* and cestodes such as *Raillietina* (*Raillietina*)

Table I

Parasites found in the examined specimens of 47 free-range chickens

	Parasite	Num.	P (%)	Mi*	Ma**
Nematodes	<i>Ascaridia galli</i>	12	26	7	1.7
	<i>Subulura suctorica</i>	21	45	20	9
Cestodes	<i>Raillietina (Raillietina) tetragona</i>	7	15	11	1.9
	<i>Raillietina (R.) echinobothrida</i>	4	8.5	4	0.3
	<i>Raillietina (S.) cesticillus</i>	1	2	1	0.02
	<i>Raillietina (Paroniella) sp.</i>	14	25.5	11	3.5
	<i>Raillietina (R.) sp.</i>	1	2	6	0.1
	<i>Raillietina sp.</i>	4	8.5	4	0.3
	<i>Cotugnia sp.</i>	1	2	2	0.04
	Hymenolepididae	4	8.5	n.d.	n.d.
Acanthocephalan	<i>Mediorhynchus gallinarum</i>	5	10.5	11	1

P: parasite prevalence; Mi: mean intensity; Ma: mean abundance

* $\frac{\text{Total number of parasites of a particular species found in a host sample}}{\text{Number of hosts infected with that parasite}}$ ** $\frac{\text{Total number of parasites of a particular species found in a host sample}}{\text{Number of hosts examined (including both infected and uninfected ones)}}$

n.d. = not done

Table II

Parasite associations

Single infection (27) * 57.5 % **	<i>Ascaridia galli</i> (5) <i>Subulura suctorica</i> (9) <i>Raillietina (Raillietina) tetragona</i> (3) <i>Raillietina (R.) echinobothrida</i> (2) <i>Raillietina sp.</i> (1) <i>Raillietina (Paroniella) sp.</i> (5) <i>Cotugnia sp.</i> (1) Hymenolepididae (1)
Double infection (13) 27.5%	<i>A. galli</i> and <i>Raillietina (Paroniella) sp.</i> (1) <i>A. galli</i> and <i>Subulura suctorica</i> (3) <i>S. suctorica</i> and <i>Raillietina (R.) tetragona</i> (1) <i>S. suctorica</i> and <i>Raillietina sp.</i> (1) <i>S. suctorica</i> and Hymenolepididae (1) <i>S. suctorica</i> and <i>Raillietina (R.) echinobothrida</i> (2) <i>S. suctorica</i> and <i>Raillietina (Paroniella) sp.</i> (1) <i>Raillietina (R.) tetragona</i> and <i>Mediorhynchus gallinarum</i> (1) <i>Raillietina (S.) cesticillus</i> and <i>Raillietina (Paroniella) sp.</i> (1) <i>Raillietina sp.</i> and <i>Raillietina (Paroniella) sp.</i> (1)
Triple infection (6) 13%	<i>A. galli</i> , <i>Raillietina (R.) tetragona</i> and <i>M. gallinarum</i> (1) <i>A. galli</i> , <i>Raillietina (R.) tetragona</i> and Hymenolepididae (1) <i>S. suctorica</i> , <i>Raillietina (Paroniella) sp.</i> and <i>M. gallinarum</i> (1) <i>S. suctorica</i> , <i>Raillietina sp.</i> and <i>Raillietina (Paroniella) sp.</i> (1) <i>Raillietina (R.) tetragona</i> , <i>Raillietina (Paroniella) sp.</i> and <i>M. gallinarum</i> (1) <i>Raillietina (R.) sp.</i> , <i>Raillietina (Paroniella) sp.</i> and Hymenolepididae (1)
Quadruple infection (1) 2%	<i>A. galli</i> , <i>S. suctorica</i> , <i>Raillietina (Paroniella) sp.</i> and <i>M. gallinarum</i> (1)

* Number of hosts having each type of association; ** Percentage of hosts having each type of association

tetragona, *Raillietina (Raillietina) echinobothrida*, *Raillietina (Skrjabinia) cesticillus* were also present in Ghana (13, 14, 15), Nigeria (10, 12, 29), Tanzania (21), Sudan (7, 8), Zimbabwe (17), Ethiopia (1) and Cameroon (19). On the other hand, *Subulura suctorica* has only been found in Nigeria (10), and a species

belonging to the Hymenolepididae family (*Hymenolopis carioca*) has only been found in Ethiopia (1).

With regard to the other *Galliformes*, the following parasites have been recorded in Africa: *Ascaridia galli*, *Raillietina (Raillietina) tetragona* and *Raillietina (Raillietina) echinobothrida* in the

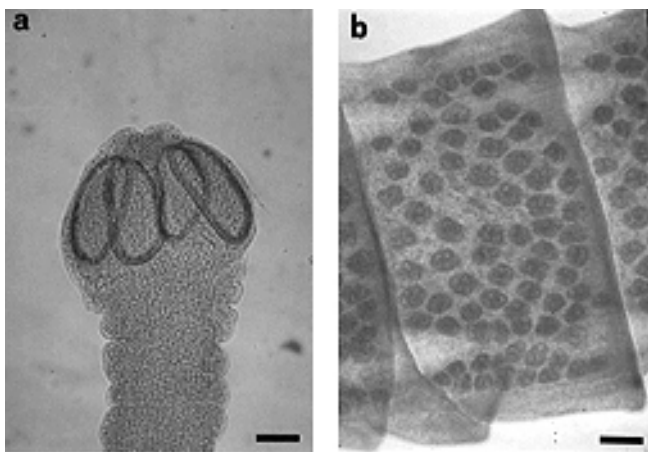


Figure 2: Raillietina (Raillietina) tetragona; (a) scolex with armed suckers (bar = 48 μ); (b) gravid segment (bar = 95 μ).

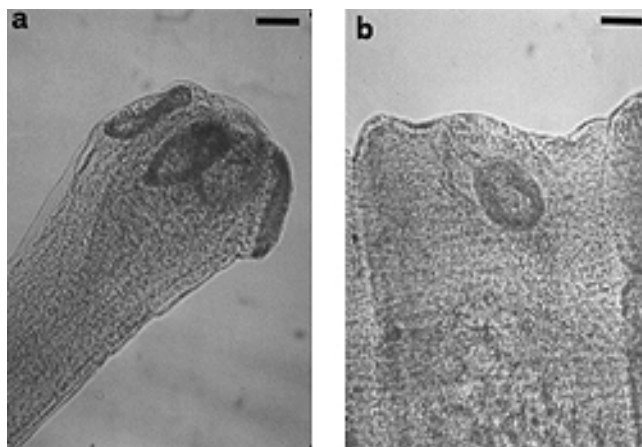


Figure 3: Raillietina (Raillietina) echinobothrida; (a) scolex with armed suckers (bar = 48 μ); (b) proglottid with cirrus sac and genital pore (bar = 95 μ).

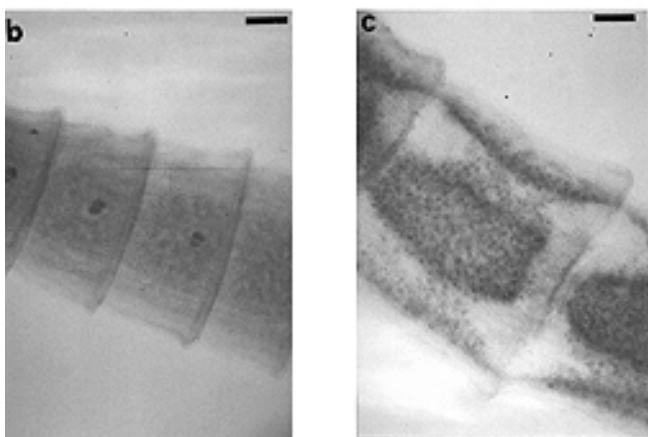


Figure 4: Raillietina (Paroniella) sp.; (a) scolex with armed suckers (bar = 48 μ); (b) mature proglottids, (c) gravid proglottids (bar = 95 μ).

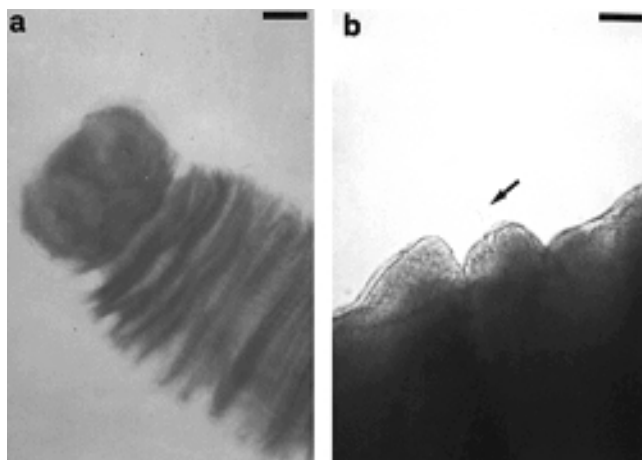


Figure 5: Cotugnia sp.; (a) scolex (bar = 95 μ); (b) proglottid with extroflexed cirrus (arrow) (bar = 48 μ).

helmet guinea fowl (*Numida meleagris galeata*) in Nigeria (2, 20); *Subulura suctorica* and *Mediorhynchus selengensis*, synonymous of *Mediorhynchus gallinarum* according to Schmidt and Kuntz (25), in helmet guinea fowl in Burkina Faso (30); *Ascaridia galli* and *Raillietina (Skrjabinia) cesticillus* in turkeys (*Meleagris gallopavo*) in Zambia (16).

Morphobiometrical examination of the parasites identified in the present work revealed no substantial differences from the original

description. Therefore, it can be stated that the parasites reported in the present research are typical of the African Continent. Those of the cestodes identified only up to genus or subgenus were possibly new species. To find answers to this question and others further surveys will have to be carried out. The cestodes identified as genus or subgenus were not described in the literature consulted. Data on mean intensity adds further information to that on prevalence, namely it indicates that certain parasite species are present in large numbers in the hosts.

Poultry rearing in developing countries such as Somalia may represent a great opportunity for their economies. Short training courses for poultry breeders is recommended to give them basic knowledge about rearing systems, hygiene and parasitic disease prevention. This policy may reduce the production costs, promote the expansion of modern intensive farming and improve rural and family poultry rearing in the country as a whole.

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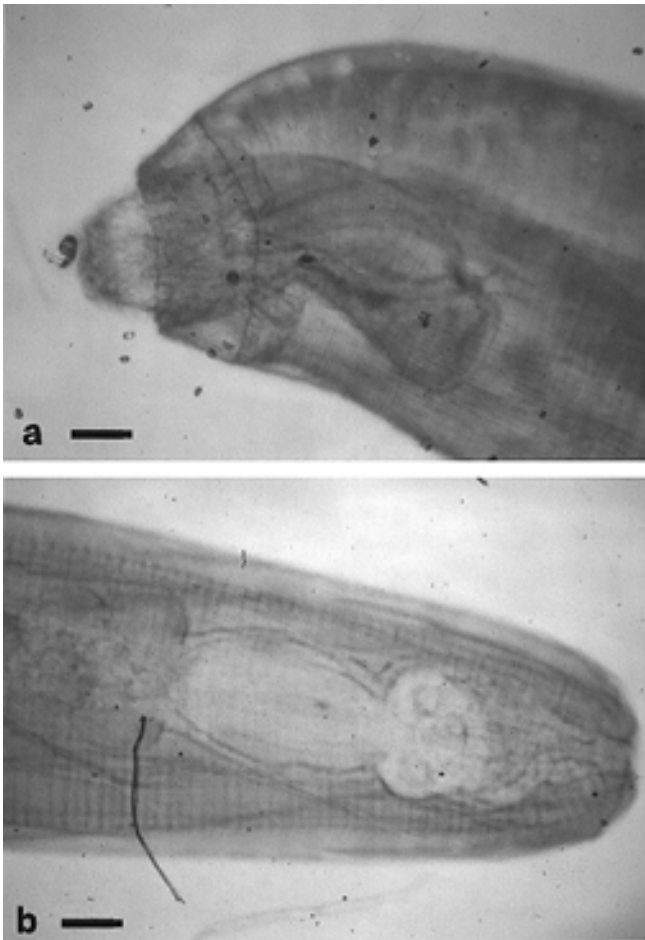


Figure 6: *Mediorhynchus gallinarum*, male; (a) anterior end - proboscis partially retracted in the proboscis sheath, (b) posterior end - bursa (bar = 200 µ).

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Résumé

Terregino C., Catelli E., Poglayen G., Tonelli A., Gadale O.I. Etude préliminaire des helminthes du tube digestif du poulet en Somalie

Une étude épidémiologique sur les helminthes du tube digestif du poulet (*Gallus gallus domesticus*) a été effectuée en Somalie. Cent quarante poulets de race locale et originaires de deux systèmes d'élevage différents ont été utilisés. Parmi eux, 125 provenaient d'élevages traditionnels et avaient été amenés à l'abattoir de Mogadishu et les 15 autres étaient issus d'un élevage intensif. Sur les 140 poulets examinés, 110 étaient infestés (79 p. 100) : 104 provenaient des élevages traditionnels et 6 de l'élevage intensif. Ainsi, 83 p. 100 des poulets du premier groupe et 40 p. 100 du second étaient infestés. Les résultats ont également mis en évidence une différence significative ($p < 0,01$) entre les deux types d'élevages concernant la prévalence des endoparasites. Les espèces parasitaires identifiées étaient les suivantes : *Ascaridia galli*, *Subulura suctoria*, *Raillietina (Raillietina) tetragona*, *Raillietina (Raillietina) echinobothrida*, *Raillietina (Skrjabinia) cesticillus*, *Raillietina (Paroniella) sp.*, *Raillietina (Raillietina) sp.*, *Raillietina sp.*, *Cotugnia sp.* et *Mediorhynchus gallinarum*. Aucun trématode n'a été trouvé. Les parasites ont présenté des formes d'associations diverses.

Mots-clés : Volaille - Poulet - Helminthe - Tube digestif - Elevage en liberté - Elevage intensif - Nematoda - Cestoda - Acanthocephala - Somalie.

Resumen

Terregino C., Catelli E., Poglayen G., Tonelli A., Gadale O.I. Estudio preliminar de los helmintos del tracto digestivo del pollo en Somalia

Se llevó a cabo un estudio epidemiológico sobre los helmintos en el tracto digestivo de los pollos (*Gallus gallus domesticus*) en Somalia. Los 140 pollos incluidos en el estudio fueron de razas locales y originarios de dos diferentes tipos de sistemas de crianza: 125 fueron pollos criados al aire libre, sacrificados en un matadero en Mogadishu, 15 provenían de una finca con crianza intensiva. De los 140 pollos examinados, 110 (79%) estaban infectados: 104 provenían de parvadas criadas al aire libre y 6 de una finca con crianza intensiva. Por lo tanto, 83% de los pollos del primer grupo y 40% de los del segundo grupo estuvieron infectados. Las diferencias en la prevalencia de los endoparásitos en ambos sistemas de manejo fueron estadísticamente significativas ($p < 0,01$). Las especies parasitarias identificadas fueron: *Ascaridia galli*, *Subulura suctoria*, *Raillietina (Raillietina) tetragona*, *Raillietina (Raillietina) echinobothrida*, *Raillietina (Skrjabinia) cesticillus*, *Raillietina (Paroniella) sp.*, *Raillietina (Raillietina) sp.*, *Raillietina sp.*, *Cotugnia sp.* y *Mediorhynchus gallinarum*. No se encontraron trematodos. Se presentaron varias asociaciones de parásitos.

Palabras clave: Ave de corral - Pollo - Helminto - Tracto digestivo - Crianza libre - Crianza intensiva - Nematoda - Cestoda - Acanthocephala - Somalia.