

South African Helminths.—Part IV.

Cestodes from Columbiformes.

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In 1923 Joyeux recorded four species of *Raillietina*, one species of *Aporina*, two species of *Cotugnia* and two species of *Hymenolepis* from five kinds of African pigeons. Le Roux (1927) found two species of *Raillietina* in domestic pigeons from Natal, namely *Raill. (Fuhrm.) crassula* (Rud., 1819) and *Raill. (Raill.) crassula* (Rud.) of Clerc, 1906, which species had been renamed *Raill. (Raill.) cierci* by Fuhrmann (1920).

According to Fuhrmann (1932), 41 species and varieties of Cestodes have been recorded from Columbiformes. Since this date four further species of *Raillietina* have been described, namely *Raill. (Raill.) idiogenoides* Baer, 1933, from *Vinago delalandei*, Rhodesia; *Raill. (Raill.) perpleta* Johri, 1933, from *Columba livia intermedia*, India; *Raill. (Raill.) taiwanensis* Yamaguti, 1935, from *Columba livia domestica*, Formosa; and *Raill. (Raill.) vogeli* Hilmy, 1936 from *Vinago calva sharpii*, Liberia. In addition descriptions of five further species and one sub-species of *Cotugnia* have appeared, namely *C. intermedia* Johri, 1934, and *C. noctua* Johri, 1934, from *Columba livia intermedia*, India; *C. bahli* Johri, 1934, from *Turtur suratensis*, India; *C. meggetti*, Yamaguti, 1935 and *C. taiwanensis* Yamaguti, 1935, from *Columba livia domestica*, Formosa, and *C. polycantha oligorchis* Joy., Baer and Martin, 1936 from *Stigmatopelia senegalensis*. Also descriptions of two species of *Killigrewia* namely *K. oenopopeliae* Yamaguti, 1935, from *Oenopopeliae tranquebarica humilis*, and *K. streptopeliae* Yamaguti, 1935, from *Streptopelia chinensis formosa*, both from Formosa. Two earlier described species of this genus must be added to these, namely *K. frivola* Meggitt, 1927, which Meggitt described from an unknown host from Egypt but which Johri (1934) has obtained from *Columba livia intermedia*, from India, and *K. pamela* Meggitt, 1927, from *Turturoena sharpii* from Egypt. And finally one species of *Hymenolepis*, *H. streptopeliae* Joyeux and Baer, 1935, from *Streptopelia orientalis orientalis* from Indo-China. This brings the total of cestode species and sub-species from Columbiformes up to date, including the four new species described below, to fifty-nine.

During the last few years the writer has been able to examine materials originating from four kinds of pigeons, namely Domestic pigeons, Green Fruit pigeons, Laughing doves and Namaqua doves; this material was found to comprise five species of *Railletina*, three of which the writer considers as new and one new species of *Hymenolepis*.

The writer did not obtain any examples of *Railletina* (*Raill.*) *clerci* Fuhrmann from domestic pigeons, but he obtained examples of a cestode which has some similarity to the above species but which the writer considers to be new; whether this material is identical with that which le Roux (1927) identified as *Davainea crassula* (Rud., 1819, Clerc 1906 [= *Railletina* (*Raill.*) *clerci*]) the writer is not in a position to say as le Roux gives no data concerning this species and his material is not available for comparison.

Railletina (*Fuhrmanetta*) *crassula* (Rud., 1819).

This species was recovered from Domestic pigeons from three localities, namely Onderstepoort, City of Pretoria and Grahamstown. The writer's materials show the following characteristics which in some aspects differ from the descriptions given by Fuhrmann (1909) and Neveu Lemaire (1936). In the following the figures between brackets are those given by these two authors.

The length of the strobilae varies from 199 to 442 m.m. (250 to 400 mm.) and the breadth is never more than 2 mm. (4 mm.); the hooks number from 120 to 140 (70), the majority of scolices carrying about 120 hooks; the length of those of the anterior row was found to be from 0.017 to 0.021 (0.02 mm.) the usual length being 0.02 mm.; those of the posterior row varied in length from 0.015 to 0.016 mm. the usual length being 0.016 mm. The breadth of the scolex is from 0.246 to 0.38 mm. (0.23 mm.) and the rostellum measures 0.07 to 0.09 mm.; the armed suckers are round to slightly oval, 0.087 to 0.91 mm. to 0.096 by 0.126 mm. (0.09 mm.). The cirrus sac is from 0.078 to 0.145 mm. long (0.1 mm.) and the testes vary in number from 35 to 61 (30 to 40), arranged laterally and behind the female glands, about 25 to 40 being aporal; in some strobilae they cross the excretory canals. The ovary is multilobate and poral in position. Each ripe segment carries about 300 egg capsules which cross the excretory canals and each capsule has from two to five eggs (3-4).

Hosts: *Columba livia domestica*.

Location: Small intestine.

Locality: Transvaal and Cape Eastern Province.

In addition to the above-described materials two specimens of a nearly related, if not conspecific, cestode were obtained from a Laughing dove [*Stigmatopelia senegalensis aequatorialis* (Erl.)] shot in the Onderstepoort grounds. These specimens agree in all essentials with those described above except that they are much smaller, reaching only 84 mm. in length by 1.2 mm. broad, and the end segments

contain much fewer egg capsules (65 to 75). Whether these differences are of specific importance or whether they are due to different host reactions, the writer cannot say; however, in the meantime the writer is referring these specimens to the above species and considering them to be a minor variety.

Raillietina (Raillietina) columbiella sp. nov.

This species was present in fair numbers in five of six domestic pigeons shot at Onderstepoort; on two occasions the host also harboured *Raillietina (Fuhrmanetta) crassula* (Rud.). According to the state of contraction the total length of complete strobilae varies from 34 to 67 mm. and the breadth by 1.5 to 2 mm.; the shorter strobilae have a lanceolate appearance. In all, a striking feature is the extreme shortness of the segments compared with their breadth; only the hindmost segments show a tendency to become elongate but even in these their breadth is always greater than their length.

The scolex is relatively small and has a transverse diameter of 0.188 to 0.27 mm.; the four suckers are slightly oval and measure 0.058 by 0.07 mm. to 0.08 by 0.09 mm.; they are armed with about 10 rows of numerous hooks, the longest measuring 0.01 mm. long. The rostellum has a thickness of 0.12 to 0.18 mm. and carries about 200 typically hammer-shaped hooks arranged in two rows; those of the anterior row are from 0.019 to 0.022 mm. long and those of the posterior row 0.016 to 0.018. The base of the rostellum is covered by numerous very minute spines.

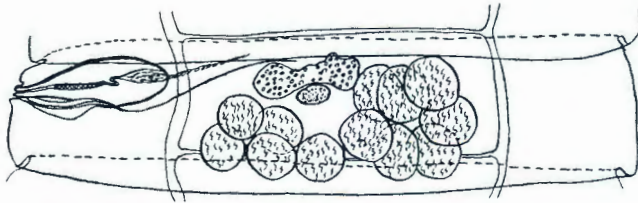


Fig. 1.—*Raill. (Raill.) columbiella* sp. nov. Mature segment.

The neck may reach a length of 1.75 mm. by 0.2 mm. broad. The genital pores are unilateral and situated in the anterior third of the segment. The cirrus sac is relatively long and almost reaches the excretory canal but in some cases may partially lie over it; it is from 0.16 to 0.23 mm. long by 0.05 to 0.087 mm. thick; its wall is not very muscular (Fig. 1); the cirrus sac is armed with minute spines which appear to be limited to its distal half. A vesicula seminalis interna is present and the vas deferens is much coiled. The testes number from 11 to 13, are round and have a diameter of 0.063 to 0.077 mm. The ovary is two lobed and slightly crenated and occupies about the central fifth of each segment; the

yolk gland is oval and about one-third the size of the ovary. There are about 50 to 80 egg capsules to each segment and these cross the excretory canals laterally; each capsule has from four to eight eggs.

Affinities.—*Raillietina* (*Raill.*) *taiwanensis* Yamaguti, 1935, possesses circa 200 rostellar hooks, about 0·02 mm. long and has testes approaching in number those of the species described above. *R. (R.) insignis* (Steudner, 1877) and *R. (R.) nagpurensis* Moghe, 1925 also have rostellar hooks of about the same size and number but have more testes (20 to 25 and 19 to 22 respectively). The writer's species can be distinguished from Yamaguti's species in that the latter has no spiny collar round the base of the rostellum and the cirrus sac is much smaller.

Raill. (R.) clerici Fuhrmann, differs from the writer's species in having numerous rostellar hooks (400?) which are much smaller (0·01 mm.); it has about 20 testes and the egg capsules do not cross the excretory canals.

Specific diagnosis.—Davaineidae which may reach a length of about 70 mm. by 2 mm. broad; and with segments much broader than long. Rostellum carries circa 200 hooks in two rows, those of the anterior row being 0·019 to 0·022 mm. long and those of the posterior row 0·016 to 0·018 mm. long. Suckers armed and base of rostellum covered with numerous minute spines. Genital pores unilateral. Cirrus sac up to 0·23 mm. in length and reaches the excretory canals, Vesicula seminalis interna present. Testes 11 to 13. Ovary two-lobed. Eggcapsules 50 to 80, crossing excretory canals and each contains four to eight eggs.

Host: *Columba livia domestica*.

Location: Small intestine.

Locality: Onderstepoort, Transvaal.

Types in the Onderstepoort Helminthological Collection.

Raillietina (*Raillietina*) *johri* sp. n.

Syn. *Raillietina* (*Raill.*) *polychalix* Kotlan, 1920, Johri, 1934.

Not *Raillietina* (*Raill.*) *polychalix* Kotlan 1920.

In 1934 Johri reported the species *Raillietina* (*Raillietina*) *polychalix* Kotlan, 1920, from *Columba livia domestica* and *Psittacula krameri manillensis*; the material from the former host differed from the latter in having a greater number of rostellar hooks (324 against 190), which are smaller (0·011 and 0·014 mm. against 0·0135 and 0·019 mm.), fewer testes (eight to nine against nine to eleven), larger cirrus sac (0·125 to 0·13 mm. against 0·061 mm.) and fewer egg capsules (30 to 40 against 48). Johri considers these differences not to be of sufficient weight to warrant the separation of these materials into different species. The writer, however, does not support this view and he considers that the great disparity in the number of rostellar hooks and sizes of the cirrus sac definitely show

that these materials are not conspecific. Besides it is highly improbable that the same species of cestode would occur in such widely differing groups (Columbiformes and Psittaciformes). The writer has much pleasure in naming this species after its discoverer.

Affinities.—This species appears to be closely related to if not conspecific with *Raillietina (Raill.) spiralis* Baczynska, 1914, from *Columba* sp. New Guinea. From the data available Baczynska's species would appear to have the same number of rostellar hooks (300) which are only slightly longer (0.0156 mm.), the scolex has about the same size (0.224 mm.), the cirrus sac is only slightly smaller (0.101 mm), the testes are slightly fewer (six to seven) and the egg capsules each contain four to six eggs. However, since the writer is not able to make a personal comparison between Johri's and Baczynska's materials he considers it advisable in the meantime to treat those materials as representing distinct species.

Host: *Columba livia domestica*.

Locality: Lucknow, India.

Raillietina (Raillietina) vinagoi sp. n.

This species, represented by several complete specimens from two Green Pigeons, has a total length of 115 to 123 mm. by 1.5 to 2 mm. broad.

The scolex measures 0.48 to 0.52 mm. across. The rostellum measures 0.085 mm. across and carries a double row of small hammer-shaped hooks; these number about 350. Their sizes are 0.017 and 0.014 for those of the anterior and posterior rows respectively. The suckers are somewhat rounded and armed and have a diameter of 0.075 mm. The neck is about 1.0 mm. long by 0.116 mm. broad.

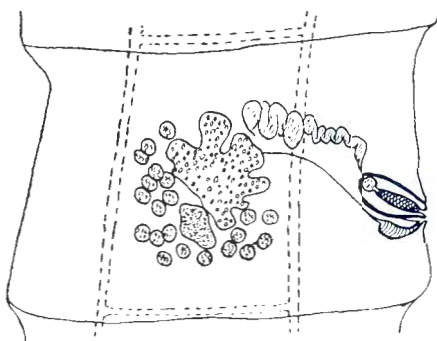


Fig. 2.—*Raill. (Raill.) vinagoi* sp. nov. Mature segment.

The genital pores are unilateral and in contracted segments they are situated in the anterior third of the segment; in well extended segments their position is at the junction of the second and last thirds of the segments (Fig. 2). The cirrus sac is large and prominent

and varies in shape from oval to flask-shaped; it is from 0.165 to 0.18 mm. long by 0.093 to 0.102 mm. in diameter. A vesicula seminalis interna is present and the vas deferens is densely coiled. There are generally from 18 to 24 testes to each segment of which five to eight are poral in position; exceptionally, however, as many as 30 testes are present; in some segments they are arranged in a semi-circle, lateral and behind the female glands whereas in others they form two lateral groups separated by the female glands. The vagina opens behind the cirrus sac and enters the genital atrium at an angle; its distal portion is pear-shaped with a relatively large lumen and is surrounded by circular muscle fibres which give this portion a hooped appearance. The ovary is centrally placed and multilobed and large and measures about 0.25 mm. long by 0.2 mm. broad; the vitelline gland is roughly oval measuring about 0.12 mm. long by 0.075 mm. broad. The egg capsules fill the whole segment, but do not extend beyond the excretory canals; each segment carries 50 to 55 capsules and each capsule has three to ten eggs.

Affinities.—The only *Raillietina* (*Raillietina*) sp. from Columbigiformes having 300 or more rostellar hooks which are more than 0.01 mm. but less than 0.02 mm. long, and possessing more than 20 testes is *Raillietina* (*Raill.*) *perplexa* Johri, 1933 and the species described above; Johri's species differs from the writer's in possessing a larger scolex (0.35 mm.), larger rostellum (0.183 mm.) with collar of numerous spines, the cirrus sac is only about half the size (0.087 to 0.97 mm.), and the testes are relatively more (26 to 28).

Specific Diagnosis.—Davaineidae possessing about 350 rostellar hooks measuring 0.017 and .014 mm.; genital pores unilateral; cirrus sac large, oval or flask-shaped up to 0.18 mm. long; vesicula seminalis interna present; testes usually 18 to 24 in number, exceptionally reaching 30; they either form a semi-circle round female glands or are arranged in two groups with five to eight testes poral. Distal portion of vagina large, muscular and pear-shaped with large lumen; ovary multilobed; 50 to 55 egg capsules to each segment, not passing over excretory ducts; each capsule with three to ten eggs.

Host: *Vinago delalandei delalandei* (Bp.).

Location: Small intestine.

Locality: Transvaal and Natal.

Types in the Onderstepoort Helminthological Collection.

Raillietina (*Raillietina*) *delalandei* sp. nov.

This delicate cestode reaches a length of 78 mm. by 0.36 to 0.48 mm. broad; the scolex has a breadth of 0.16 mm. and its rostellum has a diameter of 0.08 to 0.085 mm. The hooks are numerous and arranged in two rows; their total number appears to be between 600 and 700 and their length is 0.01 and 0.011 mm. The suckers are rounded and about 0.07 mm. across and each is heavily armed, the largest spines reaching 0.014 mm. in length. The neck varies in length from 0.58 to 0.76 mm. and is about 0.085 mm. broad.

The genital pores are unilateral and their position varies according to the state of contraction of the segment; generally they are situated just anterior to the middle of the segments (Fig. 3). The cirrus sac and distal portion of the vagina are similar to those seen in the preceding species except that they are smaller; the cirrus sac is from 0.11 to 0.12 mm. long by 0.063 mm. wide and the cirrus is spined. There are 12 to 15 rounded testes of which about six are poral and the remainder aporal in position; sometimes, especially in young segments, these two groups are joined to each other by one or two testes situated behind the female glands. The ovary consists of two almost circular wings, each about 0.06 mm. in diameters, and is centrally placed; their outlines is generally smooth but they may be slightly lobate. The circular to oval yolk gland lies immediately behind the ovary between its two wings; its diameter is from 0.06 to 0.072 mm. There are 20 to 25 egg capsules to each segment, each containing six to ten eggs; they do not extend beyond the excretory canals.

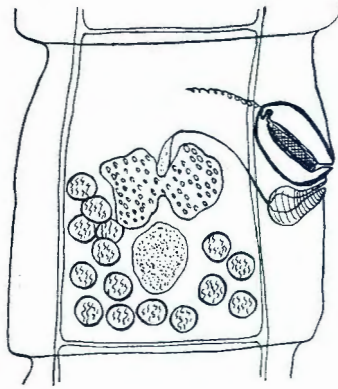


Fig. 3.—*Raill. (Raill.) delalandei* sp. nov. Young segment.

Affinities.—The size of the rostellar and sucker hooks and number of testes allies this species to *Raill. (R.) gendrei* Joyeux, 1923, from *Vinago calva*, French Guinea; it, however, differs from this species in having about three times as many rostellar hooks, only about one-fifth the number of egg capsules per segment and the cirrus sac is smaller. It appears to have its closest relatives in *Raill. (R.) vinagoi* sp. nov. described above and *Raill. (R.) clerici* Fuhrmann, 1920. It is easily distinguished from the former species by its smaller size and greater number of rostellar hooks which are much smaller; it differs from the latter species by its much smaller size, smaller spines on the suckers and much smaller cirrus sac.

Specific Diagnosis.—Davaineidae reaching a length of at least 78 mm. and provided with a rostellum carrying numerous (600 to 700) small hooks, 0.01 to 0.011 mm. long and arranged in two rows; suckers armed with large spines reaching 0.014 mm. in length. Genital pores unilateral, generally just in front of middle of segment; 12 to 15 testes arranged in a poral group of about six and rest aporal;

in young segments testes also behind female glands; cirrus sac 0.11 to 0.12 mm. long; 20 to 25 egg capsules to each ripe segment, each containing six to ten eggs; they do not extend beyond the excretory canals.

Host: *Vinago delalandei delalandei* (Bp.).

Location: Small intestine.

Locality: Natal South Africa.

Types in the Onderstepoort Helminthological Collection.

Raillietina (Raillietina) vogeli Helmy, 1936.

Several fragments of this species were available; these consisted of two scolices with portions of strobila and several portions with mature to ripe segments. The one scolex appears to possess all its rostellar hooks, but the other has lost them all; in both cases no hooks are present on the suckers.

The rostellar hooks number between 150 and 200 and are arranged in two rows; they measure 0.035 and 0.037 mm. in length. The scolices have a transverse diameter of 0.458 and 0.47 mm. and the suckers are rounded and measure from 0.165 to 0.174 mm. in diameter. The neck is about 1.5 mm. long by about 0.29 mm. broad.

The genital pores are unilateral and are situated in the anterior third of the segment. There are from 16 to 22 testes, of which four to six are poral in position; generally the poral and aporal testes form two separated groups lateral of the female glands but in some segments these groups may be united by one or two testes posterior of the female glands. The ovary is somewhat centrally placed and rounded and the vitelline gland is found behind it somewhat towards the aporal side. There are from 70 to 90 egg capsules, each containing three to six eggs.

Host: *Vinago delalandei delalandei* (Bp.).

Location: Small intestine.

Locality: Natal South Africa.

This species has been referred to Helmy's species because of the similarity in the size and number of rostellar hooks and because the material was collected from an African green fruit pigeon of the genus *Vinago*. Helmy was unfortunately not able to give an account of the male and female glands as his material was immature. The writer's material appears to differ from Helmy's in possessing a larger scolex and rostellum.

The only other species of *Raillietina* (*Raill.*) from Columbigiformes whose hooks approach in size those of the writer's material is *R. (R.) fuhrmanni* (Southwell, 1922); the hooks of this species are, however, smaller (0.025 to 0.03 mm.), less in number (110) and the testes are also fewer (about 12).

Hymenolepis oena sp. nov.

This species was recovered from three of the Namaqua pigeons shot in the Onderstepoort grounds; one of the pigeons harboured four specimens. The worms vary in length from 76 to 94 mm. with a maximum breadth of 1.6 to 1.9 mm. towards their posterior ends. All the segments are much broader than long, mature segments reaching a length of 0.22 mm. by 0.89 mm. broad; ripe segments reach a length of 0.34 mm. by nearly 2 mm. broad.

The scolex (Fig. 4A) is small and somewhat spindle-shaped and measures from 0.10 to 0.24 across, and the four unarmed suckers are slightly oval being 0.086 to 0.09 mm. across by 0.1 to 0.12 mm. long. The rostellum is partially retracted in all the specimens but the extruded portion has the shape of a truncated cone with a basal thickness of 0.098 to 0.108 mm. and an apical diameter of 0.035 mm.; the rostellar sac is large and extends beyond the posterior level of the suckers being about 0.3 mm. long. There are 10 rostellar hooks arranged in a single circle; they are from 0.041 to 0.045 mm. long, and the blade, which has a length of about 0.015 mm., lies in a straight line with the handle (Fig. 4B). The neck varies in length from 0.58 to 0.75 mm. by 0.087 to 0.1 mm. broad.

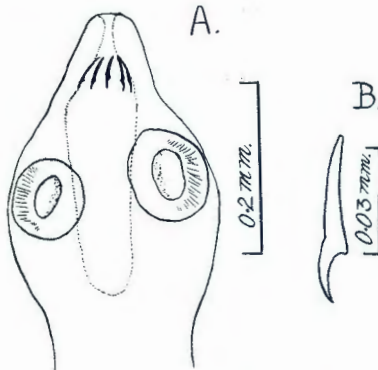


Fig. 4.—*Hymenolepis oenai* sp. nov. A. Scolex. B. Rostellar hook.

The genital pores are unilateral and are situated in the anterior quarter of the segment; they are not prominent. The cirrus sac is tubular to club-shaped, extends across the excretory canals and may pass slightly beyond the poral testis; it is from 0.2 to 0.25 mm. long with a maximum thickness in its proximal third of 0.072 mm. The cirrus appears to be unarmed and has a thickness of 0.012 to 0.015 mm. and reaches a length of 0.06 mm. when extruded. The three testes are arranged in a triangle, one poral and two aporal; the anterior aporal testis is situated slightly nearer the midline and is also generally smaller than that behind it; the poral testis is generally rounded with a diameter of 0.077 to 0.08 mm. while the aporal testes are generally oval, measuring about 0.1 by 0.05 mm. and 0.08 by 0.035 mm. for the posterior and anterior testes respectively. The ovary is centrally placed and at first consists of two wings forming an open and inverted V; as it matures it becomes

slightly lobulated and assumes an irregularly rounded appearance when it measures about 0.15 mm. across. The yolk gland is an irregular oval, 0.05 to 0.056 mm. across, and lies between the two ovarian wings. The whole of the vagina is thin walled and in the older segments, especially those in which the genital glands have disappeared, its inner portion becomes very much enlarged to form a large receptaculum seminis reaching a length of 0.3 mm. by 0.15 mm. thick. The uterus arises as a transverse tube ventral of the ovary; as it enlarges it becomes sacculated and in ripe segments it fills almost the whole segment up to its lateral margins. The numerous eggs have three shells of which the middle is thickened to form an egg-shell; the outer shell is irregularly shaped but when rounded has a diameter of 0.045 to 0.048 mm.; the middle shell has a diameter of 0.03 to 0.033 mm.; the innermost shell closely surrounds the rounded embryo which measures 0.015 mm.

Affinities.—Ours species of this genus, namely *H. columbia* Fuhrm., 1909, has been described from this host, but the nature of the scolex and hooks of this species are quite different from those described above. The shape of the hooks shows some similarity to those of *H. serrata* Fuhrm., 1906 and *H. streptopeliae* Joyeux & Baer, 1935, in the former species the hooks are fewer (8) and their size is more than twice that of the writer's species, and in the latter the strobila is much longer and wider and the hooks are smaller (0.03 mm.).

Specific Diagnosis.—Hymenolepidinae which may reach a length of about 100 mm. by 2 mm. broad. All segments much broader than long. Scolex spindle-shaped and small. Rostellum well developed with large rostellar sac extending posterior of level of suckers. Ten rostellar hooks, 0.041 to 0.045 mm. long, the handle and blade forming almost a straight line. Genital pores in anterior quarter of segment. One poral and two aporal testes. Cirrus sac tubular to club-shaped and may extend beyond poral testis. Ovary median, lobulate. Uterus fills up whole segment. Eggs three shelled.

Host: *Oena capensis* (L.).

Location: Small intestine.

Locality: Onderstepoort, Transvaal.

Types in the Onderstepoort Helminthological Collection.

SUMMARY.

The writer records the following species from four species of South African pigeons: *Raillietina* (*Fuhrmanetta*) *crassula* (Rud. 1819) from *Columba livia domestica* and *Stigmatopelia senegalensis aequatorialis*. *Raillietina* (*Raillietina*) *columbiella* sp. nov. from *Columba livia domestica*; *Raillietina* (*Raillietina*) *vinagoi*, sp. nov., *Raillietina* (*Raillietina*) *delalandei* sp. nov. and *Raillietina* (*Raillietina*) *vogeli* Hilmy, 1936 from *Vinago delalandei delalandei*; and *Hymenolepis oenai* sp. nov. from *Oena capensis*.

In addition the species identified by Johri (1934) as *Raillietina* (*Raillietina*) *polychalix* Koltan, 1920 from an Indian domestic pigeon is considered by the writer as a new species and is named *Raillietina* (*Raillietina*) *johri*.

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