

## On tapeworms of the Genus *Multiceps* hitherto unrecorded from man

Kaoru MORISHITA\*

*Takarazuka City\*\**

and

Isamu SAWADA

*Biological Laboratory, Nara Gakugei University*

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Among tapeworms of the genus *Multiceps* three species, *M. multiceps*, *M. serialis*, and *M. glomeratus*, have hitherto been reported from man. All cases, however, concerned with only coenurus, larval form of this genus, although its identification seems to be questionable in some cases (Clapham, 1941; Nagaty and Ezzart, 1946; Crusz, 1948). The present paper will deal with adult worms of this genus which were for the first time discovered in man.

The sources of the worms were: A) two cases seen by Dr. H. Yabumoto in Mie prefecture and B) a case seen by Dr. T. Haebara in Okinawa. They were sent to one of the authors (K. M.) and preserved unidentified. Recently they were reexamined carefully and found that they concerned with two species belonging to the genus *Multiceps* and furthermore, they were recognized as hitherto unrecorded ones.

### The cases

#### A. The cases from Mie prefecture

They were seen by Dr. Yabumoto at his clinic then in Iwamura, Iinan-Gun, Mie prefecture. The clinical findings made by him were as follows.

Case 1. A. K. Female, 3 years and 8 months old. Lived in Toyohara, Kibushida-Mura, Ii-

nan-Gun (now included into Matsuzaka city). Since toward the beginning of July, 1950, complained anorexia, abdominal pain and frequent diarrhoea. On 7 July, when seen first time, constitution median, undernutrition, face a little pale, and with meteorism. A clyster performed with suspicion for *Ascaris* infection caused discharge of 3 tapeworms measuring 8 cm, 12 cm, and 20 cm long respectively. The stool was diarrhoeic and underdigested. Microscopically many *Ascaris* eggs were detected in stool, but nothing regarding tapeworm. On 8 July 0.2 gm Chenopodium oil and 5 gm scented castor oil were given simultaneously with result that no tapeworm but many *Ascaris* were discharged. After then abdominal symptoms disappeared.

Case 2. S. O. Female, 55 years old. Wife of a fish dealer. Lived in Minato-Mura, Iinan-Gun. Since the end of June, 1950, complained severe painful fit in portion from epigastrium to right back and vomited 2 *Ascaris*. On 3 July when seen first time, constitution median, visible mucosa not anaemic excepting nail and without other special finding. In stool examination eggs of *Ascaris* and hookworm were detected. Immediately Chenopodium oil and Tetrachlorethylene were given resulting in discharge of some *Ascaris* and disappearance of subjective symptoms. On 9 July when clyster was performed with purpose of stool examination 3 tapeworms, 6 cm, 12 cm, and 20 cm long respectively passed with indigested stool. Microscopically stool was entirely negative for any egg.

\* Formerly Department of Parasitology, Osaka University.

\*\* Present Address: Murasakien, Nakasuji, Takarazuka City, Hyogo Pref.

The worms obtained in these cases were placed at our disposal. However, Dr. Yabumoto wrote to the authors his experience of another 2 cases as mentioned below.

Case 3. A. F. Male, 2 years and 6 months old. Lived in Kamijima, Shima-Gun. Since early May of 1949 complained without special cause anorexia, nausea, vomiting, and severe diarrhoea, and toward 10 of the same month one tapeworm passed spontaneously. Anthelmintic treatment was given by a physician without discharging any parasite. Then symptoms disappeared, but as remaining worm was suspected, the patient consulted Dr. Yabumoto. When seen constitution and nutrition median and without any special finding. Red cells 4,930,000, Hb 85 % and colour index 0.86. White cells 10,300 with 6 % eosinophils. Stool examination showed nothing concerning tapeworm but some *Ascaris* eggs. 3 gm Kamala was given with negative result.

Case 4. N. S. Female, 5 years and 11 months old. Lived in Hino-Cho, Matsuzaka city. Since toward the middle of August, 1949, complained anorexia, pain in epigastric region, and on 20 August one tapeworm passed spontaneously. The symptoms disappeared in few days, but as another worms were suspected to exist, the patient was seen by Dr. Yabumoto on 6 September. Constitution median and no special finding but slight malnutrition was observed. Red cells 4,910,000, Hb. 95 % and colour index 0.96. White cells 9,300 and eosinophils 17.5 %. Stool examination exhibited only few *Ascaris* eggs. On 15 September 7 gm Kamala in 2 dosis and on next day 0.7 gm Hexylresorcinol followed by magnesium sulphate after 3 hours were given resulting in that no tapeworm but 5 *Ascaris* were discharged.

The worms in cases 3 and 4 were not seen by Dr. Yabumoto who, however, was of opinion that they were probably similar to those obtained in cases 1 and 2. According to Dr. Yabumoto, it was said that similar cases were not infrequently encountered in the same areas at toward that time.

#### B. The case from Okinawa

The case was a girl aged 4 years and lived

in Naha city. On 5 November of 1955 she passed one tapeworm spontaneously which was sent by Dr. Haebara to one of the authors (K. M.). No clinical finding nor other data were available.

### Description of the worms

#### A. Worms from Mie prefecture.

3 worms, 1 from case 1 and 2 from case 2, were placed at our disposal. They were all provided with complete scolex. Strobila muscular and thick, measuring 60–200 mm long when passed and 3–4 mm in width in preserved condition. The scolex is short and cylindrical in shape, with 4 median-sized suckers, and attenuated anteriorly with truncated end involving a short rostellum. The rostellum is armed with double circle of 20 hooks respectively. The large hooks are very prominent, curved and with conspicuous sinuous handle, measuring 0.418 mm long. The small hooks measure 0.209 mm long.

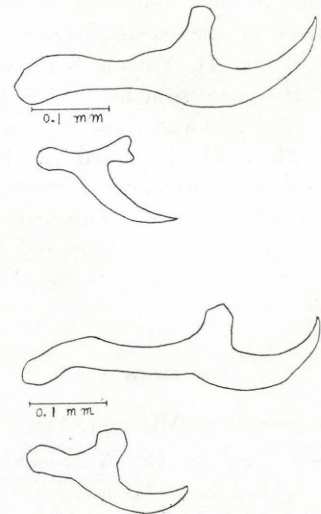


Figure 1. Rostellar hooks

Upper: *Multiceps longihamatus*

Lower: *Multiceps* sp. from Okinawa

The neck is short and nearly equal to the scolex in its width. The proglottids are wider than long in most part except gravid ones which are longer than width. The posterior



margin of each proglottid somewhat projects posteriorly and covers anterior margin of the next one, giving a doll-saw-shaped lateral aspect. The genital pore opens unilaterally somewhat anterior to the middle of margin of the proglottid.

The internal structure of the mature proglottid is alike that of *Taenia*. A long club-shaped uterus runs longitudinally in the middle of the proglottid. The ovary, situated on both sides near posterior end of uterus, consists of two large symmetrical lobes and a large mass of yolk glands lies just behind uterus. The vagina originating from near posterior end of

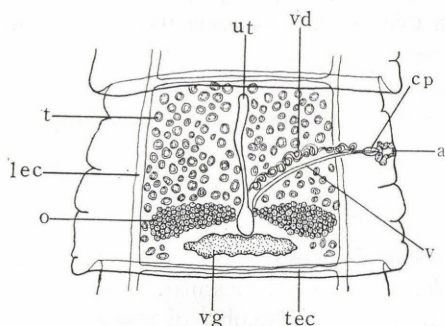


Figure 2. Mature proglottid of *Multiceps longihamatus*

atr. atrium cp. cirrus pouch lec. lateral excretory canal o. ovary t. testis tec. transverse excretory canal ut. uterus v. vagina vd. Vas deferens vg. vitelline gland

uterus proceeds antero-laterally to open into the atrium situated in lateral margin. The testes, 150-180 in number, are distributed throughout the almost field of the proglottid except its postero-median region. Vas deferens, much convoluted, runs nearly parallel with vagina and connected with the cirrus pouch which opens into atrium. In gravid proglottid the uterus has 20-23 branches on each side. The egg is nearly spherical in shape, measuring 0.025-0.028 mm in diameter. The shell is thick and oncosphaera measures 0.007-0.008 mm in diameter.

#### B. Worm from Okinawa

Only one specimen preserved so badly as internal organ of mature proglottid can not fully

observed was placed at our disposal.

Strobila is very thick and measures 160 mm long and 4 mm in width. The scolex is short and cylindrical in shape with 4 median-sized suckers, and truncated anteriorly involving a short rostellum which is armed with double circles of hooks of 23 in number in each. The large hook is prominent, curved, and with conspicuous sinuous handle, measuring 0.38-0.39 mm long. The small hook measures 0.26-0.27 mm long.

The neck is short and almost equal to the scolex in width. The posterior margin of the proglottid overlaps a little the anterior margin of the next one. The genital pore opens unilaterally in around middle of the lateral margin of the proglottid. The gravid proglottid is longer than width, containing uterus with 26-29 side branches which are often subdivided. The egg is nearly spherical in shape, measuring 0.025-0.029 mm in diameter. The shell is thick and oncosphaera measures 0.011 mm in diameter.

	Dimensions (mm)	
	Worms from Mie	Worm from Okinawa
Strobila: length	60-200	160
width	3-4	4
Scolex: width	1.6-1.7	1.3
Sucker: diameter	0.383 × 0.265	0.139 × 0.139
Rostellum: diameter	0.697	0.523
Hook:		
large: number	20	23
length	0.418	0.38-0.39
small: number	20	23
length	0.209	0.26-0.27
Testis: number	150-180	
Egg: diameter	0.025-0.028	0.025-0.029
thickness of shell	0.004-0.0042	0.004
Oncosphaera:		
diameter	0.007-0.008	0.011
Uterus:		
number of branches	20-23	26-29

#### Discussion

From the descriptions made above it is con-

sidered that both worms may belong to the genus *Multiceps* of the family Taeniidae. The recognition of this genus is easy when characteristic larval form has been found, but with adult worm this genus is often difficult to distinguish from other genera of the Family especially from genus *Taenia*. In *Multiceps*, however, adult worm is characterized by large rostellar hook usually with sinuous handle and the presence of leflex loop of vagina in the vicinity of the osmoregulatory canal of that side, although the latter is not necessarily always observed. The worms dealt with here are recognized to belong to genus *Multiceps* by the character of large rostellar hook although the leflex loop of vagina could not be confirmed. It is also notable that the shell of egg is very thick in the present worms.

As to the specific position of both worms, A and B, it is obvious that as seen from their dimensions they may concern with different species and in general aspect B is smaller than A. For identification of species of this genus the large rostellar hook is thought most important basis. Comparing this character of present worms with that of known species, the large hook of those from Mie prefecture is extraordinary in length, measuring 0.418 mm long, whereas in known species it measures mostly 0.07–0.198 mm long with a few exceptions in which it is longer than above measurement but not exceeds 0.4 mm. In this point the present species differs undoubtedly from all known ones. As to the species from Okinawa which has large hook measuring 0.38–0.39 mm long, *Multiceps macracantha* Clapham, 1924 is only one among known species comparable with the former in the size of the large hook as it measures 0.377–0.391 mm long in the latter. However they differ from each other in number of hooks, being 23 in species from Okinawa while 20 in *M. macracantha*.

From the points mentioned above it seems to be reasonable to conclude that both species dealt with here may be new to science. However, the authors are of opinion that at present only species from Mie prefecture is to be named and species from Okinawa should be

retained unnamed until the time when the structure of mature proglottid will fully be cleared up. The diagnosis of both species are as follows.

*Multiceps longihamatus* n. sp.

Specific diagnosis: With character of genus *Multiceps*. Strobila muscular, 60–200 mm long by 3–4 mm in width. Number of rostellar hooks 20 in each circle. The large hook very conspicuous, measuring 0.418 mm long. The small one measures 0.209 mm long. Testes 150–180 in number per proglottid. Uterus, when gravid, with a median stem and 20–23 side branches. Egg nearly spherical in shape with thick shell, measuring 0.025–0.028 mm in diameter.

Host: man.

Locality: Mie prefecture (Inan-Gun, Shima-Gun, Matsuzaka city), Japan.

*Multiceps* sp. (from Okinawa)

Specific diagnosis: With character of genus *Multiceps*. Strobila muscular, 160 mm long by 4 mm in width. Number of rostellar hooks 23 in each circle. The large hook prominent, measuring 0.38–0.39 mm long. The small hook 0.26–0.27 mm long. Uterus, when gravid, with a median stem and 26–29 branches on each side. Egg spherical in shape with thick shell, measuring 0.025–0.029 mm in diameter.

Host: man.

Locality: Naha city, Okinawa.

**Pathogenicity and infection route**

As already described, the cases from Mie prefecture complained commonly anorexia, nausea, vomiting, diarrhoea, and abdominal pain, and rarely epigastric pain. It is uncertain whether or not these symptoms may have been caused by the tapeworms as all cases had simultaneous infection of *Ascaris* or hookworm which might have concerned with similar symptoms. However, it is noteworthy that in some cases the symptoms disappeared after the tapeworm passed in spite of presence of *Ascaris*.

Regarding the infection route of tapeworms



of genus *Multiceps* it is well known that larval form, coenurus, developing in several mammals such as cattle, sheep, goat, rabbit, hare etc. may cause the infection when taken by final host. So far as Dr. Yabumoto's inquiry went, three cases from Mie prefecture, all children, had chance to eat flesh or liver of rabbit or hare as tonic, probably in raw condition, what suggested the infection route of this tapeworm although there was no exact proof.

About the case from Okinawa no data was available regarding its symptom or infection route owing to the death of Dr. Haebara who dealt with the case although a similar route of infection as in above cases was supposed.

### Summary

1) The tapeworms found parasitic in man in Mie prefecture and Okinawa were identified as species belonging to genus *Multiceps*. They involved two species different according to the locality where each was obtained.

2) Both species are characterized by conspicuous large rostellar hook. In specimens from Mie prefecture it is extraordinary in length measuring 0.418 mm long and there is no one among known species similar in this character. In specimen from Okinawa the large hook measures 0.38-0.39 mm long and *Multiceps macracantha* Clapham is only species among known ones to be comparable with it in length of large hook, but their number differs in both species.

3) Basing on the aspects mentioned above the authors are of opinion that both species should be new to science. At present, however, they intend to deal with only species from Mie prefecture as new, naming *Multiceps longihamatus* and to retain species from Okinawa unnamed because of obscurity of structure of internal organ of mature proglottid.

4) In most cases from Mie prefecture certain abdominal symptoms were complained. However, it is questionable whether these symptoms may have been caused by tapeworm

as in all cases simultaneous infection of *Ascaris* or hookworm was seen.

5) As to the infection route of this tapeworm, it is noteworthy that the most cases from Mie prefecture ate flesh or liver of rabbit or hare as tonic, probably in raw condition.

6) The present paper deals for the first time with adult tapeworm of genus *Multiceps* found in human being.

### Acknowledgments

The authors are much obliged to Dr. H. Yabumoto for his kind placing of interesting specimens at their disposal and for information on clinical and other important findings about the cases seen by him. They are also very thankful to Dr. T. Haebara for a specimen from Okinawa kindly sent by him and wish to offer their deep condolence to his sorrowful death.

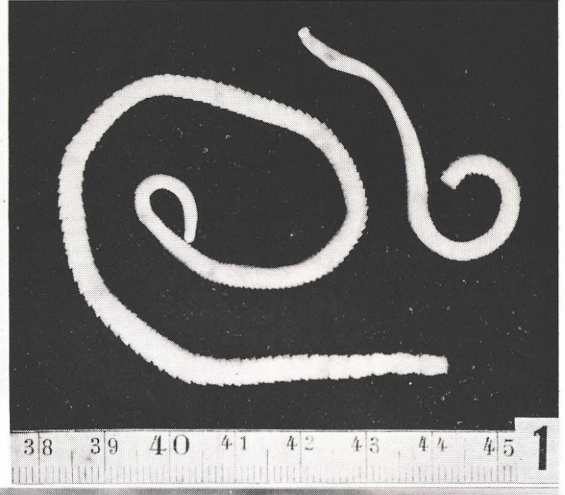
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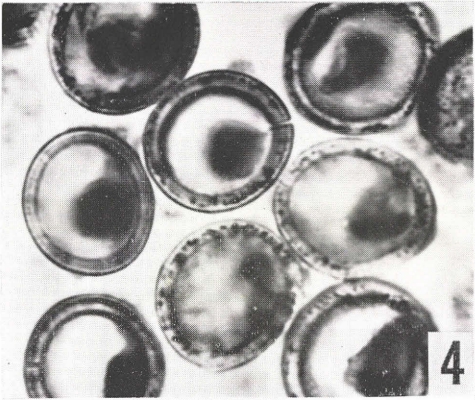




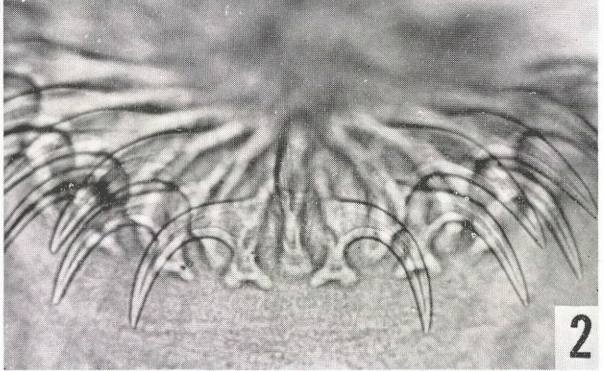
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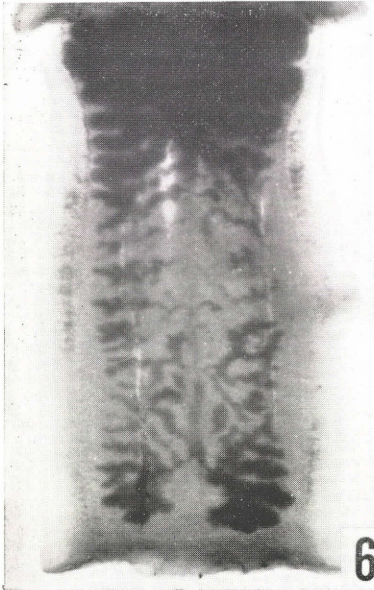
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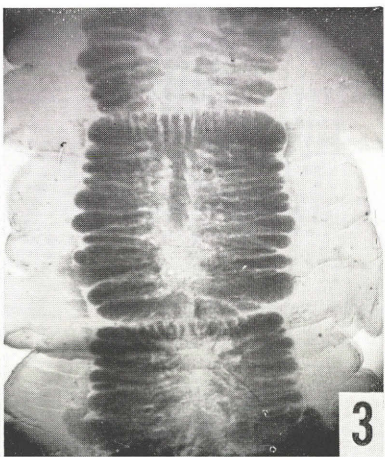
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## 人体より未記録の *Multiceps* 属条虫について

森 下 薫

(宝塚市)

沢 田 勇

(奈良学芸大学生物学教室)

著者らは藪本秀一氏が三重県下で、また南風原朝保氏が沖縄でそれぞれ人体から得た条虫を検し、何れも *Multiceps* 属のものであることを知った。本属の種類で従来人体から報告されたものは3種とされているが、何れも幼虫形の共尾虫 *coenurus* であつた。今回報告するものは人体から始めてみられた本属の成虫であり、かつ今日まで未記録のものである。

三重県下の標本は2症例より得られた3条で、体長60-200 mm、額嘴の鉤列は大小それぞれ20、大鉤は頗る著大で長さ0.418 mmを算し、既知の種類にはこれに匹敵する大鉤を有するものがなく、明らかに新種と認められるので、これを *Multiceps longihamatus* (n. sp.) と命名した。

沖縄のものは1症例から得た1条であるが、三重のものとは異なる。体長160 mm、額嘴の鉤列は大小それぞれ

23を数え、大鉤は大きく長さ0.38-0.39 mmを算する。既知種では只 *M. macracantha* Clapham, 1924のみがこれに匹敵する大鉤を有するが、鉤列の数はそれで20でこれと異なる。これより本種も新種と考えられるが、成熟片節の内部構造を明らかにし得ないので、ここには命名を保留したい。

三重県下の症例の多くは食慾不振、悪心、嘔吐、下痢、腹痛などを訴えたが、何れの例も蛔虫または鉤虫が同時寄生していたので、条虫に因るか否か明らかでない。ただし蛔虫が残つていても条虫の排出後諸症状の消失しているもののあることに注意を要する。三重の例では家兎または野兎の肉または肝臓を摂取しているものが多く、それによる感染が推察されるが、元より確証はない。

### Explanation of Plate

1-4 *Multiceps longihamatus* n. sp.

1. Strobila with scolex.

2. Rostellar hooks.

3. Gravid proglottid with branched uterus.

4. Eggs in uterus.

5-7 *Multiceps* sp. from Okinawa.

5. Anterior part of scolex showing rostellum provided with hooks.

6. Gravid proglottid with branched uterus.

7. Eggs in uterus.