

(RESEARCH ARTICLE)



The description of adult worm of *Spirometra* species: A Pseudophyllidean tapeworm

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Abstract

A complete life-cycle of *Spirometra* sp. was carried out in the laboratory of Institute of Postgraduate Studies, University of Malaya, Malaysia. The life-cycle started in from the egg to adult stage. The 4 adult worms of *Spirometra* recovered from experimentally infected cats were used for description after staining the scolex and proglottids with Alum-carmin. The entire strobila measured 15.0-53.5cm long. The scolex was spatulate with two bothria both sides, neck long and mature proglottids had 3 genital pores: cirrus, vaginal and uterine at separate sites. Uterus was located in the middle of the proglottid. With 6 coils, testes and vitellaria were found on both sides.

Keywords: Scolex; Neck; Proglottid; Genital pores

1. Introduction

Spirometra is a pseudophyllidean tapeworm (Cestode) which belong to the family Diphylobothriidae whose plerocercoid larva (sparganum) infects human causing sparganosis [1]. Sparganosis is an infection of man with clinical presentation of itching and irritating migratory pear-sized nodule or tumor under the skin which contains the worm. The most common presentation of sparganosis is a migratory subcutaneous mass with elevated blood eosinophilia [2] (Campbell, 1977). Spargana has been found in brain [3, 4, 5], spinal cord [6] and eyes [7, 8]. Human can be infected with spargana through drinking unboiled or treated water containing infected cyclops with proceroids. In countries like Far East and Southeast Asia where people have a habit of eating raw or undercooked meat of frogs or snake and application of the flesh of snake or frog to wounds as treatment may transfer the spargana to human if the snake or frog is infected. The parasite has five stages in its life cycle: egg, coracidia, proceroid, plerocercoid (spargana) and adult stage. Two intermediate hosts are required in the life cycle [9, 10]. The first intermediate host is cyclops in which the proceroids develop while amphibians, reptiles and birds are second intermediate hosts in which plerocercoid (sparganum) is found. The infective stages to man are proceroid and plerocercoid. Adult stage of *Spirometra* has been used for identification of the parasite [11,12, 13, 14]. In Malaysia *Spirometra* has been reported by different researchers [15, 16, 17]. In the present study *Spirometra* was propagated in the laboratory and the morphological characteristics of the adult worm was used for description.

The morphology of an adult worm consists of scolex, neck and proglottids. Mature proglottid has uterus, testes, vitellaria and three genital pores: cirrus, vaginal and uterine pores. These structures are very important for identification of *Spirometra* species. Therefore, the aim of this study was to describe the adult worm of *Spirometra*.

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2. Material and methods

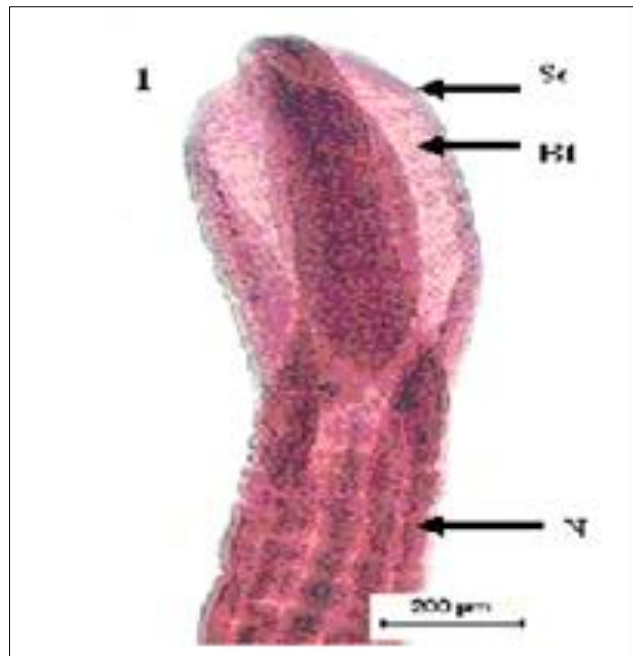
A complete life cycle of *Spirometra* was carried out under laboratory conditions. Plerocercoids were collected from frogs (*Rana limnocharis* and *R. cancrivora*) which were purchased from Tanjung Karang. The plerocercoids were fed to cats where developed to adult worms in the small intestines. Adult worms started discharging eggs in faeces of cats. The eggs were collected and used to start the life cycle. Eggs were incubated in the laboratory at temperature 30°C until hatched to coracidia. The hatched coracidia were experimentally infected to Cyclops (first intermediate host) where developed to proceroid. The infected Cyclops were orally infected to hamster mice by using a 2 ml syringe with normal saline where developed to plerocercoids. After 30 days post infection of the mice were killed and dissected to recover the plerocercoids. The recovered plerocercoids were fed orally to cats only the scoleces. The plerocercoids developed to adult worm in the small intestine of the cats and started producing eggs which were discharged in faeces of cats. The infected cats were sacrificed and the adult worms were recovered in the small intestine. The adult worms were preserved in 70% ethanol until used.

2.1. Processing of adult worms

Specimen of scolex, neck and mature proglottids were dehydrated in a graded series of ethanol, cleared in Xylene, stained with Alum-carmin and mounted in Canada balsam. Adult worms were studied under light microscope.

3. Results

A total of 4 adult worms were recovered from experimentally infected cats with *Spirometra* spargana. The measurements of the entire strobila ranged between 15.0-53.5cm (Table 1). The morphology of the adult worm had scolex which was spatulate with two bothria both sides, neck long and proglottids. Mature proglottid had 3 genital pores: cirrus (male), vaginal and uterine. Uterus coiled with 6 coils, located in the middle of the proglottid. Testes and vitellaria was observed to be in the lateral sides. The morphology of scolex, neck (Figure 1) and proglottid (Figure 2).

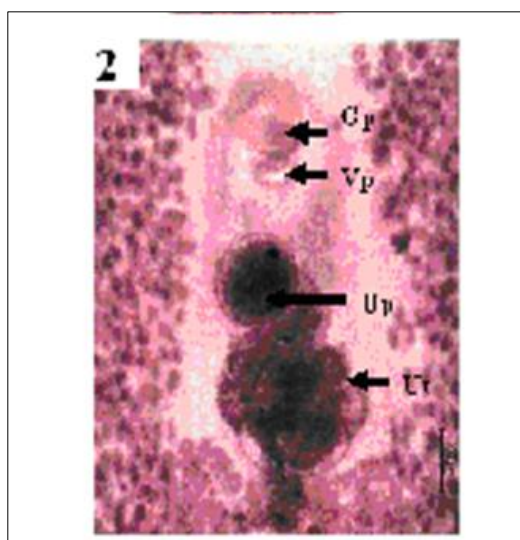


Adult worm (Alum-carmin stain)

Figure 1 Scolex (Sc) of Malaysian *Spirometra* species, Bothria (Bt) and neck (N)

Table 1 Measurements of length of 4 adult worms

Worm	Length (cm)
1	15.0
2	47.5
3	53.5
4	16.0
Mean	33.0
Range	15.0-53.5

**Figure 2** Proglottid showing genital pore (Gp), vaginal pore (Vp), uterine pore (Up) and uterus (Ut)

4. Discussion

Cats have been reported to be definitive hosts of *S. erinacei* where the spargana develops to adult worm in the small intestine and discharge eggs in faeces [10, 18, 19]. The measurements of the entire adult worm has been reported in Malaysia [18] to be 55-71 cm, in Japan [20] was 30-95cm. In the present study spargana developed to adult worm after oral infection and started discharging eggs in faeces. The measurements of 4 adult worms recovered from small intestine of cats was between 15.0-53.5 cm. The measurements are within the range of adult *Spirometra erinacei* when grown in cats as reported by other workers.

The morphology of adult worm of *Spirometra* has been reported in various studies [10, 20, 8]. They reported that scolex is spatulate with two lateral bothria, neck long, proglottid has uterus coiled 5 to 7 coils, occupies a narrow field along the median line. Uterine pore lies in the midline some distance behind the anterior margin of the male genital pore (cirrus). Vaginal pore is broad, just behind the male pore. Testes and vitellaria are not united anteriorly in the midline. In the present study the adult worm showed scolex to be spatulate with two lateral bothria, neck long, mature proglottid has uterus with 3 pores: genital pore located on the upper ventral side of the proglottid, vaginal pore located short distance in front of the terminal uterine coil, and uterine pore lies on the ventral side of the terminal coil some distance further from the genital pore. The uterus has 6 coils, centrally located in the proglottid. Testes not united with vitellaria in the midline. The results of the present study correspond with the results of the previous workers for *S. erinacei*.

5. Conclusion

The results have shown the morphological characteristics of Malaysian *Spirometra* to be *Spirometra erinacei* which is the species available in Asia.

Recommendation

It is recommended that in future molecular biology studies should be done to confirm the species.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

In this study there is no conflict of interest.

Statement of ethical approval

The present research work contain studies performed on animal subjects: amphibians –frogs which were purchased from Tanjung Karang, hamster mice- which were laboratory bred for the purpose of research and cats- these were stray cats. However, consultation was sought from Ipoh Veterinary Research Institute.

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