THE TAXONOMIC STATUS OF *PTERYGODERMATITES* spp. AND THE SCANNING ELECTRON MICROSCOPY STUDY OF *PTERYGODERMATITES WHARTONI* (TUBANGUI, 1931) (NEMATODA: RICTULARIIDAE) FROM INDONESIAN MURIDS

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ABSTRACT

Kartika D. 2010. The Taxonomic Status of *Pterygodermatites* Spp. and The Scanning Electron Microscopy Study of *Pterygodermatites whartoni* (tubangui, 1931) (Nematoda: Rictulariidae) from Indonesian Murids. Zoo Indonesia 2010. 19(1): 31-36. *Species of genus Pterygodermatites which had been reported from Indonesian murids were P. tani dan P. whartoni. The females of the two species could not be morphologically disthingushed each other, but the different is at the genital morphology of males. Similar morphology characters on female between both species confused many researhers. This study is the first which has successfully described the morphology of P whartoni from Indonesian specimen using light and scaning electron microscope. Observation on morphology of P. whartoni using SEM give addition data which was not recorded by ligth microscope. This study also provided new knowledge about distribution and host of Pterygodermatities spp. in Indonesia.*

Keywords: *Pterygodermatites whartoni, Pterygodermatites tani, Rattus tanezumi, Rattus hainaldi,* Central Sulawesi, Flores.

ABSTRAK

Kartika D. 2010. Status Taksonomi *Pterygodermatites* spp. dan Kajian *Pterygodermatites whartoni* (Tubangui, 1931) (Nematoda: Rictulariidae) dari Tikus Menggunakan Mikroskop Elektron. Zoo Indonesia 2010. 19(1): 31-36. *Marga Pterygodermatites yang pernah dilaporkan menginfeksi tikus di Indonesia adalah P. tani dan P. whartoni. Secara morfologi, cacing betina antara P. tani dan P. whartoni tidak dapat dibedakan, sehingga status taksonominya membingungkan banyak taksonom. Untuk membedakan kedua spesies tersebut hanya bisa dilakukan menggunakan spesimen jantan. Pada penelitian ini P. whartoni dideskripsikan secara morfologi dari spesimen Indonesia dengan menggunakan mikroskop cahaya dan elektron. Pemeriksaan spesimen dengan menggunakan mikroskop elektron memberikan tambahan karakter yang tidak bisa terekam menggunakan mikroskop cahaya. Tulisan ini membahas status karakter dan*

memberikan tambahan catatan baru inang untuk Pterygodermatites spp. di Indonesia

Kata kunci: *Pterygodermatites whartoni, Pterygodermatites tani, Rattus tanezumi, Rattus hainaldi, Sulawesi Tengah, Flores.*

INTRODUCTION

Pterygodermatites whartoni (Tubangui 1931) (syn: *Rictularia whartoni)* was firstly described by Tubangui based on female specimens from intestine of *Rattus norvegicus* in Philippines. Previously, *Pterygodermatites tani* (syn: *Rictularia tani),* a very similiar species, was described by Hoepply in 1929. That description based on five female specimens from the same host in China (Kamiya 1975; Schacher & Cheong, 1960; Hasegawa et al.1993).

In 1936, Chen described the male of *P. tani* for the first time and compared to *P. whartoni.* He concluded that the two species might be the same (Schacher & Cheong 1960). The idea was supported by Schacher & Cheong (1960) who regarded *P. whartoni* as a junior synonim of *P. tani.* Later, the males of *P. whartoni* was described by Schmidt and Kuntz in 1967 from *Sundasciurus steeri juvencus* in Philippines, but Kamiya (1975) stated if *P. whartoni* seemed to be a synonym of *P. tani* base on a pair of ventro-lateral cuticular dilations in the cervical region of females.

In actually, females of *P. whartoni* is morphologically identic to *P. tani.* It has consequent to confusion among researchers about its taxonomic relationship (Hasegawa et al. 1993). The taxonomical confusion of both species ended when Hasegawa et al. (1993 & 1994) described male of *P. whartoni* and *P. tani* from *Rattus rattus* in Japan and Taiwan in which genital morphology of males of the species were different. The length and length ratio of the spicules had been considered as an important taxonomic character in rictulariid.

Pterygodermatites tani was previously reported in Indonesian murid by Wiroreno in 1978 from *Rattus rattus diardii* in Bogor area, then this nematode had been reported from *R. diardii* and *M. surifer* in Sunda Strait, and *R. xanturus* in Lore Lindu, Central Sulawesi (Wiroreno 1978; Purwaningsih & Saim 1988; Purwaningsih & Dewi 2007). Those specimens were identified only based on females specimen. In actually, rictulariid males were small and usually much fewer in number than females (Hasegawa et al. 1993). However, the problem is *P. whartoni* could not be differed with *P. tani* only based on female specimen, so the taxonomic status of reported *P. tani* in Indonesia was still in confusion

Pterygodermatites whartoni was reported from Indonesian murid by Hasegawa and Syafrudin (Hasegawa and Syafrudin 1995). That worm was reported infecting *Rattus xanthurus* and *Rattus rattus* from Halmahera. However, the publications did not describe the morphology of that worm.

MATERIALS AND METHODS

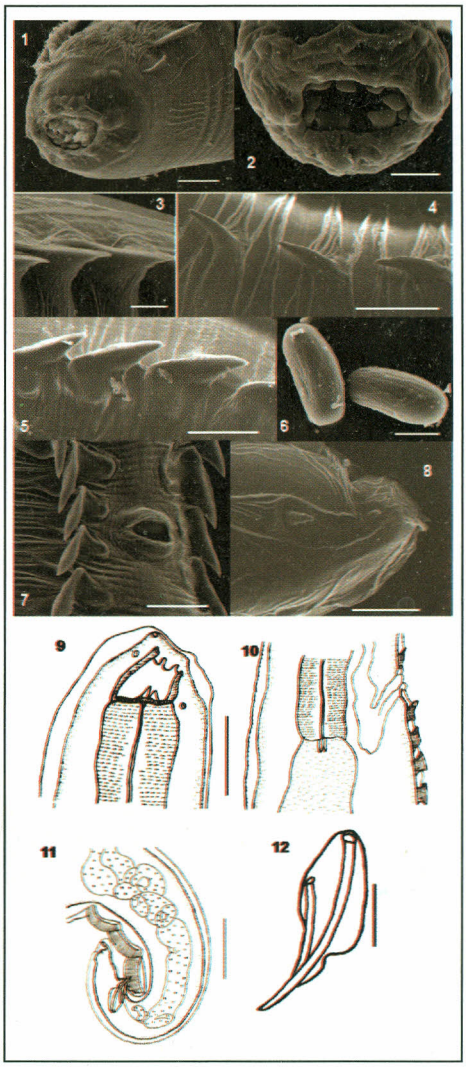
Specimens of *P. whartoni* were obtained from deposited rodents in Museum Zoologicum Bogoriense. That nematodes were parasitizing *Rattus tanezumi*, collected from Central Sulawesi on 23 July 2008. The habitat of *P. whartoni* was small intestine. Later,

The specimens were examined using a compound Olympus BH series microscope with a drawing tube, and scanning electron microscopy JEOL-JSM5310LV, in 20 kV accelerating voltage. Specimens for light microscopy, were cleared in glycerine, measurements were made with an ocular micrometer. One specimen for scanning electron microscope was fixed in cacodylate buffer and glutaraldehyde, dehydrated through a graded series of ethanol, and freeze dried using Labconco Model 79480 (Labconco Co., Kansas, Missouri). The dried specimen were attached to stubs with double sided cello-tape, then coated with an gold ion coater Eiko IB-2 (Eiko Co., Tokyo, Japan) at 5–8mA for 5 min. Measurements (range, followed by mean in parentheses) were given in micrometers unless otherwise stated.

RESULTS AND DISCUSSION

The descriptions based on 8 specimens (1 male and 7 females).

General. -Stout worm with two subventral rows of comb like spine commencing immediediately behind buccal cavity. Mouth subterminal, opening dorsally by a transversely elongated aperture bordered by denticle buccal capsule wall chitinized armed at its base with teeth and spines (fig. 1). Ventral wall with two large slightly bent teeth; lateral walls each with two round teeth; dorsal wall with two small teeth (fig. 2). Labium absent. Three oesophageal teeth present, 1 ventral and 2 subdorsal (fig. 9). Four pairs large cephalic papillae and six small inner papillae, amphid behind the lateral inner papillae. Oesophagus simple slightly claviform, divided into short anterior muscular and long posterior glandular portion. Excretory pore slightly anterior to nerve ring.



Figs 1-11. ***Pterygodermatites whartoni.*** 1. Anterior part (apical view), 2. Teeth, 3. Combs in the middle part of body, 4. Combs in the posterior part, 5. Transitions part of comb from boomerang-shape to spini-shape, 6. Egg, 7. Vulva, 8. Posterior part of female (lateral view). Bars: 1: 50 µm, 2, 6: 20 µm, 3: 30 µm, 4,5,7: 100 µm, 8: 200 µm

9. Anterior part, 10. Vulva 11. Posterior part of male, 12. Spicules. Bars: 9, 10: 100 µm, 11: 200 µm; 12: 50 µm.

Female. -Total length 2.2 cm (1.8 – 3.0 cm), width at mid body 975 (950- 980). Chepalic end (apical view) 159 long, 111 wide. Mouth 85.5 long by 30.5 wide. Muscular oesophagus 710 (650-790) long, dan 96 (90-100) long, glandular oesophagus 2,830 (2,410-3,100) long, 190 (184-206) wide. Buccal capsul 81 (75-90) long by 60 (58-65) wide, wider than deep. Nerve ring 371 (320-480), from anterior end. Number of comb pairs 89: 40 pairs prevulva and 49 postvulva. The anterior combs wide and short (fig. 3), the widest comb 101; base of combs become thick in the mid body, so the combs like boomerang-shaped. The thickness become disappear gradually, and really disappear at 42th comb from anterior end (fig. 5) and becoming spine-shaped (fig. 4). The spine becoming scares posteriorly. Vulva 3,120 (3,094-3,432) from anterior end, lying a short distance anterior to posterior end of the oesophagus (fig. 10), vulva lip salient (fig. 7). Vagina short and muscular. Uterin branches pararel. Eggs ellipsoidal (fig. 6), 42,1 (40-44) by 34,6 (30–38), thick-shelled, containing developed embrio in uterine. Tail conical 266 (240-290), with one spines at the pre anus and 1-2 at post post anus, ends in a sharp point. End of posterior spine-like (fig. 8).

Male. –Total length 4,42 mm. wide 560. Body strongly curved ventrally at the posterior end. Muscular oesophagus 378 long and 55 wide, glandular oesophagus 1.300 long, 120 wide. Buccal capsul 40 wide by 30 long. Nerve ring 303, excretory pore 420, deirids 590, respectively from anterior end. Spicules unequal, simple, slightly bent ventrally, right spicula 72, left spicule 140. Number of combs 66, begins after buccal capsul until near to cloaca. Combs in anterior and posterior part scare, but in the middle, combs become close to each other. Caudal papilla ten pairs: 2 pre anal,1 adanal dan 7 post anal. Three well developed preanal fans present: width 105.2, 127.2 and 142.3 from anterior to posterior, respectively (fig. 11). Gubernaculum spade-like. Tail conical 150 long (fig. 12).

Schacer & Cheong (1960) described *P. whartoni* having two spicules very nearly equal. They compared of the original description of *P. tani* with *P. whartoni* showing that the only differential feature was the presence of spines posterior to the anus in the female of *P. whartoni.* So they gave opinion if *P. whartoni* to be definite synonym of *P. tani.* This study revealed that number of spine at the post anus of female had variation between 1 or 2., so it could not be considered as a taxonomic character for the species.

Hasegawa et al. (1993 & 1994) described *P. whartoni* and *P. tani* from *Rattus rattus* in Japan and Taiwan using light microscope. In both descriptions, differentiation between the two *Pterygodermatites* species was clear. Spicules in *P. tani* were almost equal (right spicule 62-78 long; left spicule 68-76), whereas in *P. whartoni* were unequal in length (right spicula 65-83; left spicule 138-170).

The morphology of *P. whartoni* found in Indonesia showed no differences with *P. whartoni* from Japan and Taiwan. However, slight differences of size were occurred among samples from different region in which the different could be considered as morphological variation (Table 1). Based on observation, the character of *P. whartoni* from Central Sulawesi agreed well with *P. whartoni* described by Hasegawa et al. (1994), except in the number of outer circle of cephalic papilla. In the Hasegawa's description *P. whartoni* had four cephalic papilla, but using scanning

Table 1. Comparison of *Pterigodermatities whartoni* male from Japan, Taiwan and Indonesia (in micrometers unless stated otherwise)

Host Locality References	*Rattus rattus* Uotsuri Island, Japan Hasegawa et al., 1993	*Rattus rattus* Lanyu, Taiwan Hasegawa et al., 1993	*Rattus tanezumi* Central sulawesi Present study
Body length	5.62 mm	4.58-6.15 mm	4.42 mm
Body width	400	254-359	560
Number of comb pairs	64	60-62	66
Buccal depth	51	46-51	40
Oesophagus length			
Muscular	356	265-394	378
Glandular	1.52 mm	1.13-1.61 mm	1.3 mm
Nerve ring	281	238-312	303
Excretory pore	429	308-421	420
Deirids	545	419-600	590
Spicule			
Rigth	75	65-83	72
Left	155	138-170	140

electron microscope they consisted eight (four pairs) cephalic papilla. Moreover Hasegawa et al. (1994) reported that the mediodorsal of tooth at buccal capsule had straight apex, but this study revealed different evidence which the tooth was concave-shaped. Observation of morphology *P. whartoni* of *P.whartoni* using SEM gave addition data to the shape of tooth, the number of outer circle of cephalic papilla. SEM also successfully figured clearer the shape and the changes of spines at the cuticle.

This study also examined five *Rattus hainaldi* from Flores collected by Dr. Kitchener in 1995. The study showed that the number of female of *Pterygodermatities* sp., paraziting two of *R. hainaldi* ere two and five, respectively. Examination of that material had provided new knowledge about distribution and host of *Pterygodermatities* sp. However, only based on female specimens, identification of the the worms could not be identified yet whether they belong to either *P. tani* or *P. whartoni*.

As common species, *Pterygodermatities* spp. were found in many regions and infected many species of rats in Indonesia (Table 2). The data was derived from catalog of Museum Zoologicum Bogoriense (unpulished data) and from the publication from other researchers

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Table 2. *Pterygodermatities* spp. collected from the rodents in Indonesia.

Nematode	Host	Habitat	Region	References
***Pterygodermatities* sp.**	*Sundamys muelleri*	intestin	North Sumatra	
	Lepoldamys sabanus	stomach	North Sumatra	
	Hylomis suillus	intestin	South Sulawesi	
	Rattus sp.	intestin	South Sulawesi	
	Rattus diardii	stomach, intestine	North Sumatra, Rakata Island	
	Rattus hainaldi	intestin	Flores	Present study
Pterygodermatities tani	*Rattus bartelsii*	unspecified habitat	West Java	Wiroreno, 1978
	Rattus rattus diardii	unspecified habitat	West Java	Wiroreno, 1978
	Rattus diardii	stomach, intestin	Rakata Island	Purwaningsih & Saim, 1988
	Rattus xanthurus	stomach, intestin	Central Sulawesi	Purwaningsih & Dewi, 2007
Pterygodermatities whartoni	*Rattus exulans*	intestin	Halmahera	Hasegawa & Syafrudin, 1995
	Rattus rattus	Intestin	Halmahera	Hasegawa & Syafrudin, 1995
	Rattus tanezumi	intestin	Central Sulawesi	Present study

REFERRENCES

Hasegawa, H., S. Arai & S. Shiraishi. 1993. Nematodas collected from rodent on Uotsuri Island, Okonawa, Japan. *Journal of Helminthological Socociety of Washingthon*, **60**(1): 39-47.

_____., J. Kobayashi & M. Otsuru. 1994. Helminth parasites collected from *Rattus rattus* on Lanyu, Taiwan. *Journal of Helminthological Socociety of Washingthon*, **61**(1): 95-102.

_____& Syafrudin. 1995. Nematode fauna of the two sympatric rats, *Rattus rattus* and *R. exulans*, in Kao district, Halmahera Island, Indonesia. *Journal of the Helminthological Society of Washington* **62:** 27-31.

Purwaningsih, E. & K. Dewi. 2007. Nematoda pada tikus suku Muridae dan pola infeksinya di Taman Nasional Lore Lindu, Sulawesi Tengah. *Berita Biologi.* **8**(6): 509-514.

_____ & A. Saim. 1997. Pola Kandungan Parasit pada tikus di Siberut, Sumatra Barat. *Majalah Parasiologi Indonesia,* **12**(1-2): 49-60.

Kamiya, M. 1975. *Rictularia tani* from rodents in Thailand. *Southeast Asian Journal Tropical. Medicine Public Health.* **6**(1): 139-141.

Schacher, J. F. & C. Chee-Hock. 1960. Nematoda parasites of three common house rat species in Malaya, with notes on *Rictularia tani* Hoeplli, 1929. *Malaya.***29:** 208-216.

Wiroreno W. 1978. Nematoda Parasites of Rats in West Java, Indonesia. *Southeast Asian Journal Tropical. Medicine Public Health.* 9 (4). 520-525.