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Studies on the Parasite Fauna of Insectivora III.

Two new nematodes, *Soboliphyme abei* n. sp. (Soboliphymatidae) and *Stefanskostrongylus yagii* n. sp. (Angiostrongylidae) from *Sorex* spp. in Japan

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Introduction

In an effort to clarify the data reported in the previous studies on parasite fauna of the Japanese *Sorex*, the authors conducted further investigations. In this paper, two new soboliphymatid and angiostrongylid nematodes are described.

Materials and Methods

From 1974 to 1983, 99 Japanese shrews (*Sorex shinto saevus* THOMAS) and 229 big-clawed shrews (*Sorex unguiculatus* DOBSON) were collected in several areas of Hokkaido, Japan, and a new soboliphymatid nematode was obtained from the stomach and a new angiostrongylid nematode from the lungs, respectively (Tab. 1).

The nematodes were fixed in 5% formalin, and for microscopic examination were cleared in lacto-phenol solution. For scanning electron microscopy, some of the specimens of the soboliphymatids were further dehydrated through a graded series of ethyl-alcohol and substituted with isoamyl acetate. They were critical-point dried (Hitachi HPC-1), and carbon-gold-coated specimens by an ioncoater (I.B-3 Eiko) were observed under a scanning electron microscope at 20～25 kV (Hitachi HHS-2R). The lungs in which the angiostrongylids were found were fixed in 10% formalin solution and embedded in paraffin, and the sections made were stained with hematoxylin-eosin for pathological investigations.

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Table 1. Occurrence of *Soboliphyme abei* n. sp. and *Stefanskostrongylus yagii* n. sp..

GEN. SP.	HABITAT	HOSTS	
		S.u. (N=129)	*S. s.* (N=99)
Soboliphyme abei n. sp.	stomach	69 (30.1)*	24 (24.2)
Stefanskostrongylus yagii n. sp.	lung	0 (0.0)	14 (14.1)

+: Number of shrews infected.
*: Percentage of shrews infected (%).
S.u.: *Sorex unguiculatus*; *S.s.*: *S. shinto saevus.*

Results and Discussion

1) *Soboliphyme abei* n. sp. (Nematoda : Soboliphymatidae)

Host : Big-clawed shrew, *Sorex unguiculatus* DOBSON (type host); Japanese shrew, *S. shinto saevus* THOMAS

Habitat : stomach

Locality : Hokkaido, Japan

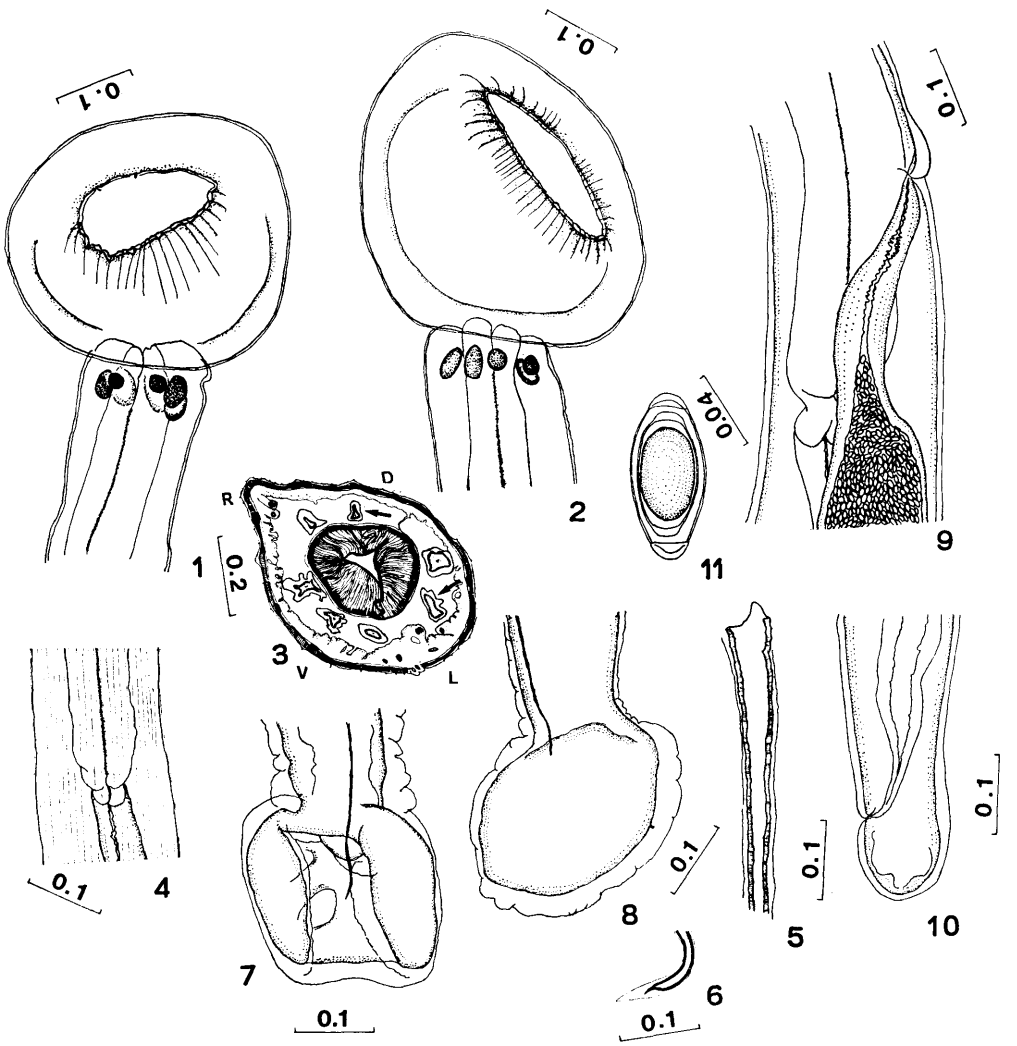
Description (measurements in mm)

Body large and drum-stick shaped. Main measurements are shown in Table 2. Swollen buccal capsule ; 0.97～1.58 long, 0.98～1.25 wide and 0.75 thick in male, and 1.75～2.24 long, 1.89 wide and 1.05～1.54 thick in female in size, respectively. Mounth opening 0.63～0.77 wide in male and 1.30 wide in female ; surrounded by six sessile papillae (Fig. 21). Many fine longitudinal striations on cuticule surface (number of striations anout 60). Esophagus cylindrical and muscular. Seven esophageal glands (=cervical sac) present ; a pair of globular esophageal glands (0.07～0.09 in diameter) on the ventral side, and five foot-ball-shaped esophageal glands (0.13～0.15 in length and 0.06～0.09 in width) on dorsal and lateral sides. Male (seven specimens) : Bursa bell-shaped without rays (Fig. 7) ; 0.36～1.00 long, 0.60～0.93 wide and 0.44～0.82 high, many papillae inside bursa (Fig. 22). Spicule slender, about 1.8 in length, surrounded by thin membrane ; ratio of spicule length to body length 8.8%～15.8%, tapering distally. Cloaca at 0.23～0.74 from caudal extremity. Female (three specimens) : Vulva opening at posterior extremity of esophagus (3.8～5.3 from head end), with swollen cuticular projection. Uterine eggs about 0.06×0.03 in size, unsegmented ovoid cell surrounded by two membranes (inner thin and outer thick shell) and plugs at both poles. Tail end bluntly rounded.

Type specimen is deposited in Meguro Parasitological Museum (No. 19498), Tokyo, Japan.

The genus *Soboliphyme* PETROW, 1930[14] includes 5 species as follows :

1) *Sobolyihyme baturini* PETROW, 1930[14]



Figures 1–11. *Soboliphyme abei* n. sp. (scale in mm).

Fig. 1. Anterior extremity of male, ventral view.
Fig. 2. Anterior extremity of male, right-lateral view.
Fig. 3. Cross-section of body at junction of buccal capsule and esophagus (esophageal gland; →): D, dorsal; V, ventral; R, right; L, Left.
Fig. 4. Fine longitudinal striations of male, ventral view.
Fig. 5. Anterior extremity of spicule.
Fig. 6. Spicule tip.
Fig. 7. Posterior extremity of male, ventral view.
Fig. 8. Posterior extremity of male, right-lateral view.
Fig. 9. Vulva of female, right-lateral view.
Fig. 10. Posterior extremity of female, left lateral view.
Fig. 11. Egg.

Table 2. Measurements of *Soboliphyme abei* n. sp. and *Stefanskostrongylus yagii* n. sp..

GEN. SP.	*Soboliphyme abei* n. sp.	*Stefanskostrongylus yagii* n. sp.
Male	N=7	N=9
Body		
length	11.0–22.0	4.6–7.4
width (Max.)	0.49–0.84	0.14–0.20
Esophagus		
length	2.0–3.7	0.26–0.30
Nerve ring*	unknown	0.11–0.19
Excretory pore*	4.1–4.9	0.16–0.27
Spicule length	1.73–1 98	0.28–0.40
Female	N=3	N=8
Body		
length	14.0–30.0	8.4–15.6
width (Max.)	0.86–1.07	0.21–0.30
Esophagus		
length	2.8–4.0	0.30–0.41
Nerve ring*	unknown	0.21–0.23
Excretory pore*	unknown	0.27–0.34
Tail length	0.23–0.35	0.02–0.03
Egg	0.06–0.07×0.03–0.04	0.04–0.06×0.02–0.03

N: Number of specimens examined.
*: Distance from head end.

Hosts: *Mates* spp. *Vulpes* spp. *Felis* spp. *Gulo* spp.
Localities: U. S. S. R. and U. S. A.

2) *S. soricis* BAYLIS et KING, 1932[4]
Hosts: *Sorex* spp. *Neomys* spp.
Locality: Europe

3) *S. sahalinensis* SHIMAKURA et ODAJIMA, 1934[17]
Host: *Martes zibellina*
Locality: Kuril Islands, U. S. S. R.

4) *S. jamesoni* READ, 1952[16]
Host: *Sorex vagrans*
Locality: U. S. A.

5) *S. urotrichi* MACHIDA et UCHIDA, 1982[9]
Host: *Urotrichus talpoides*
Locality: Izu Peninsula, Japan

The present species differs from *S. baturini* and *S. sahalinensis,* because these two species are characterized by rough surfaced of egg, longer spicule (about 4.0), vulval opening at the central level of the esophagus, and the carnivorous hosts. The present species differs from *S. soricis* in possessing smaller body size (body length of soricis is about 25 in male and 46 in female), lack of a notch on the antero-dorsal surface of buccal capsule, the egg with polar plugs (the egg of *soricis* with a plug at one pole) and seven esophageal glands (number of esophageal glands of *soricis* 9～10).

The present species also differs from *S. jamesoni.* In *jamesoni,* size of spicule longer (about 4.0), the number of esophageal glands at least ten, and vulval opening at the central level of esophagus. *S. abei* n. sp. is differentiable from *S. urotrichi*: in the latter, all the esophageal glands are globular in shape, there is a notch on the antero-dorsal surface of the buccal capsule and the egg has a plug at one pole.

The specific name of *S. abei* was given in honor of Prof. H. ABE, the Institute of Applied Zoology, Faculty of Agriculture, Hokkaido University.

2) *Stefanskostrongylus yagii* n. sp. (Nematoda: Angiostrongylidae)

Host: Japanese shrew, *Sorex shinto saevus* THOMAS

Habitat: lungs

Locality: Hokkaido, Japan

Description (measurements in mm)

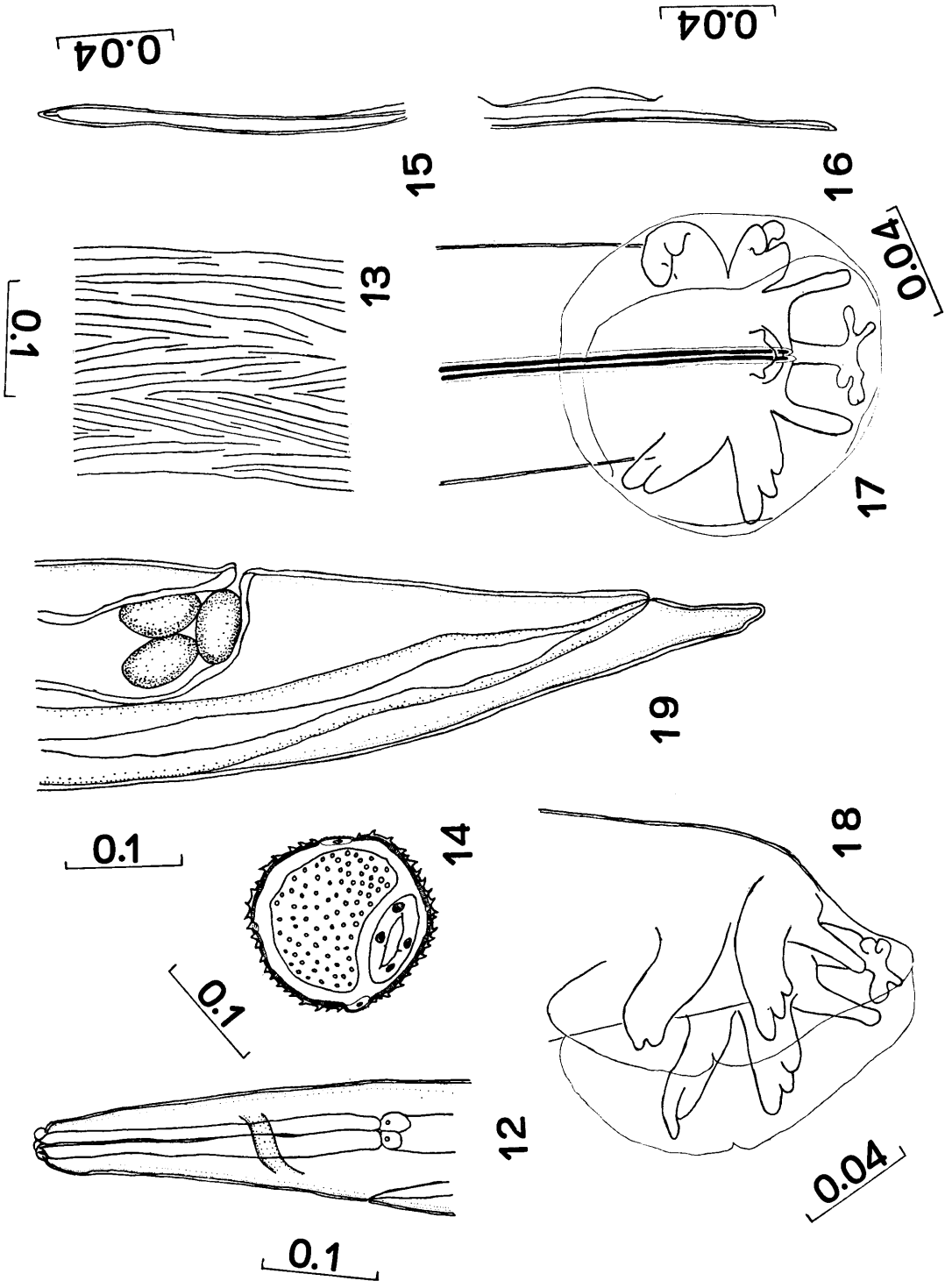
Body filiform and white in color. Three papillae present at head end and about 0.007×0.010 in size. Cuticle finely striated obliguely and forming the letter "V'. Main measurements are shown in Table 2. Male (9 specimens): Bursa, symmetrical, rounded and well-developed, 0.098～0.126 in length and 0.105～0.110 in width; ventral rays fused proximally, antero-ventral ray longer than postero-ventral; lateral rays with common trunk, antero-lateral ray longest and postero-lateral shortest, distal ends of laterlas knoblike; externo-dorsal rays separate at base, elongated straightly; dorsal ray long, bifurcating distally. Spicules equal, striated, about 0.3 in length, with thin membrane. Gubernaculum moderately sclerotized. Female (eight specimens): Vulva opening at 0.10～0.31 from tail end. Eggs oval, about 0.05～0.03 in size, with thin shell and unsegmented ovoid cell.

Pathological findings

The nematodes were found freely in the bronchioles; however, there was no inflammation in surrounding tissues (Figs. 24 & 25).

Type specimen is deposited in Meguro Parasitological Museum (No. 19499), Tokyo, Japan.

This species belongs to the genus *Stefanskostrongylus* DRÓŻDŻ, 1970[8], because of the following key characterisitics, 1) ventral rays and lateral rays each joined to long common stalks, 2) dorsal ray long with two branches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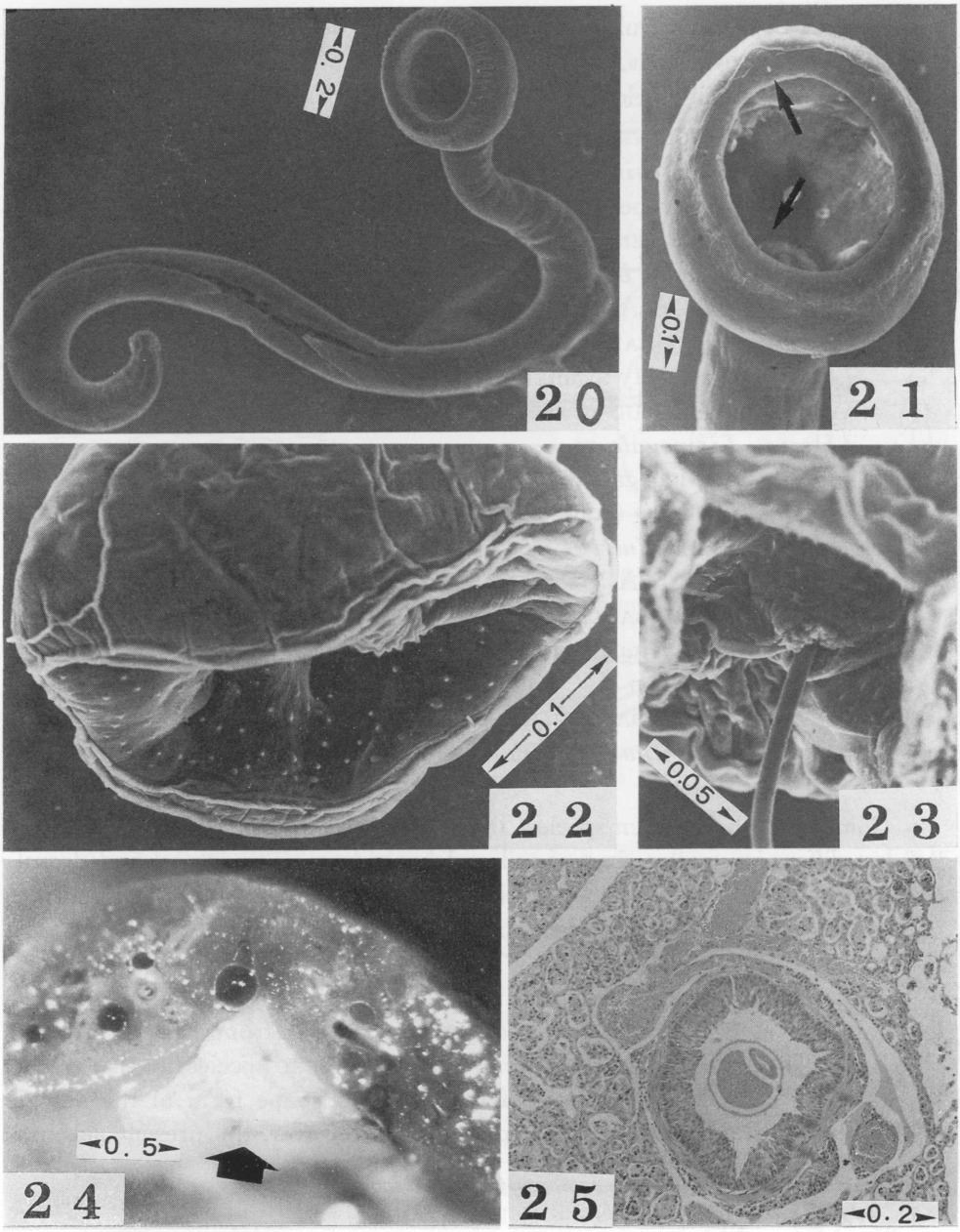
bifurcated at tips, 3) spicules and gubernaculum delicate, 4) anus and vulva not terminal, 5) oviparous, 6) parasites of lungs of insectivores (ANDERSON, 1978[1]). Seven species belong to this genus.

1) *S. soricis* (SOLTYS, 1954)[18].
   Host: *Sorex minutus*
   Locality: Europe
2) *S. blarini* (OGREN, 1954)[11]
   Host: *Blarina breiccauda*
   Locality: U. S. A.
3) *S. minimus* (CHABAUD, BRYGOO & PETTER, 1965)[7]
   Host and Locality: unknown
4) *S. potti* (CHABAUD & BAIN, 1965)[6]
   Host: *Limnogale* sp.
   Locality: Madagascar
5) *S. michiganensis* (ASH, 1967)[3]
   Host: *Sorex cinereus*
   Locality: U. S. A.
6) *S. dubosti* CHABAUD, 1872[5]
   Host: *Potamogale velox*
   Locality: Gabon
7) *S. minutus* (OHBAYASHI *et al.*, 1973)[12] n. comb.
   Host: *Urotrichus talpoides*
   Locality: Japan

Comparing these seven species, the present species resembles *S. soricis*,[10, 15, 18] but differs in smaller sizes of tail and bursa (especially, lateral and dorsal rays). The specific name is dedicated to Dr. K. Yagi, the Hokkaido Institute of Public Health. Orihara & Ishimoto[13], reported *Angiostrongylus* sp. from *Sorex unguichulatus* in Hokkaido. The present authors consider this species to be the same as *S. yagii*, but no specimens are available at present. Ohbayashi et al.[12] described *Angiostrongylus minutus* from *Urotrichus talpoides*. This species is quite different from the other species in size (body length 1 mm in male and 2 mm in female) and in shape form of the dorsal ray (two short simple arms rising separately). However, the present authors

Figures 12–19. *Stefanskostrongylus yagii* n. sp. (scale in mm).

Fig. 12. Anterior extremity of male, left-lateral view.
Fig. 13. Oblique striation of mid-body of male, ventral view.
Fig. 14. Cross-section of mid-body of female.
Fig. 15. Anterior extremity of specule.
Fig. 16. Spicule tip and gubernaculum.
Fig. 17. Posterior extremity of male, ventral view.
Fig. 18. Posterior extremity of male, left-lateral view.
Fig. 19. Posterior extremity of female, right-lateral view.



Figures 20–23. *Soboliphyme abei* n. sp. (scale in mm).

Fig. 20. Whole body.
Fig. 21. Buccal capsule, ventral view.
Fig. 22. Bursa, lateral view.
Fig. 23. Cloaca.

Figures 24 & 25. *Stefanskostrongylus yagii* n. sp. (scale in mm).

Fig. 24. Lung parasitized by *St. yagii* n. sp. (→).
Fig. 25. Lung section showing worms.

listed this species as a member of the genus *Stefanskostrongylus* because the host belongs to Insectivora.

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Summary

Two new nematodes, *Soboliphyme abei* n. sp. (Soboliphymatidae) and *Stefanskostrongylus yagii* n. sp. (Angiostrongylidae) of the Japanese *Sorex* was described. *S. abei* n. sp. was found in the stomach of 69 out of 129 big-clawed shrews, *Sorex unguiculatus* DOBSON, and in the stomach of 24 out of 99 Japanese shrews, *S. shinto saevus* THOMAS, captured in Hokkaido, Japan. This species is easily distinguished from the known species of this genus by the morphologic characteristics of buccal capsule, esophageal glands and eggs, and the number of esophageal glands. *S. yagii* n. sp. was found in the lungs of 14 out of 99 Japanese shrews, *Sorex shinto saevus* THOMAS. This species resembles *S. soricis* (SOŁTYS, 1954) but diffus from it by the bursa (lateral rays and dorsal ray) and tail length.

Key words: *Soboliphyme abei* n. sp., *Stefanskostrongylus yagii* n. sp., *Sorex* spp., Japan.

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要　　旨

北海道産トガリネズミ (*Sorex* 属) から得た新種の線虫2種について記載した。*Soboliphyme abei* n. sp. (Saboliphymatidae 科): 129 例中 69 例のオオアシトガリネズミおよび 99 例中 24 例のエゾトガリネズミの胃に認められた。本種は buccal capsule, 食道腺, 虫卵等の形態および食道腺の数で既知種と区別された。

Stefanskostrongylus yagii n. sp. (Angiostrongylidae 科): 99 例中 14 例のエゾトガリネズミの肺に認められた。本新種は *S. soricis* に似るがブルザの側肋の形状および尾長で既知種と区別された。尚, 走査電子顕微鏡の使用にあたり酪農学園大学獣医解剖学教室の各位にご指導賜った。