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Sabatieria sinica sp. nov. (Comesomatidae, Nematoda) from Jiaozhou Bay, China*

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Abstract A new free-living marine nematode species of the genus *Sabatieria* was documented from the sediment of the Jiaozhou Bay, Qingdao, China, and it has been named *Sabatieria sinica* sp. nov. It is characterized by homogeneous cuticle without lateral differentiation, relatively short cephalic setae, spiral amphideal fovea with 2–2.25 turns; thick spicules with a mid constriction or joint, gubernaculum with a long straight dorso-caudal apophyses, and 6–7 prominent papillar precloacal supplements. This new species could be distinguished from other congener species by the combination of its characteristics: body size, length of cephalic setae, number of amphid turns, structures of spicules and gubernaculum, and type and number of precloacal supplements. An update dichotomous key is provided for nine species of *pulchra* group of *Sabatieria* including the new species.

Keyword: new species; free-living marine nematode; taxonomy; Jiaozhou Bay

1 INTRODUCTION

The genus *Sabatieria* was established by Rouville based on the type species *Sabatieria cettensis* in 1903. It is a dominating and large genus in a variety of habitats. To date, 99 valid species have been recorded around the world (Leduc, 2017; Guo et al., 2018; Bezerra et al., 2019). Platt (1985) reviewed the genus and divided 36 valid species into five groups (*praedatrix* group, *armata* group, *pulchra* group, *celtica* group, and *ornata* group) according to the main characteristics including the length of cephalic setae, the number of turns of amphideal fovea, the type and distribution of precloacal supplements, features of gubernaculum and apophyses and character of cuticle punctation. Subsequently, Botelho et al. (2014) reviewed the genus in 2014, confirmed 66 valid species, and concurrently described two new species from Brazil: *Sabatieria labium* and *Sabatieria verteris*. In the same year, Rosli et al. (2014) also revised the genus, and gave the modified list including 68 valid species that were divided into five groups. Meanwhile, they described a new species *Sabatieria dispunctata* from New Zealand. The newly recorded species in this genus were *Sabatieria megadena* Leduc (2017) also from New Zealand and *Sabatieria conicoseta* Guo, Chang & Yang, 2018 from China.

Sediment samples were collected in many sites from intertidal to sublittoral regions in 2015 and 2016 with the aim to study the biodiversity of free-living marine nematodes in the Jiaozhou Bay of Qingdao, China. The average abundance of the nematodes was 2 538±676 inds./10 cm^2. Up to now, 198 nematode species were identified from these habitats (Gao, 2017; Huang et al., 2018, 2019). *Sabatieria* is the common and abundant genus in the Jiaozhou Bay. Four species of *Sabatieria* were discovered, and among them, an unrecorded species was identified and is described here as *Sabatieria sinica* sp. nov.

2 MATERIAL AND METHOD

Undisturbed samples of seafloor sediment were taken using a 0.1-m^2 improved Gray-O'Hara box

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Table 1 Individual measurements of *Sabatieria sinica* sp. nov. (in μm except *a*, *b*, *c*, *c′*, and *V*%)

Character	Holotype	Paratype			
	♂1	♂2	♀1	♀2	♀3
Total body length	2 245	2 151	2 307	2 102	2 158
Maximum body diameter	58	49	58	50	55
Head diameter	15	13	16	15	15
Length of cephalic setae	4.5	3	5	4	5
Number of amphidial turns	2.25	2.25	2	2	-
Amphidial fovea diameter	8	9	8	8	9
Pharyngeal length	208	216	213	206	210
Body diameter at base of pharynx	46	44	47	38	48
Never ring from the anterior end	119	122	99	107	124
Distance of excretory pore from anterior end	141	141	132	130	144
Spicule length along arc	69	54	-	-	-
Gubernacular apophyses length	28	30	-	-	-
Number of supplements	7	6	-	-	-
Tail length	150	137	161	148	154
Body diameter at anus	40	43	37	38	40
c′	3.8	3.2	4.4	3.9	3.9
Vulva from anterior end	-	-	1 221	1 051	1 114
Body diameter at vulva	-	-	58	49	55
V%	-	-	53%	50%	52%
a	38.7	43.9	39.8	42	39.2
b	10.8	10	10.8	10.4	10.3
c	15	15.7	14.3	14.2	14

a: body length / max. body diameter; *b*: body length / pharynx length; *c*: body length / tail length; *c′*: tail length / body diameter at anus; *V*%: position of vulva from anterior end expressed as a percentage of total body length.

corer at a grid of sixteen sampling stations (36°7′10″N–36°35′6″N; 120°14′12″E–120°30′58″E, water depth 3.8–18 m) in July 2016 in the Jiaozhou Bay, Qingdao. The nematodes were collected, sorted, and slide mounted as already indicated in our previous papers (Gao and Huang, 2017; Huang et al., 2018). The descriptions were made from glycerin mounts using a differential interference contrast microscope (Leica DM-2500). Line drawings were made with the aid of a camera lucida. All measurements were obtained using Leica LAS X version 3.3.3, and all curved structures were measured along the arc or median line. Type specimens were deposited in the Key Laboratory of Biodiversity, Liaocheng University, Shandong, China.

3 SPECIES DESCRIPTION

Order Araeolaimida de Coninck and Schuurmans Stekhoven, 1933

Family Comesomatidae Filipjev, 1918

Genus *Sabatieria* De Rouville, 1903

Sabatieria sinica sp. nov. (Figs.1, 2)

3.1 Type material

Two males and three females were collected from the Jiaozhou Bay. Holotype, ♂1 on slide number JZW11-4. Paratypes: ♂2, ♀1, ♀2, and ♀3 on the slide number JZW11-2, JZW11-4, and JZW11-3, respectively.

3.2 Type locality and habitat

Specimens were collected from the surface 0–2 cm sublittoral silt sediment at station JZW-11 in the Jiaozhou Bay (JZW-11: 36°10′16″N; 120°16′51″E), water depth of 5.5 m.

3.3 Etymology

The new species is named after the national name of type locality belonging to, China.

3.4 Measurement

All measurement data are given in Table 1.

3.5 Description

Males: body cylindrical, attenuated at both ends. Cuticle homogeneous with transverse rows of

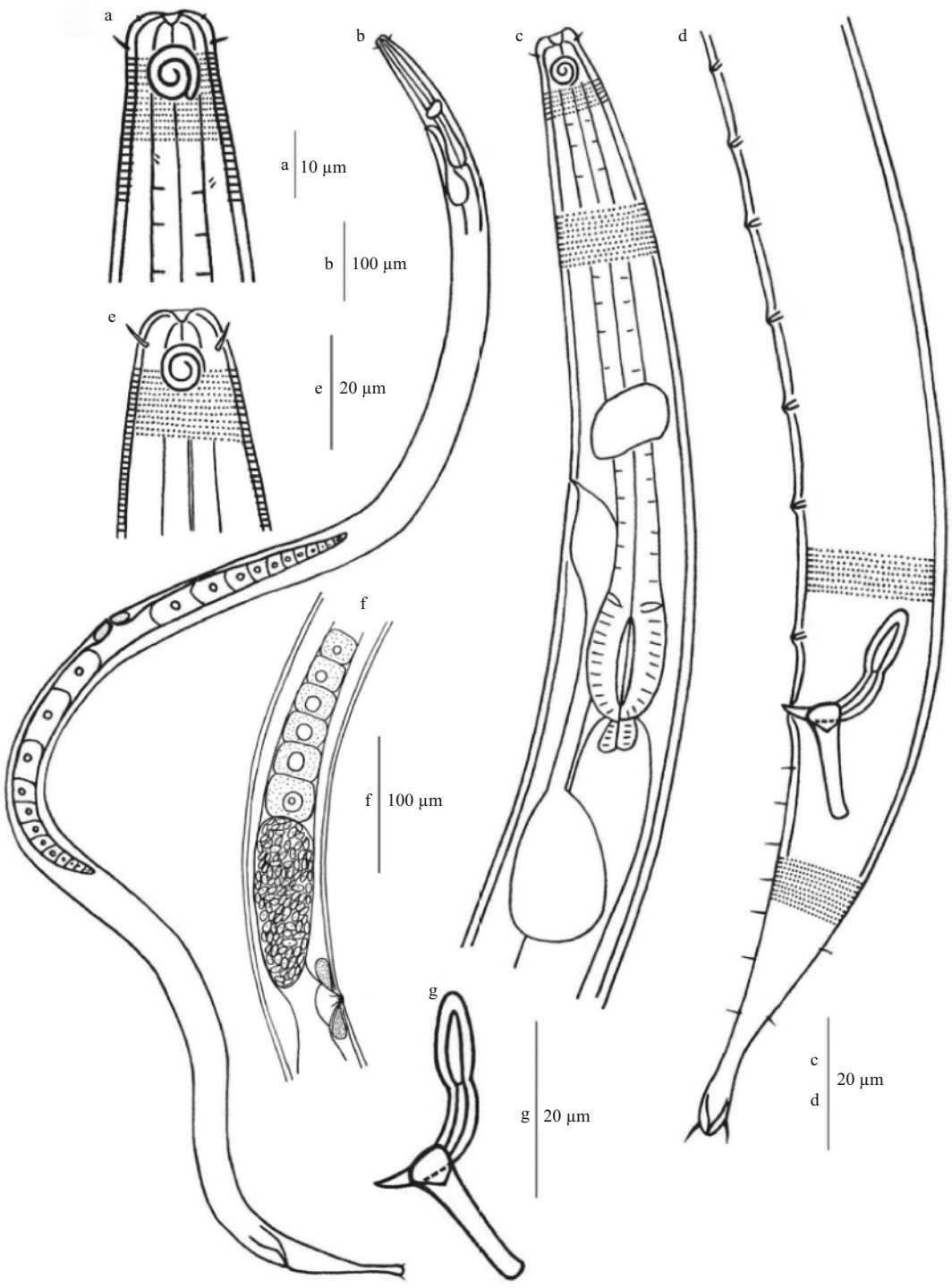

Fig.1 *Sabatieria sinica* sp. nov.

a. male head end; b. entire view of female body, showing reproductive system; c. male pharyngeal region, showing pharyngeal terminal bulb and secretory-excretory system; d. male posterior end, showing spicule, gubernacular apophysis and precloacal supplements; e. female head end; f. female vulva region, showing ovary, spermatheca and vulva; g. spicule and gubernacular apophysis.

punctuations from the anterior border of the amphideal fovea to the cylindrical part of tail, and without lateral differentiation of coarse dots. Cervical setae twinning, short, 2.5–3 μm long, three to four pairs. Somatic setae short and sparse. Head slightly set off by constriction posterior to cephalic setae. Inner labial sensilla invisible. Outer labial sensilla papilliform. Four cephalic setae, 3–4.5 μm long. Multi-spiral amphideal fovea with 2.25 turns, 8–9 μm in diameter or 47% of corresponding body diameter. Anterior

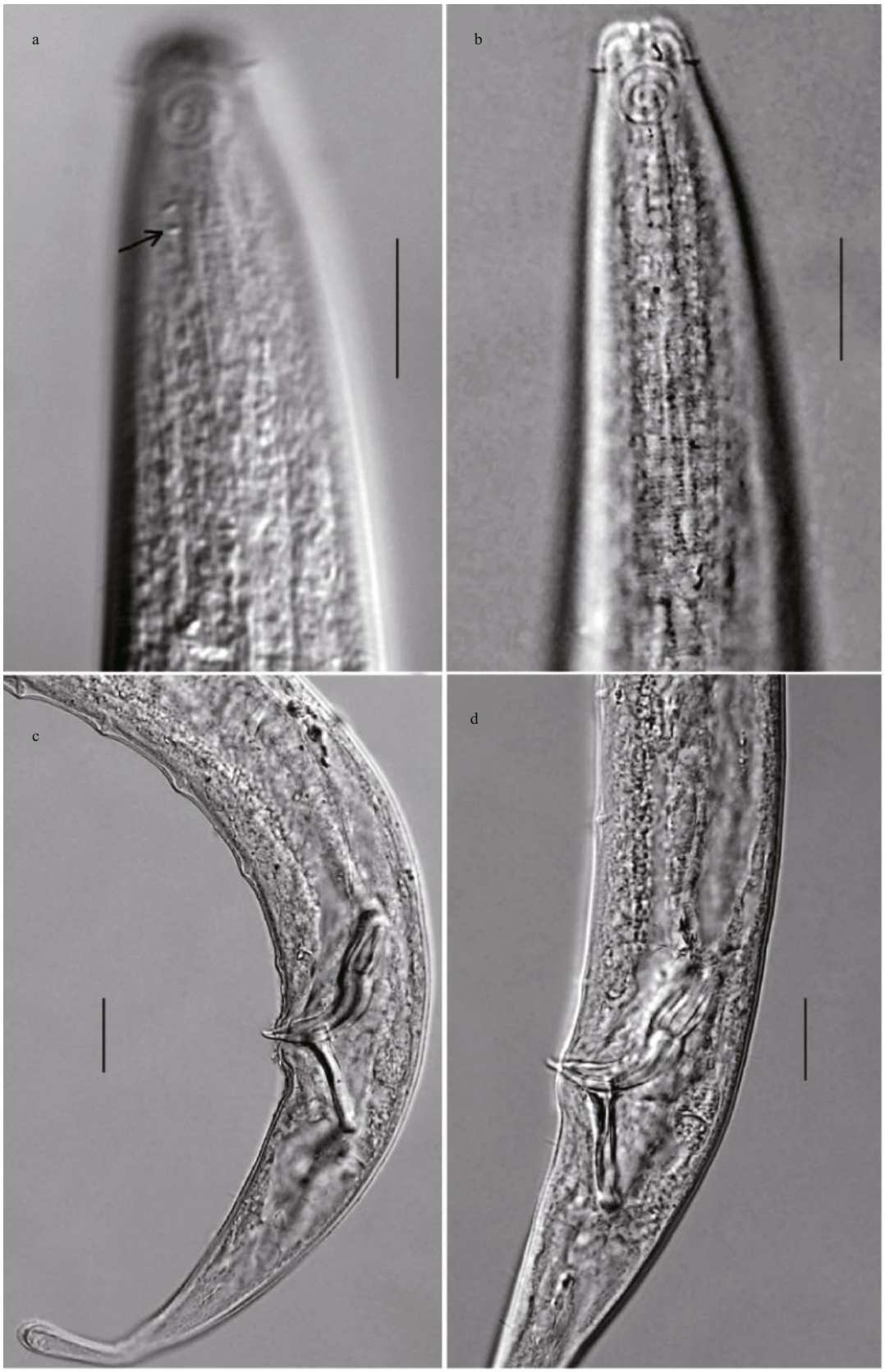

Fig.2 *Sabatieria sinica* sp. nov.

a. male anterior end, showing cervical setae (arrow); b. male anterior end, showing buccal cavity, cephalic setae and amphideal fovea; c. male tail end, showing spicule, gubernacular apophysis and precloacal supplements; d. male cloaca region, showing spicule and gubernacular apophysis (scale bar=20 μm).

border of amphideal fovea at the level of cephalic setae. Buccal cavity small, cup-shaped with slightly sclerotized walls. Pharynx cylindrical, with an oval-shaped posterior bulb. Cardia conical. Nerve ring near middle of pharyngeal length, 119–122 μm from the anterior end, 56%–57% of the pharyngeal length. Secretory-excretory system distincte, excretory pore slightly posterior to nerve ring, 141 μm from the anterior end; ampulla large; renette cell large and conspicuous, located posterior to pharyngeal-intestinal junction.

Reproductive system diorchic, testes opposite and outstretched. Spicules thick with median hollow region, proximal half oval and straight, distal half tapered and curved, with a distinctive constriction or joint between the two halves, 54–69 μm (1.3–1.7 times as long as body diameter at the level with cloaca) long along arcuate. Gubernaculum with a long straight dorso-caudal apophysis, 28–30 μm long. 6–7 papillar precloacal supplements, more or less evenly spaced. Tail 3.2–3.8 body diameter at anus, conico-cylindrical with rounded swollen tip bearing three terminal setae, 6–7 μm long. Cylindrical part about third of total length. A row of ventral caudal setae located at conical portion of tail. Three caudal glands obvious.

Females: similar to males in most morphologicaly aspects excepting tail without ventral caudal setae, amphideal fovea with 2 turns. Reproductive system didelphic with two opposite and outstretched ovaries. Vagina trumpet-shaped, 0.3 times vulval body diameters long. A large sack-like spermatheca situated at each side anterior and posterior to vulva and filled with oval sperms. Vaginal glands present. Vulva with slightly raised lips and situated at about mid-body.

3.6 Differential diagnosis and discussion

Sabatieria sinica sp. nov. is characterized by homogeneous cuticle without lateral differentiation; cephalic setae 3–5 μm; spiral amphideal fovea with 2–2.25 turns; thick and arcuate spicules with median hollow region and a mid-constriction or joint; gubernaculum with relatively long dorso-caudal apophyses; 6–7 prominent papillar precloacal supplements. *Sabatieria sinica* sp. nov. belongs to *pulchra* group mainly because of the low number of supplements (5–9), the gubernaculum with median pieces, relatively short cephalic setae and short paired cervical setae. Most species in the pulchra group have the amphids with 3–4 turns, but some species such as *S. propisinna* and *S. breviseta* have the amphids with only 2.5 and 2.25 turns, respectively. The described species is most close to the *pulchra* group to comprehensively consider its main characteristics and does not fit under the other groups. The *pulchra* group currently includes eight species: *S. breviseta* Stekhoven, 1935; *S. maboyae* Gourbault & Vincx, 1990; *S. mortenseni* (Ditlevsen, 1921) Leduc & Wharton, 2008; *S. pisinna* Vitiello, 1970; *S. propisinna* Vitiello, 1976; *S. pulchra* (Schneider, 1906) Tchesunov, 1978; *S. pumila* Leduc, 2013; *S. punctata* (Kreis, 1924) Timm, 1952 (Botelho et al., 2014; Rosli et al., 2014).

This new species is most similar to *Sabatieria pulchra* (Schneider, 1906) Tchesunov, 1978 in morphological features, but differs from the latter species in having thick and jointed spicules (vs slender spicules only enlarged proximal end not constricted at mid in *S. pulchra*), longer gubernacular apophyses (28–30 μm vs 19–22 μm), slightly shorter cephalic setae (3–5 μm vs 6–7 μm long), and the disposition of precloacal supplements (6–7 papillar precloacal supplements, more or less evenly spaced vs 7–9 tubular precloacal supplements, anterior ones more closely spaced). The difference of *Sabatieria sinica* sp. nov. with other congeners can be referred to the key below.

Update key to known species of *pulchra* group

1 Cephalic setae longer than 0.5 head diameter.....2
Cephalic setae shorter than 0.5 head diameter.....3
2 Spicule 2.1 abd, 4–5 precloacal supplements .....*S. maboyae* Gourbault & Vincx, 1990
Spicule 1 abd, 6 precloacal supplements .....*S. mortenseni* Leduc & Wharton, 2008
3 Spicule with distal hook and short distal lamella .....*S. pumila* Leduc, 2013
Spicule without distal hook.....4
4 Body length shorter than 800 μm.....5
Body length longer than 1 000 μm.....6
5 Cephalic setae 0.22 head diameter, lateral differentiation absent.....*S. pissina* Vitiello, 1970
Cephalic setae 0.43–0.44 head diameter, lateral differentiation present.....*S. propissina* Vitiello, 1976
6 Lateral differentiation present, amphideal fovea 3 turns.....*S. punctata* Timm, 1952
Lateral differentiation absent.....7
7 Spicule thick with mid constriction, cephalic setae 3–5 μm.....*S. sinica* sp. nov.
Spicule slender without mid constriction.....8
8 Body 1.9–2.3 mm, amphids 2.5 turns, cephalic setae 6–7 μm.....*S. pulchra* Tchesunov, 1978

Body 1.1–1.3 mm, amphids 3.5 turns, cephalic setae 3–4 μm.....*S. breviseta* Stekhoven, 1935

4 DATA AVAILABILITY STATEMENT

The authors declare that the data supporting the findings of this study are available within the article. The data will be available on request from the corresponding author.

5 ACKNOWLEDGMENT

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