

**A Case Study of Otomyiasis Caused by *Parasarcophaga similis* (Meade, 1876) (Diptera : Sarcophagidae)**

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**ABSTRACT.** A rare human case of otomyiasis found in Okayama Prefecture is reported. On August 10th, 1987, 7 dipterous larvae were found in right ear canal of a 50-year-old woman living in Okayama, Japan. Removed specimens were with 11 segments excluding the cephalic segment. Average sizes were about 5.0 mm in length and 1.0 mm in maximum width. No anterior spiracle was recognized on the lateral surface of the 2nd segment. By insectological observation, the specimens were identified as the 1st instar larvae of *Parasarcophaga similis* (Meade, 1876) belonging to the family Sarcophagidae, based on morphological characteristics of cephalopharyngeal skeleton and anterior and posterior spiracles.

To our best knowledge, this is the first case of human otomyiasis in Japan caused by *Parasarcophaga similis*. Details with some bibliographical data are reported.

**Key words :** otomyiasis — auditory foreign body — *Parasarcophaga similis* — 1st instar larva — Sarcophagidae — Diptera

House flies around residences have no doubt been decreasing in recent years, but they are still most influential insects for human hygiene. The flies convey some protozoan cysts, helminthic ova and various kinds of bacterial agents attaching to their external body surface and legs, and freely spread pathogenic organisms in and out of houses.

On the other hand, larvae of several fly species are frequently found from human body, such as digestive organs (stomach, intestine and rectum), uro-genital organs (urine and uro-genitals), ear (internal and external auditory canals) as well as eye-lids and skin. The term "myiasis" has in general been used in the human infestation with fly larvae. The authors wish to report a human case of otomyiasis found in Okayama Prefecture together with bibliographical consideration.

To our best knowledge, no other case in Japan has been reported in the literature on human otomyiasis caused by *Parasarcophaga similis* larva.

**CASE NOTE**

The patient (S.I.) was a 50-year-old housewife residing in Hōga, Okayama City, Japan. She was enrolled to our hospital on August 10th, 1987, because

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she noticed the tinnitus in her right ear canal for several nights before asleep. On examination of right ear canal of the patient with magnifying spectacles, moving foreign bodies which looked somewhat like small maggots were found at the inner part of the ear canal. The unidentified bodies were then carefully removed out with a forceps one by one, and totally counted 7.

Superficial examination of the right ear canal revealed that the simple erosive lesions were observed on surface of the external auditory canal, and the erosion seemed to occur when she had poked the ear canal with an earpick trying to pick up foreign bodies. However, no perforation or damage caused by foreign bodies was recognized on the tympanic membrane. The tinnitus symptom disappeared immediately after the foreign bodies were taken out.

The removed foreign bodies were milk-white in color, somewhat cylinder-shaped and legless with narrowed head end (Fig. 1). On dissecting binocular microscope observation, the circular ring-shaped 11 segments excluding the cephalic segment were found on the external surface of all 7 foreign bodies. Thus, they were confirmed as larvae of certain dipterous species (Fig. 2). The characteristics of these larvae were then studied both by light microscopy and scanning electron microscopy.

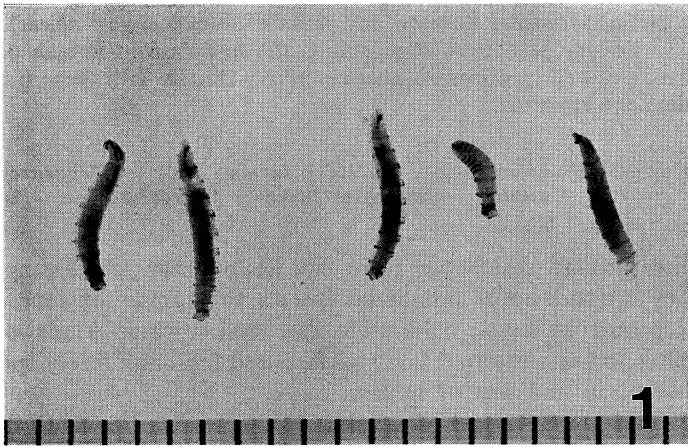


Fig. 1. The dipterous larvae removed from right external auditory canal of the patient, fixed in 70% alcohol (Scale = 0.1 mm).

The larvae fixed in 70% alcohol solution were measured 3.0–6.0 mm (av. 5.0 mm) in length and about 1.0 mm in maximum width, and cephalopharyngeal skeleton was faintly seen in the cephalothorax region through integument. No anterior spiracle was observed on the external lateral surface of the 2nd segment or thoracic segment by scanning electron microscopy (Fig. 3). The foregoing findings corresponded to the characteristics of the 1st instar larva. Each segment is clearly divided from one another by spinous area with many spines of different shape arranged in groups (Figs. 4 and 5). Moreover, by scanning electron microscopy two types of sensory papillae or hair were found on the ventro-lateral surface of the 1st segment (Figs. 6 and 7). The cephalopharyngeal skeleton treated with of 1.0% potassium hydroxide solution appeared to be larger in size having frontal process of narrow ended dorsal cornua which pointed forward (Fig. 8). The gross morphology of cephalopharyngeal skeleton definitely

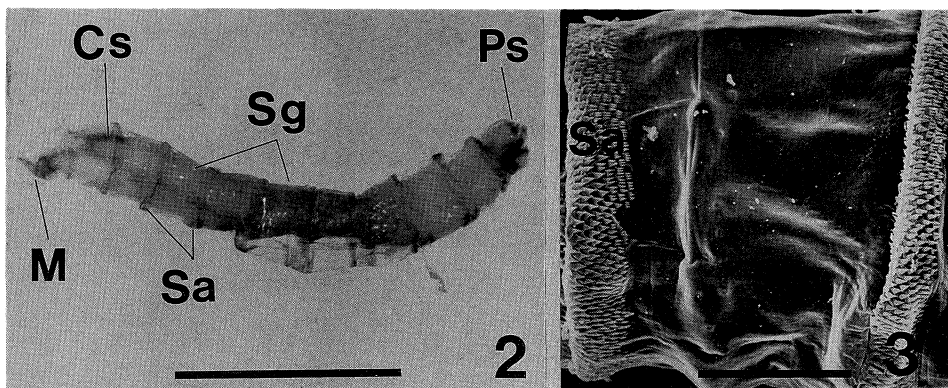
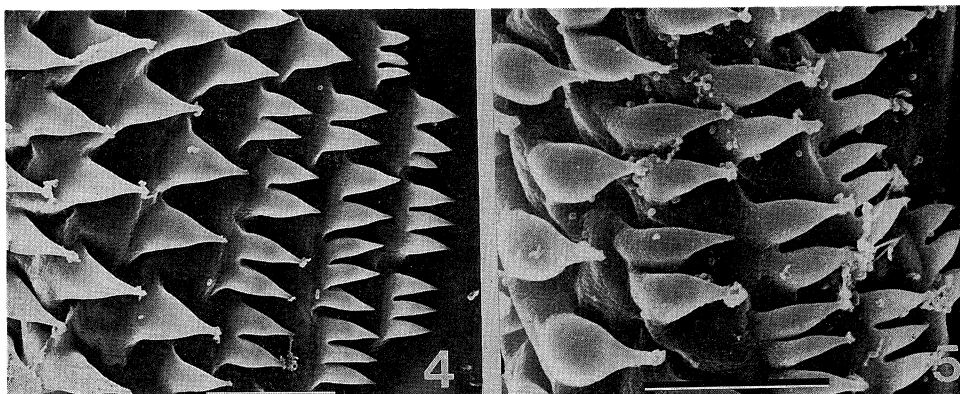
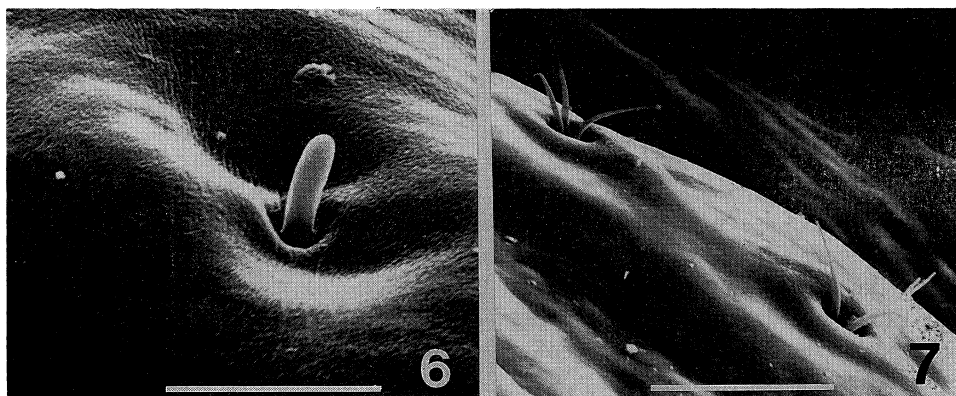


Fig. 2. Whole body of the larva, lateral view (Scale bar = 0.2 mm).  
 Fig. 3. SEM picture of the 2nd segment of larva, lateral view. Anterior spiracle was not found on the lateral surface (Scale bar = 0.2 mm).  
 Cs : cephalopharyngeal skeleton, M : mouth, Ps : posterior spiracle,  
 Sa : spinous area, Sg : segment.



Figs. 4 and 5. SEM pictures of spines existing on the spinous area intervenes between the 1st and 2nd segment (4), and the 2nd and 3rd segment (5), lateral view (Scale bar = 20  $\mu$ m).



Figs. 6 and 7. SEM pictures of sensory papillae on the ventro-lateral surface of the 1st segment of larva (Scale bars = 10  $\mu$ m (6), 20  $\mu$ m (7)).

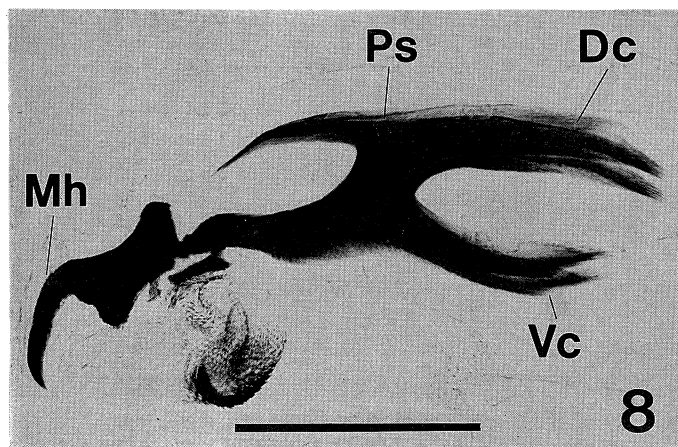


Fig. 8. Photomicrograph showing a cephalopharyngeal skeleton situated in the cephalo-thorax region of larva, lateral view (Scale bar = 0.3 mm).

Dc : dorsal cornua, Mh : mouth hook, Ps : pharyngeal sclerite, Vc : ventral cornua.

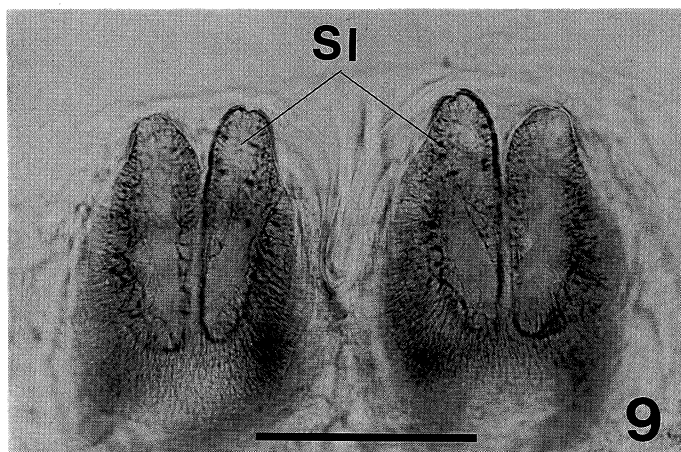


Fig. 9. Photomicrograph of two posterior spiracles located on the terminal segment of larva, caudal view (Scale bar = 0.1 mm).

Sl : slit.

suggested that the larvae belonged to Family Sarcophagidae.

On the distal end of the terminal segment, 2 sets of posterior spiracles without peritremes were recognized in concavity of the surface. The posterior spiracles were equipped only with 2 pairs of slit on each side as shown in Fig. 9. From the above, it is safe to say that these specimens were 2nd instar larvae. According to our morphological observation, there was a marked discrepancy on the existence of two types of spiracles and the external appearance of cephalopharyngeal skeleton.

To solve the problem the authors needed an expert opinion on this subject. Dr. Satoshi Shinonaga, Tokyo Medical and Dental University has given us a

comment that the specimens were identified as the 1st instar larva of *Parasarcophaga similis* (Meade, 1876) belonging to the family Sarcophagidae on the pre-moulting stage.

#### DISCUSSION

The human myiasis by dipterous larvae of 12 species have so far been reported in Japan, namely *Aldrichina grahami*, *Lucilia ampullacea*, *L. illustris*, *Phaenicia sericata*, *Chrysomya megacephala*, *Boettcherisca peregrina*, *Parasarcophaga harpax*, *P. similis*, *P. crassipalpis*, *Megaselia spiracularis*, *Psychoda alternata* and *Telmatoscopus albipunctatus*.

In general, the flies develop into adult by complete metamorphosis passing through 3 developing stages—that is, egg, larva and pupa. Fully grown adult females of most flies lay eggs on meats, but some exceptional species of flies, such as Sarcophagidae and Muscidae females directly drop 1st or 2nd instar larvae on the meat surface. These larvae immediately change their form into pupa passing through 3 stages from 1st to 3rd instars. Normally the average duration of each larval stage is considered as one to several days of which the 1st and 2nd instars are only one day each. Judging from the facts it is indicated that the larvae in the present case had probably been on the skin surface for only a few days.

The external and internal morphological feature of fly larvae considerably varies according to developing stages. Especially both cephalopharyngeal skeleton and anterior and posterior spiracles are said to be important for identification of species. The present specimens were identified as the 1st instar larva of *P. similis* belonging to Sarcophagidae judged from those features.

It is well known that larvae of the family Sarcophagidae are usually inhabited in night-soil pot, animal carcass and dumping ground. These larvae develop wings to become adults after pupal stage. Human myiasis thus occurred when the adult flies incidentally drop their larvae on to the human body surface.

Human and animal myiasis are classified into 3 types; specific, semi-specific and accidental infestations by Faust *et al.* (1975).<sup>1)</sup> The human myiasis can be divided to 2 categories depending upon the invasion site, internal or external myiasis. The former is limited to digestive and uro-genital organs, and the latter is to eye-lid, ear, mouth and skin. The most cases of human myiasis known in Japan are by accidental infestation, but some are otherwise the imported cases.

The first human case of auditory myiasis was reported by Ozawa (1903)<sup>2)</sup> in Shizuoka Prefecture, then about 60 cases have so far been found since. Amounting to about 50 cases before 1945 as summarized by Kano (1959)<sup>3)</sup> and Ohkawa (1979),<sup>4)</sup> and 9 cases found from 1946 to present-day are shown in Table 1.<sup>5-13)</sup> The most cases are 8 years old or under with one exception.<sup>8)</sup> Three cases<sup>9,12,13)</sup> of newborn infants are interesting that they deserve the special emphasis. The number of larvae from 9 patients varies, beside, sex ratio of the patients is no obtainable. After 1946, human myiasis reported are with 4 species in 3 families; Muscidae (*M. domestica* Linneus, 1758), Sarcophagidae (*B. peregrina* Robineau, 1830 and *P. harpax* Pandellé, 1896) and Calliphoridae (*P. sericata* Meigen, 1826) as shown in Table 1. The auditory infestation with

*P. similis* larva is not reported. In Table 1, the location of larvae is restricted to the external auditory canal except 3 cases by Kusaka (1952),<sup>5)</sup> Yoshii *et al.* (1957)<sup>8)</sup> and Kaneko *et al.* (1968).<sup>9)</sup> Kusaka<sup>5)</sup> reported that a total of 29 muscid larvae were found right ear canal of a 2-year-old boy. Of these 19 larvae were found from the middle ear chamber which might be invaded through the ruptured tympanic membrane. Yoshii *et al.*<sup>8)</sup> reported that 11 larvae of fully developed 3rd instars of *Phaenicia sericata* were removed from the external auditory canal and tympanic cavity through 2 holes on the tympanic membrane of a 74-year-old woman. According to Kaneko *et al.*,<sup>9)</sup> on the other hand, 2 out of 3 sarcophagid larvae were found in the tympanic cavity through a hole on the tympanic membrane of a 1-day-old newborn infant.

Only 5 cases of human myiasis with *Parasarcophaga similis* larvae have

TABLE 1. Human cases of otomyiasis reported in Japan (since 1946)

Case No.	Patient		Dipterous larva			Author (year)
	age	sex	instar (age)	number	species	
1.	8	M	1	29	<i>Musca domestica</i>	Kusaka (1952) <sup>5)</sup>
2.	2	"	?	?	?	Ijima (1953) <sup>6)</sup>
3.	3	F	"	"	"	Fujihara (1954) <sup>7)</sup>
4.	74	"	3	11	<i>Phaenicia sericata</i>	Yoshii <i>et al.</i> (1957) <sup>8)</sup>
5.	newborn infant	"	"	3	<i>Parasarcophaga harpax</i>	Kaneko <i>et al.</i> (1968) <sup>9)</sup>
6.	8	M	"	many	"	Kawashima (1971) <sup>10)</sup>
7.	"	F	2	2	<i>Boettcherisca peregrina</i>	Yagisawa <i>et al.</i> (1975) <sup>11)</sup>
8.	newborn infant	?	?	?	"	Koga <i>et al.</i> (1985) <sup>12)</sup>
9.	"	"	"	"	?	Ohyama (1986) <sup>13)</sup>
10.	50	F	1	7	<i>Parasarcophaga similis</i>	Present authors

F = female, M = male.

TABLE 2. Human cases of *Parasarcophaga similis* larvae infestation reported in Japan

Case No.	Patient		Larva			Author (year)
	age	sex	location	instar (age)	number	
1.	77	F	?	1	1	Kano <i>et al.</i> (1962) <sup>14)</sup>
2.	1 $\frac{1}{2}$	M	in feces	1	30	
3.	newborn infant	F	eye-lid	1	over 10	Yoneda <i>et al.</i> (1981) <sup>15)</sup>
4.	56	"	intestine	?	?	Nakao <i>et al.</i> (1984) <sup>16)</sup>
5.	?	?	in feces	2	"	Natsume (1987) <sup>17)</sup>
6.	50	F	right ear	1	7	Present authors

F = female, M = male.

previously been reported as shown in Table 2.<sup>14-17)</sup> Ages of the patients varied from newborn to 77. The larvae were found in feces, eye-lid and intestine, and most of them were the 1st instars. The adult flies of *P. similis* are distributed throughout Japan and commonly found around residences. As stated above, adult flies of sarcophagid species drop their larvae on fish, flesh and fowl meats, but they occasionally trespass into inhabiting residences and drop larvae on the human body surface. In the present case it is believed that an adult female fly dropped the 1st instars around the patient's right ear when she was asleep under room lights on.

The authors suggested that particular attention should be paid to prevent the fly invasion into houses, particularly with newborn infant.

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