วารสารเทคนิคการแพทย์ เชียงใหม่
BULLETIN OF CHIANG MAI
ASSOCIATED MEDICAL SCIENCES

Vol. 7 No. 3
September 1974

STUDY THE STIGMATA PLATES IN COMMON MUSCOIDES *

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ABSTRACT :

From the study of stigmal plates of common muscoides, we have shown that the 6 genera of common flies which usually breed in the common baiting area are :

1. **Musca domestica**
2. **Sarcophaga** spp.
3. **Phaenicia** spp.
4. **Calliphora** spp.
5. **Callitroga** spp.
6. Rat-tail larvae of Eristalis spp.

Therefore good practical Medical Entomology should bear in mind the above mentioned maggots.

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* Part of this work had been submitted to the Faculty of Associated Medical Sciences Project, Chiang Mai University in partial fulfilment of the requirement for the B.Sc. (Med. Tech.) degree.

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INTRODUCTION :

Many of the important and widespread diseases of the tropics such as, typhoid, dysentery, diarrhoea etc, are transmitted by flies, and fly larvae infect human flesh or domestic animals (1). Consequently the housefly, which has equal liking for human excreations and human food supplies, may transfer pathogenic viruses, bacteria, protozoa and helminth ova to the human host either on its feet or its vomit. Nevertheless most flies are eager for blood or haematophagous either from open wound or from sites where blood sucking flies have been feeding. Some species in larval stages invade human tissue producing myiasis. In the case of intestinal myiasis, man usually acquires his infection by the accidental ingestion of the eggs or larvae of the food frequenting flies. But their striking appearance attracts attention and they are often mistaken for helminth diseases such as rat-tail larvae of drone fly.

The typical muscoid larva, such as that exemplified by Sarcophaga, Musca, Calliphora, is a cylindrical, headless, legless maggot, usually broader on the posterior than on the anterior half, tapering sharply anteriorly, and with a more or less truncated posterior face

The larvae are distinctly segmented with 12 visible body segments including the so-called "cephalic" segments. The cephalic and annular segments are in either appearance simple, or compound.

The first or cephalic segment is short and conical. Ventrally it is armed with pair of strong

mouth hooks. The first thoracic (prothoracic) segment bears an anterior spiracle on each side. This structure is typically tubercular, its apex terminating in a varying number of processes each of which ends in a spiracular opening. The cuticle of the thoracic and abdominal segments may be bare; usually, however it bears rows or bands, either complete or incomplete, of spines along the anterior or posterior or both margin of certain segments.

The structure of the posterior spiracle is of great importance in taxonomy. The spiracle or spiracular plate usually has an outer strongly sclerotized area or peritreme which may completely encircle the spiracle or may be incomplete ventrally.

In the ventral position there often occurs a rounded structure, the button. This may lie in the opening of peritreme or may be surrounded by that structure or may be completely within its inner margin. The respiratory slits of the mature larva may be straight, curved or sinuous. Occasionally one or more of the slits may be fragmented into two or more parts. Somtimes they are breaks in the membrane between the slits. The number of slits is usually considered indicative of the larval stage, one for the first, two for the second, (fig. 6) three for the third. (fig. 7) It may be absent or variously situated depending on the species, and therefore has taxonomic value. Some muscoide larvae differ from the general pattern. The cattlegrub and sheepgrub for example are robust and more oval, and larva of Fannia is flattened with

conspicuous processes extending laterally from the body (3)

The common muscoidae passes through a complex metamorphosis, i.e. egg, larva or maggot, pupa, and adult or fully winged insect. Under warm summer temperatures which may perhaps be considered representative condition, the egg stage requires 8 to 12 hours, the larval stage about 5 days, the pupa 4-5 days, that is a total of about 10 days from egg to adult insect.

Temperature influences materially both the survival of the immature stages and the development time required from the egg to adult. The temperature of an average manure pile to which material is added daily varies from 18°C to 66°C. Young growing larvae are most numerous where the temperature varies from 45°C to 55°C. Below 45°C half grown and full grown larvae occur; about 55°C the temperature seems to become the great.

At temperatures of from 16° to 30°C, at 16°C, the egg stage required 36 to 40 hours for its completion, the larval stage 11 to 20 days and pupal stage 18 to 21 days. The short time required for the development of **Musca domestica** may, depending on local conditions, be less than the minimum time observed above.

STATEMENT OF PROBLEM:

During the study of Medical Entomology course, the authors lacked experience of the common muscoides. The discussion of the problem was held among the staff of the Department of Parasitology. This project was undertaken by the authors

MATERIALS AND METHOD

In the study of mature (third

stage) muscid larvae, the living larvae first were killed in hot water treated with detergent (soap powder). The contours of larvae were observed. Muscoides larvae were seen to have blunt posterior ends and tapering toward anterior ends. The muscoides larvae were shown to have cephalo-pharynxgeal skeleton or anterior paired mouth hooks, which move in a vertical plane to scrape and tear soft food, dead substances or living tissue (Semi-solid stage). On each side of prothorax were observed anterior spiracles which were palmate-like flaps. The rows of minute spines on the body segments provided traction, and the larvae could crawl rapidly and vigorously. The posterior spiracles on eighth abdominal segment were elaboratory designed as filters to exclude materials other than air.

In using the posterior spiracle for purpose of classification the following characters are to be noted.

1. Diameter of the stigmal plate, the space occupied by one stigmal plate on a line drawn through the center of both.
2. The distance between the plates.
3. The general form and shape of the plates.
4. Presence or absence of a button.
5. The form of the peritreme whether complete or broken, regular or irregular, its thickness, and its relation to the button.
6. The form of the spiracular slits, if present, and their relation to one another and to the peritreme and button.
7. The location of the plates

in the respect to the segment that bears them, for example, whether they lie flush with the posterior wall of the segment or whether they are sunken into concavities.

The collection of maggots were obtained by using several baites and at different levels. The baites were carrion of **Achatina fulica** (Giant African snail), salted fish, cat's feces, dog carcass. Maggots were also obtained from stagnant water contaminated donkey's excreta at 1000 ft. above the sea level in Chiang Mai area, and from water buffalo manure at 150 kilometres north of Chiang Mai. 1500 ft, above sea level. The temperature is in the range of 15° - 30° C, relative humidity 78% (Personal communication from Northern Weather Forecasting Division, Meteorological Department, Ministry of Communication).

In collecting stigmal plates, at each time of the collection of maggots from breeding place, the full grown larvae were kept in a bottle.

REAGENTS:

1. Detergent (Soap powder)
2. Normal saline
3. Differentiated alcohol.
4. Xylene and permounts

APPARATUS

1. Surgical blade.
2. Slide and coverglass
3. Sterioscope.

Method of collecting stigmal plates.

1. 5 gms of detergent powder was put into 100 c.c. of water and boiled.
2. Inmediately the full grown larvae was put in the hot detergent solution and boiled for 10-15 minute, to harden the internal structure of

larvae for the purpose of easier pilling out the stigmal plates.

3. Larvae were washed with normal saline and keep in normal saline.
4. Posterior spiracle was cut with a surgical blade and disected the plates with disecting needles under the Sterioscope.
5. The stigmal plates were dehydrated in the differentiated alcohol.
6. The plates were cleaned in Xylene for 30 minutes
7. The plates were mounted as permanent specimens by permounts. As the following steps:—

LARVAE
↓
DETERGENT SOLUTION
boiled 10-15 min.
washed
↓
NORMAL SALINE
↓
MAGGOTS DISECTION
↓
STIGMATAL PLATES COLLECTION
↓
DEHYDRATING
70 % ALCOHOL
30 min.
↓
35 % ALCOHOL
30 min.
↓
90 % ALCOHOL
30 min
↓
95 % ALCOHOL
30 min.
↓
ABSOLUTE ALCOHOL
30 min. 2 times
↓
XYLENE
30 min.
↓
PERMOUNT
(FOR PERMANENT GLASS SLIDES)

RESULTS

The total amount of fly-larvae were collected 1842 larvae from eight places and have found that the common muscoides are:—

1. Musca spp. (Fig. 1, 2, 9)
2. Sarcophaga spp. (Fig.6,7,10)
3. Phaenicia spp. (Fig.5,8)
4. Calliphora spp. (Fig.4,11)
5. Calitroga spp. (Fig.3,12)
6. Rat-tail larvae of Eristalis spp. (Fig.13)

The brief description of the posterior spiracular structures of the above mentioned muscoides larvae are indicated in table 1 and 2.

DLSCUSSION

The study of stigmal plates of common muscoides should be undertaken the whole year round instead of limited two months in dry and cold season. The maximum collection of maggots depended on the climate and humidity. The rainy season is the best time. Another problem was communications were not easy and a limited budget restricted the work.

At the first time of baiting. the earilest collection produced not fully grown larvae of Sarcophaga spp., the stigmal plates were shown two slits (Fig.1).

From the results of this work, we have shown that the maggots in different baiting sources differ in size. Those grown in cat's feces are smaller than those grown in buffalo manure.

However from this studying we know that, the common muscoides are mostly included of Musca spp. Sarcophaga spp. Phaenecia spp. Callitroga spp. Calliphora spp. and Drone fly which is nearly corresponded to a significant study of by Yoa Yuan and Huie in Paiping, China. This was based on total of 384,193

flies, of which 98.4% were **Musca domestica** 1.1% were **Fannia canicularis** and **Fannia scalaris,** 0.31% were **Phaenia caesar** were **Calliphora vicina,** and **Calliphora vomitoria,** and 0.03% were **Sarcophaga carnaria.**

The author would like to continue looking for haematophagous flies. This kind of work should be continued in the near future.

Table I Maggots Collecting items

Breeding source	Baiting places	Number of maggots	Size of maggot		Preserve number of plate are collected	spp.
			length cm.	width cm.		
A	Carrion of snail	687	1.3–1.7	0.2–3.5	120	Sarcophaga
A	,,	235	0.6–0.8	0.1–0.2	20	Unable to identify
B	Salted fish	30	0.8–1.0	0.1–0.25	20	Phanecia
C	Salted fish	210	0.8–1.2	0.2–0.25	80	,,
D	,,	176	0.6–1.0	0.15–0.25	–	,,
E	Buffalo manure	160	0.6–1.0	0.2–0.25	60	Musca domestica
F	Cat excreta	121	0.6–1.0	0.2–0.25	30	,,
A	Salted fish	32	0.8–1.0	0.1–0.2	–	Phanecia
G	Donkey excreta	46	3.8–4.2	0.20–0.35	–	Eristalis
F	Dog's carcass	98	1.2–1.5	0.20–0.30	–	Sarcophaga
G	Donkey	5	0.6–0.9	0.1–0.2	3	Callitroga
	excreta	42	0.6–1.0	0.1–0.25	–	Musca domestica
H	Cat's carcass	5	0.6–0.9	0.1–0.2	2	Calliphora spp.

A = 79–81 Rajapakinai rd., Chiang Mai.

B = Pra Tu Chiang Mai market.

C = Varoros market.

D = Tone Lumyai market.

E = Ban Koa Ploung Chiang Dow, Chiang Mai.

F = Animal house Chiang Mai Hospital.

G = Chiang Mai Breeding Section 2, Army Veterinary and Remount Department.

H = Super High Way, Chiang Mai.

Table II Characteristics of stigmal plates (5–9)

Description	Musca domestica	Sarcophaga spp.	Phanicia spp.	Callitroga spp.	Calliphora spp.
Diameter of plates in micron	170 - 220* 370 - 400**	300 - 550	165 - 200	300 - 400	180 - 200
Distance between plates in micron	90 - 100* 30 - 40**	100 - 120	70 - 100	60 - 70	30 - 40
Distance from middle of the plate	40 - 50* 18 - 20**	50 - 60	40 - 50	30 - 35	10 - 20
Form + shape	D - shape	C - shape	shell - shape	round shape	round shape
Button	Present	Absent	Present	Present	Present
Peritreme	Complete	Incomplete	Compiete	Complete	Complete
Spirocular slits	Convoluted S - shape	Elongated Vertically	Elongated straight toward to the bottom with hair like process radiated from bulging portion of slits medially of inner one and laterally outer two	Elongated straight toward to bottom	Elongated Horizon-tally
Location of plates	Lie flush	Lie flush	Lie flush	Lie flush	Lie flush

* in cat's excreta.

** in buffalo manure.

Fig. I - VII MICROPHOTOGRAPHS OF STIGMAL PLATE

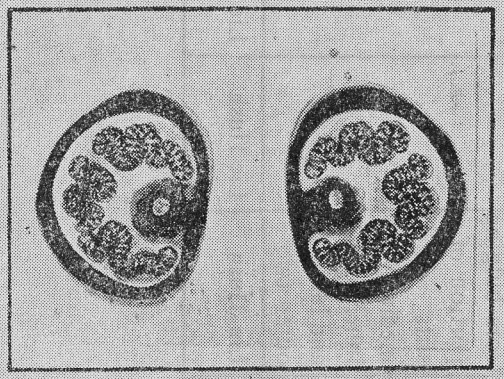

Fig. I Musca domestica in cat's excreta

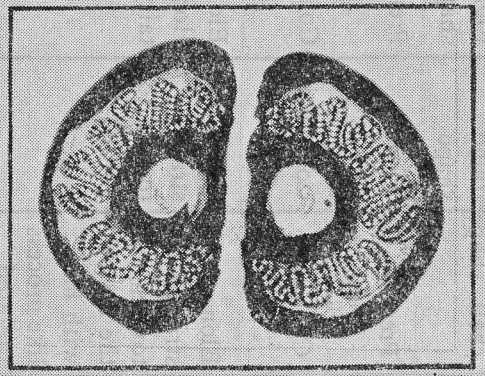

Fig. II Musca domestica in buffalo's manure

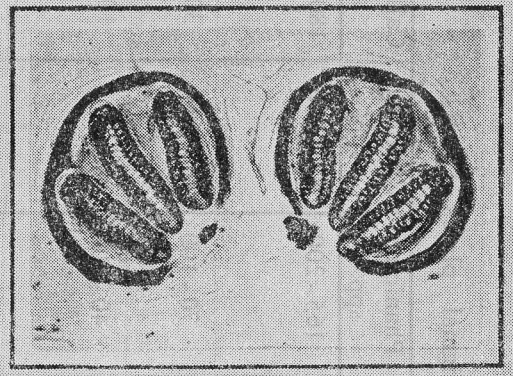

Fig. III Callitrogra spp.

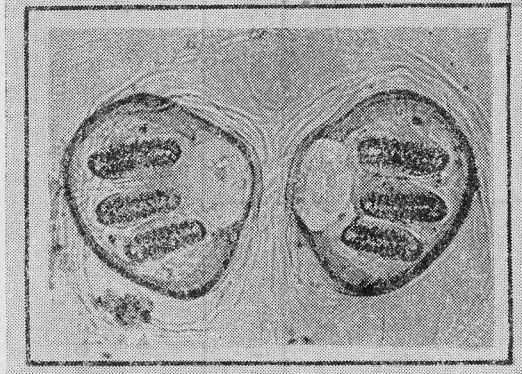

Fig. IV Calliphora spp.

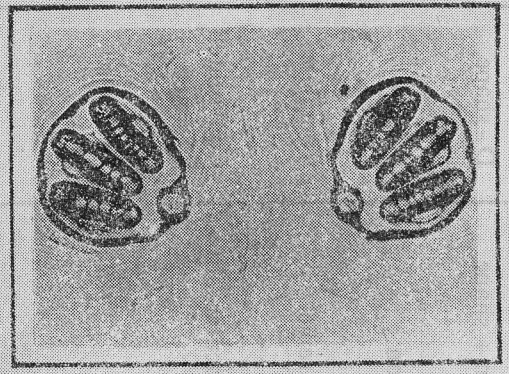

Fig. V Phaenicia spp.

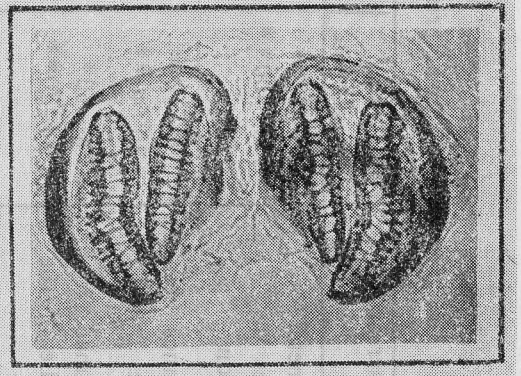

Fig. VI Sarcophaga spp.

Fig. VIII - XII DRAWING DIAGRAM OF STIGMATAL PLATES

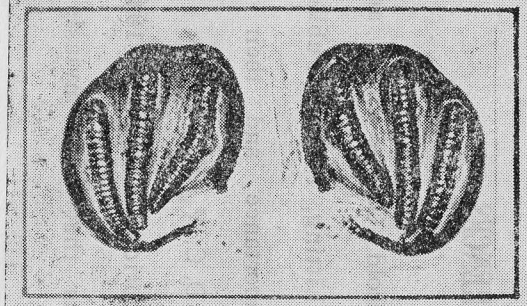

Fig. VII Sarcophaga spp.

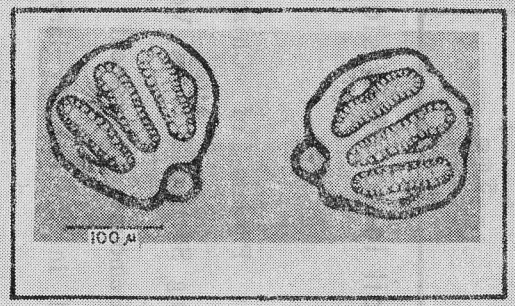

Fig. VIII Phaenicia spp.

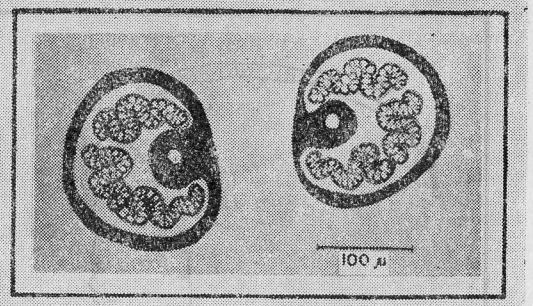

Fig. IX Musca spp.

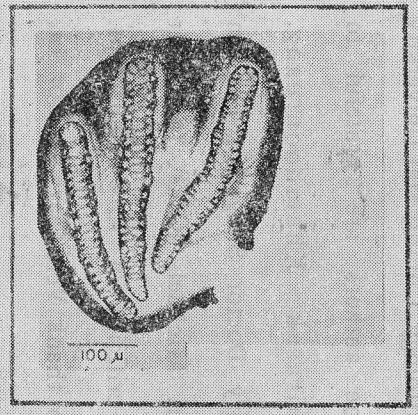

Fig. X Sarcophaga spp.

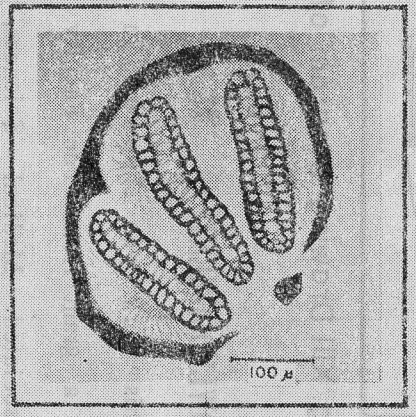

Fig. XI Calliphora spp.

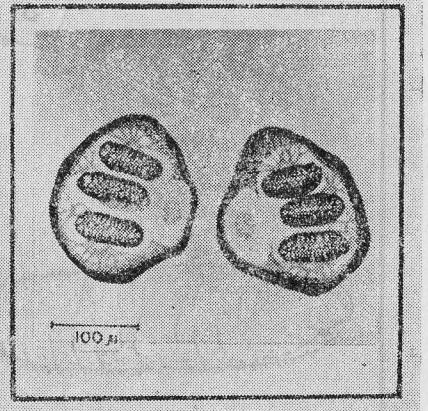

Fig. XII Callitroga spp.

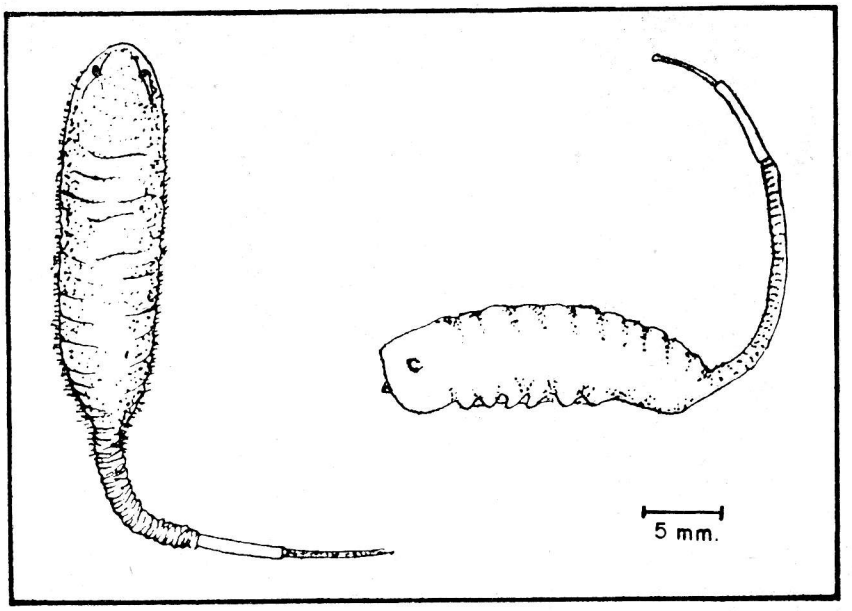

Fig. XIII Drawing Diagram of Rat-tail larva of Eristalis

ACKNOWLEDGEMENT:

This work was supported in part by a grant from The Faculty of Associated Medical Sciences, Projcct, and in prospectuses of Prof. Prayuth Thitasut, Head of Department of Parasitology, Chiang Mai University.

The authors are grateful to Dr. Chirasak Khamboonruang, Veterinary Doctor Sungwian Pan—in and Mr. Michael Kliks for their helpful criticism of this manuscript. Wish to thank Veterinary Doctor Lt. Chairat Panjam of Chiang Mai Breeding Section 2, Army Veterinary and Remount Department for his helpful in baiting fly-larvae.

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ย่อความภาษาไทย

การศึกษา Stigmatal plates ใน common muscoides, โดยการใช้ baiting media หลายชนิด เพื่อ collected larvae ของแมลงในสถานที่ต่าง ๆ กัน แล้วจึงนำมาต้มใน alkaline solution โดยใช้ผง-ซักฟอกผสมน้ำต้ม นำมาตัดเอา stigmatal plates ออก แล้ว dehydrate และ mount ใน permount เป็น permanent slide พบว่ามีพวก

1. **Musca domestica**
2. Sarcophaga spp.
3. Phaenicia spp.
4. Calliphora spp.
5. Callitroga spp.
6. Rat-tail larvae of Eristalis spp.