



UNIVERSITI PUTRA MALAYSIA

**SOME ASPECTS OF THE LIFE CYCLE OF FISH BLOOD FLUKE,
Sanguinicola armata PLEHN, 1905 (DIGENEA: SANGUINICOLIDAE)
IN GRASS CARP (*Ctenopharyngodon idellus*
CUVIER AND VALENCIENNES, 1884)
FINGERLINGS**

KUA BENG CHU

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FINGERLINGS**

By

KUA BENG CHU

**Thesis submitted in fulfilment of the
requirement for the degree of Master of Science
in the Faculty of Fisheries and Marine Science,
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LIST OF ABBREVIATIONS

B & b	-	Body
bs	-	Body Spines
CM	-	Circular Muscles
cm	-	Centimetre
DF	-	Dorsal Fin
E	-	Eyespot
eg.	-	For Example
FC	-	Flame Cell
FT	-	Forked Tail
G	-	Granule
GC	-	Germ Cell
GT	-	Gill Tissues
H & E	-	Haematoxylin and Eosin
IC	-	Immature Cercaria
IF	-	Infected Fish
IGT	-	Infected Gill Tissues
L	-	Litre
M	-	Membrane
ml	-	Millilitre
mm	-	Millimetre
pa	-	Papilla
p	-	Pores
PG	-	Penetration Gland
ppm	-	Part Per-Million
R	-	Rodlet
SA	-	Sac
SC	-	Segmented Cell
SD	-	Standard Deviation
SEM	-	Scanning Electron Microscopy
SH & sh	-	Sensory Hair
T & t	-	Tail
TB	-	Tubule
TEM	-	Transmission Electron Microscopy
UG	-	Unknown Gland
UGT	-	Uninfected Gill Tissues
US	-	Uninfected Snail
VC	-	Vitelline Cell
Z	-	Zygote
μm	-	Micrometre



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**SOME ASPECTS OF THE LIFE CYCLE OF FISH BLOOD FLUKE,
Sanguinicola armata PLEHN, 1905 (DIGENEA:
SANGUINICOLIDAE) IN GRASS CARP (*Ctenopharyngodon idellus*
CUVIER AND VALENCIENNES 1884) FINGERLINGS**

By

KUA BENG CHU

September 1995

Chairman : Faizah Shaharom-Harrison, Ph.D

Faculty : Fisheries and Marine Science

The life-cycle of the fish blood fluke, *Sanguinicola armata* Plehn, 1905 was studied in the laboratory. The snail *Gyraulus convexiusculus* Hutton, 1849 was identified as the intermediate host of *S. armata* from grass carp (*Ctenopharyngodon idellus*) fingerlings.

Two types of experiment (pre-trial and laboratory experimental infections) were carried out in order to infect the laboratory bred snails. The pre-trial study was divided into three experiments. In the first experiment, twenty infected fish were exposed to the thirty uninfected snails and was left for the duration of the experiment. For the second experiment, similar number of fish and



snails were left together for 24 hours. In the third experiment, snails were exposed to gill tissues containing miracidia for 12 and 24 hours. Only snails which were exposed to live infected fish with *S. armata* for 24 hours exposure and left together throughout the experiment became infected. The range of the percentage of snail infection rate in the first and second experiment were 0 - 25% and 10 - 46% respectively. For laboratory experimental infections, similar procedures were performed as in the pre-trial study except that ten infected fish were used. The range of the percentage of snail infection rate in laboratory experimental infections were 32 - 48%.

Cercariae of *S. armata* produced from the laboratory experimental infections were used to infect the uninfected grass carp fingerlings. Three hundred cercariae were exposed to 102 uninfected grass carp fingerlings for 24 hours. Two fish were examined daily for over a period of 105 days. A high rate of infection (74%) with a low rate of mortality (4%) was obtained from the study.

A minimum time of 40 to 43 days was needed to complete the life-cycle of *S. armata*. Newly laid eggs contained several vitelline cells and embryos. Within 6 to



8 days, the eggs became mature and possessed a moving ciliated miracidia. The eggs which were found in the kidney, heart, liver and spleen were encapsulated but the eggs found in the gill tissues were not. Miracidia only hatched in the gill tissues and swam freely before penetrating the snail, *G. convexiusculus*.

Upon entering the snail, the miracidium formed a mother sporocyst, which then produced a daughter sporocyst by asexual reproduction. The shape of the sporocyst was variable, thin-walled, nonmotile and unbranched. A maximum of two to three immature cercariae were found inside the thin membrane. Forked-tail cercariae developed from two sporocyst generations within 14 to 15 days in the snail. They were released from the snails and swam in the water towards the abdominal region of grass carp fingerlings. The tail of the cercariae were shed when penetration of the cercarial body was completed. Cercaria took 18 days to undergo the process from penetration to migration into the blood vessel, matured into an adult and released triangular-shaped eggs. Adult fluke which inhabited the bulbus arteriosus was identified from its lanceolate shape with marginal spines on both sides of its body, butterfly-shaped ovary and 10 pairs of testes.



Abstrak tesis yang dikemukakan kepada Senat Universiti
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Ijazah Master Sains.

**BEBERAPA ASPEK KITARAN HIDUP FLUK DARAH IKAN,
Sanguinicola armata PLEHN, 1905 (DIGENEA:
SANGUINICOLIDAE) DARI FRI IKAN KAP RUMPUT
(*Ctenopharyngodon idellus* CUVIER AND VALENCIENNES 1884)**

Oleh

KUA BENG CHU

September 1995

Pengerusi : Faizah Shaharom-Harrison, Ph.D

Fakulti : Perikanan dan Sains Samudera

Kitaran hidup fluk darah ikan, *Sanguinicola armata* Plehn, 1905 telah dikaji di dalam makmal. Siput *Gyraulus convexiusculus* Hutton, 1849 telah dikenalpasti sebagai perumah perantaraan untuk *S. armata* dari fri ikan kap rumput (*Ctenopharyngodon idellus*).

Dua eksperimen (Pra-percubaan dan eksperimen jangkitan makmal) telah dijalankan untuk menjangkiti siput yang dibiak dalam makmal. Kajian pra-percubaan dibahagikan kepada tiga eksperimen. Dalam eksperimen pertama, dua puluh ikan jangkitan didedahkan kepada tiga puluh siput yang tidak dijangkiti dan dibiarkan sepanjang masa eksperimen. Untuk eksperimen kedua, jumlah ikan dan siput



yang sama telah digunakan dan dibiarkan selama 24 jam. Bagi eksperimen ketiga, siput didedahkan kepada tisu insang yang mengandungi mirasidia untuk tempoh 12 dan 24 jam. Hanya siput yang didedahkan dengan ikan hidup bagi 24 jam dan dibiarkan sepanjang masa eksperimen didapati berjangkit. Julat peratus siput yang dijangkiti untuk eksperimen pertama dan kedua adalah 0 - 25% dan 10 - 46% masing-masing. Untuk jangkitan eksperimen makmal, kaedah sama seperti dalam kajian pra-percubaan kecuali hanya 10 ikan jangkitan digunakan. Julat peratus siput yang dijangkiti dalam jangkitan eksperimen makmal adalah 32 - 48%.

Serkaria *S. armata* yang dihasilkan dari jangkitan eksperimen makmal digunakan untuk menjangkiti fri ikan kap rumput yang belum dijangkiti. Tiga ratus serkaria telah didedahkan kepada seratus dua ekor ikan kap rumput untuk 24 jam dedahan. Dua ekor ikan diperiksa setiap hari untuk jangkamasa 105 hari. Kadar jangkitan yang tinggi (74%) dan kadar yang kematian rendah (4%) telah diperolehi dari kajian.

Tempoh masa minimum selama 40 hingga 43 hari diperlukan untuk melengkapkan kitaran hidup *S. armata*.



Telur yang baru dikeluarkan mengandung beberapa sel viteline dan embrio. Dalam jangkamasa 6 hingga 8 hari, telur menjadi matang dan mempunyai mirasidia bersilia yang bergerak aktif. Telur yang dijumpai pada organ ginjal, jantung, hati dan limpa adalah berkapsul manakala telur pada organ insang tidak sedemikian. Mirasidia menetas hanya pada tisu insang dan berenang bebas di dalam air sebelum menjangkiti siput, *G. convexiusculus*.

Apabila memasuki perumah perantaraan, mirasidia membentuk ibu sporosista di mana kemudian ia menghasilkan peringkat anak sporosista melalui pembiakan aseksual. Sporosista mempunyai pelbagai bentuk seperti membran yang nipis, tidak bergerak dan tidak bercabang. Maksimum dua hingga tiga serkaria tidak matang boleh dijumpai dalam membran nipis sporosista. Serkaria berekor dwicabang berkembang daripada dua generasi sporosista dalam jangkamasa 14 hingga 15 hari di dalam siput. Mereka akan keluar dari siput dan berenang ke arah bahagian abdomen fri ikan kap rumput. Ekor serkaria tanggal apabila badan serkaria telah menembusi abdomen ikan sepenuhnya. Serkaria mengambil 18 hari untuk melalui proses jangkitan ke dalam saluran darah dan menjadi dewasa serta mengeluarkan telur berbentuk segitiga. Fluk dewasa yang mendiami bulbus



arteriosus dikenal pasti dari bentuknya seperti daun dengan marginal spina di kedua bahagian sisi badan, ovari berbentuk seperti kupu-kupu dan mempunyai 10 pasang testes.



CHAPTER 1

INTRODUCTION

Background

The grass carp, *Ctenopharyngodon idellus* (Family: Cyprinidae) or locally known as 'chow hu' among Malaysians is a very popular food fish which fetches a high price in the market (Shireman and Smith, 1983). Grass carp is one of the main Chinese Carp species which was introduced extensively into Malaysia in the 1800's from China (Welcommie, 1981). Initially grass carp was introduced primarily for controlling submerged vegetation. Due to its fast growth rate, it soon became an integral part of composite fish culture. It is the most cultivated species in the Southeast Asian region (Pillay, 1976).

The production of grass carp in Malaysia is however, limited because of the inadequate supply of seed mainly due to various problems encountered in its breeding techniques in the last decade. The increase in demand has thus forced some local farmers to import grass carp seed from other countries such as Taiwan and Hong Kong since early 1974 (Low, 1974). Inevitably, the importation of

