

SEATO MEDICAL RESEARCH STUDY ON NON-MARINE AQUATIC MOLLUSCA

Coordinator: Rolf A.M. Brandt

Principal Investigator: Rolf A.M. Brandt

Associate Investigators: Brasong Temcharoen
Suchat pariyand

Period of Report: 1 April 1966—31 March 1967

GENERAL INFORMATION

The principal Investigator is associated with the SEATO Medical Research Laboratory through an Army Medical R & D Grant given to the University of Medical Sciences in Bangkok to provide for his services for a second period of three years. It was understood, that he should not only work as a Medical Malacologist and Parasitologist for the SMRL but also a teacher of Thai students at the local University.

During the three years of the first grant a careful survey of the non-marine aquatic molluscan fauna of Thailand was carried out in all 71 provinces of the kingdom and a considerably large reference collection was built up. This collection will be stored partly in the building of the Thai Research Council and partly in the U.S. National Museum.

Three Thai students were attached to the Department of Medical Zoology for training in Medical Malacology and Parasitology. They have here successfully worked on their theses for obtaining the degree of Master of Science and two of them are now working as associate investigators in medical malacology and parasitology.

Although the second grant is primarily supposed to help research on larval stages of trematodes, studies on molluscs will be continued. As the general faunistic survey of the kingdom was concluded in March 1967 these studies will cover anatomy, variability, biology and ecology. Further collecting of molluscs will have the predominant objective of obtaining larval stages of trematodes for their further study. These studies of cercariae is carried out in cooperation with the School of Tropical Medicine in Bangkok.

Title: Non-Marine Aquatic Molluscan Fauna of Thailand

Principal Investigator: Rolf A.M. Brandt

Associate Investigators: Brasong Temcharoen
Suchat Pariyanond

Objective: As even a cursory study of helminthic diseases has been proved to be impossible without an intensive knowledge of the intermediate hosts of the worm parasites, an Army Medical R&D Grant was given to the University of Medical Sciences in Bangkok to provide for the services of a Medical Malacologist and Parasitologist for a period of three years. This grant had been extended for a second period of three years.

The objective of this grant was to make a careful survey of the non-marine aquatic molluscan fauna of the Kingdom, to build up a reference collection of the found species, to train Thai students in medical malacology and to help the SMRL and agencies of the Universities with the identification of collected materials. The reference collection, partly stored in Bangkok, partly in Washington, comprises now about 2000 lots, including many undescribed species.

Description: The survey of Thailand for Fresh-water Molluscs was continued in the last twelve months and about 50 new species—partly undescribed—were found. A more careful study of the brackish water fauna resulted in the detection of a surprisingly large number of species new for the Kingdom. Few of these species, however, are of importance for parasitology. In Egypt, a brackish water species of the prosobranchiate family of Potamididae (*Pirinella conica*) is known to harbour the cercariae of Heterophyes. Large numbers of Cerithidea, the closest relative of the above species, were collected and placed in dishes. No heterophoid cercariae were shed. As Echinostomatidae were reported from fishing villages in Thailand, and as the fresh-water molluscs, which are known to harbour metacercariae of Echinostomatidae, are rarely eaten by the villagers, extensive study of the brackish water molluscs which they do eat was carried out. No infected specimen was found. A detailed account of the species is given below.

With regard to the study of potential intermediate hosts of *Schistosoma*, particular care was focused on the genera *Tricula*, *Ferrissia* and *Pachydrobia*. *Tricula* had been reported as intermediate host of *Paragonimus*, but this report proved to be erroneous, as DAVIS proved that these so-called *Tricula* were small forms of *Oncomelania*. As it was evident that *Tricula* and *Oncomelania* look morphologically so similar that experienced taxonomists confound them, the local species of *Tricula* were carefully studied to point out the differences from *Oncomelania*.

From India, reports are known of a *Ferrissia* species (fresh-water limpet) serving as intermediate host of *Schistosoma*. Therefore our local species of that genus were carefully studied, particularly as one of the few localities known of that genus coincides with a *Schistosoma* focus in Thailand. Although information was received from the Medical Department of the British Colonial Office that the above report was a "hoax", this study is being carried on because a fork-tailed cercaria was found in one of these species.

After several reports of cases of schistosomiasis from towns on the Mekong River were received, the fluvial molluscan fauna of that river was closely studied, particularly those species of *Pachydrobia* and its relatives which were reported to us as "*Oncomelania*".

The principal investigator was invited by the Department of Zoology of the University of Malaya for a teaching visit and to help find the intermediate host of *Opisthorchis* around Kuala Lumpur, as several cats were found infected with the liver-fluke. Although no infected snails were found, it can be assumed that *Bithynia laevis*, the only widely distributed Bithyniidae around Kuala Lumpur, serves as intermediate host, as the same species was found infected in Bangkok. The local food habits prevent infection of humans.

Progress and Results: These are shown by the following charts. As the collected specimens have been compared with material reported from other countries and some have been compared with material in different museums, a chart on zoogeography and ecology has been added. This gives the names of new species not included in the lists of the last report.

TABLE I
Geloina Species Examined for Metacercariae

Species	Amount	Locality	Date	Metacercariae
<u>G. bengalensis LAM</u>	71	Chantaburi	21-4-66	None
<u>G. bengalensis LAM</u>	19	Trad	26-7-66	"
<u>G. bengalensis LAM</u>	112	Takua Pa	29-8-66	"
<u>G. bengalensis LAM</u>	62	Gabi	22-8-66	"
<u>G. bengalensis LAM</u>	76	Satun	27-8-66	"
<u>G. bengalensis LAM</u>	37	Kao Yoi	14-6-66	"
<u>G. impressa DESH</u>	18	Gabi	22-8-66	"
<u>G. impressa DESH</u>	23	Satun	27-8-66	"
<u>G. impressa DESH</u>	22	Takua Pa	29-8-66	"
<u>G. impressa DESH</u>	16	Trad	26-7-66	"
<u>G. impressa DESH</u>	6	Gabi	23-8-66	"
<u>G. impressa DESH</u>	11	Tachalaeb	26-7-66	"
<u>G. siamensis PRIME</u>	48	Glaeng	21-12-66	"
<u>G. siamensis PRIME</u>	17	Kao Yoi	14-6-66	"
<u>G. galathea MOERCH</u>	69	Takua Pa	29-8-66	"
<u>G. proxima DESHAYES</u>	9	Trad	26-7-66	"
<u>G. proxima DESHAYES</u>	35	Glaeng	21-12-66	"
<u>G. proxima DESHAYES</u>	42	Takua Pa	29-8-66	"
<u>G. proxima DESHAYES</u>	8	Nara Tiwat	no date	"
<u>G. proxima DESHAYES</u>	12	Kantang	24-8-66	"
<u>G. coaxans GMELIN</u>	14	Chantaburi	21-4-66	"
<u>G. coaxans GMELIN</u>	7	Trad	27-7-66	"
<u>G. coaxans GMELIN</u>	52	Bandon	19-9-66	"
<u>G. coaxans GMELIN</u>	12	Satun	27-8-66	"
<u>G. coaxans GMELIN</u>	37	Takuapa	29-8-66	"
<u>G. coaxans GMELIN</u>	6	Trad	17-11-66	"

Six Species

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TABLE II
Cercariae and Metacercariae in Potamides and Telescopium

Species	Amount	Locality	Date	Species of Cercariae	Species of Metacercariae
<u>P. eurypterris</u> ADAMS (?)	642	Welu River	29-7-66	1	0
<u>P. palustris</u> LAMARCK	766	Tachalaeb	26-7-66	0	0
<u>T. telescopium</u> LINNE	52	Khlung	29-7-66	0	0
<u>T. telescopium</u> LINNE	8	Narativat	4-4-66	0	0
<u>T. telescopium</u> LINNE	36	Grabi	21-8-66	0	0
<u>T. telescopium</u> LINNE	4	Trad	30-7-66	0	0
<u>T. moritso</u> BUTOT	12	Grabi	21-8-66	0	0
Potamides (Terebralia)	1408			1	0
Telescopium	110			0	0

TABLE III
Cercariae and Metacercariae in Cerithidea

Species	Amount	Locality	Date	Species of Cercariae	Species of Metacercariae
<u>C. djadjariensis</u> M.	120	Kao Yoi, Petburi	15-6-66	0	0
" "	942	Tachalaeb	21-4-66	0	0*
" "	1117	Klong Na Klua	10-1-67	0	0*
" "	433	Ban Ampoe	6-1-67	0	0
" "	1422	Klong Bang La Mung	4-1-67	1	0*
<u>C. cingulata</u> GMELIN	2361	Klong Na Klua	10-1-67	2	0*
" "	1860	Klong Bang La Mung	4-1-67	1	0*
" "	45	Tachalaeb	21-4-66	0	0
" "	648	Bang Saen	12-1-67	0	0
" "	104	Kao Yoi	15-6-66	0	0
" "	374	Klong Nachon Tian	26-4-66	0	0
" "	252	Grabi	23-8-66	0	0
" "	709	Ko Samui	20-9-66	0	0
" "	126	Trad	21-4-66	0	0
" "	20	Ban Ampoe	6-1-67	0	0
" "	1312	Sriracha	12-1-67	1	0*
" "	581	Glaeng	7-1-67	0	0*
<u>C. alata</u> PHILIPPI	291	Tachalaeb	21-4-66	0	0*
<u>C. weyersi</u> DAUTZ.	103	Kantang	25-8-66	0	0
<u>C. carbonieri</u> PETIT	35	Bandon	15-9-66	0	0
<u>C. obtusa</u> LAMARCK	10	Surat Thani	20-9-66	0	0
" "	80	Penang	no date	0	0
" "	50	Bandon	21-9-66	0	0
" "	6	Ban Tamru	21-1-67	0	0
" "	652	Satun	4-1-66	0	0*
" "	125	Pak Panang	23-11-65	0	0
" "	25	Tachalaeb	21-4-66	0	0
" "	277	Ranong	20-8-66	0	0
" "	163	Grabi	22-8-66	0	0
" "	413	Ko Samui	22-9-66	0	0
<u>C. quadrata</u> SOWERBY	481	Tachalaeb	21-4-66	0	0*
" "	2278	Ban Ampoe	6-1-67	1	0*
" "	88	Ban Tam Niap	7-1-67	0	0
" "	291	Ban Na Klua	3-1-67	0	0*
Seven species	16994				0
<u>C. djadjariensis</u>	4034	(1 specimen infected 0.025%)			0
<u>C. cingulata</u>	8392	(4 specimen infected 0.05%)			0
<u>C. obtusa</u>	1401	(0 specimen infected 0%)			0
<u>C. quadrata</u>	2958	(1 specimen infected 0.033%)			0

0* only 20% of the specimens were crushed

Table IV

Non-Marine Molluscan Fauna of Thailand Brackish and Fresh-water Species
Zoogeography and Ecology

Species	Thailand only				Thail. and Asia			Fresh Water							Br. W		Remarks				
	Burma	Malaya	Laos	Cambodia	South	Southeast	East	Insulinde	Australo-Pacific	Palearctic	Circumtropic	Palearctic	Holarctic	Cosmopolitan	creeks	fluvialile		lacustrine	still water	estuarine	mud flats
<u>Neritidae</u>														X	X	X	X		X	X	predominantly marine
<u>Neritina</u>											X				X	X	X		X	X	
<i>pulligera</i> L.						X	X	X	X						X	X					=sulcata LAM.?
<i>chimmoi</i> REEVE					X	X	X	X	X											X	
<i>variata</i> LESS					X	X	X	X	X											X	
<i>violacea</i> LAM.					X	X	X	X	X											X	
<u>Clithon</u>											X								X	X	rarely marine and in lagoons
<i>sowerbyana</i> R.					X	X	X	X	X										X		
<i>oualaniensis</i>					X	X	X	X											X		
<u>Nerita</u>											X								X	X	predominantly marine
<i>lineata</i> SOW.					X	X	X	X	X										X	X	
<i>planispira</i> PFR					X	X		X											X	X	
<u>Viviparidae</u>													X			X	X	X	X		not South America
<u>Idiopoma</u>					X	X									X	X	X	X			
<i>umbilicata</i> LEA							X										X	X	X		
<i>variata</i> FRFLD					X	X									X	X	X				
<u>Cipangopoludina</u>					X	X	X								X	X	X	X			
<i>crooki</i> BR.	X		?													X					
<u>Anulotaia</u>																X					one other species in Cambodia
<i>forcarti</i> BR	X															X					
<u>Trochotaia</u>					X	X												X	X		
<i>trachoides</i> M.					X	X												X	X		
<u>Eyrlesia</u>					X	X										X	X				monotypical genus
<i>eyriesi</i> DESH.					X	X										X					
<u>Sinotaia</u>					X	X	X	X	?												
<i>guangdungensis</i>						X	X									X					
<u>Siamopaludina</u>					X	X	X	X	X												
<i>martensis</i> FRF.						X	X	X								X	X	X			
<i>javanica</i> HASS.						X		X									X	X			
<i>zilchi</i> BR.																X					
<i>maekokensis</i> BR.	X		X													X		X			

Species	Thailand only			Thail. and Asia			Eresh Water										Remarks					
	Burma	Malaya	Laos	Cambodia	South	Southeast	East	Insulinde	Australo-Pacific.	Paleotropic	Circumtropic	Paleartic	Holarctic	Cosmopolitan	creeks	fluvialile		lacustrine	still water	estuarine	mud flats	Br. W
<u>Filopaludina</u> HABE					X	X									X	X	X	X			& Madagascar	
<i>filosa</i> REEVE	?		X												X	X		X	X			
<i>dollaris</i> GOULD	X				X												X	X	X			
<i>polygramma</i> MART.		X		X											X	X		X	X			
<i>sumatrensis</i>						X		X													ssp. <i>speciosa</i> DESH. & South Vietnam	
<u>Mekongia</u>				X	X											X						
<i>siamensis</i> FRFLD.	X															X						
<i>bocourti</i> MABILLE	X															X					Mae Klong	
<i>bourguignati</i> "	X															X					Petburi river	
<i>heinesiana</i> LEA	X															X					"	
<i>swainsoni</i> LEA				X	X											X						
<i>moreleti</i> DESH.				X	X											X						
<i>rattei</i> FISCHER				X	X											X						
<i>lamarcki</i> DESH.				X	X											X						
<i>pongensis</i> BR.				X	X											X						
<i>flavida</i> BRANDT				X												X						
<u>Ampullariidae</u>											X					X	X	X				
<u>Pila</u>					X	X	X	X	X								X	X				
<i>ampullacea</i> L.					X	X	X	X	X								X	X				
<i>polita</i> DESH.					X	X	X	X	X								X	X				
<i>callistoma</i> MORELET						X											X	X				
<i>scutata</i> MOUSSON					X	X		X									X	X				
<i>gracilis</i> LEA			X	X												X	X					
<u>Bithyniidae</u>														X	X	X	X	X				
<u>Gabbia</u>										X						X	X					
<i>wykoffi</i> BRANDT	X	?	?	?	?												X	X				
<i>pygmaea</i> PRESTON	X				X											X						
cf. <i>longicornis</i>						X															X	
<u>Bithynia</u>														X	X	X	X	X			subgen. <i>Digonio-</i> <i>stoma</i>	
<i>funiculata</i> WALKER	X		X															X				
<i>goniomphalus</i> MOR.					X	?										X	X	X				
<i>siamensis</i> LEA			X	X												X	X	X				
<i>laevis</i> LEA				X												X	X				& Malaya	
<i>pulchella</i> BENSON					X											X	X	X				
<u>Wattebledia</u>					X			X								X	X					
<i>crossean</i> WATTEBL.					X											X	X					
<i>siamensis</i> MLLDFF.	X															X	X				not Java	

Species	Thailand only				Thail. and Asia				Fresh Water						Br. W		Remarks				
	Burma	Malaya	Laos	Cambodia	South	Southeast	East	Insulinde	Australo-Pacific.	Paleotropical	Circumtropical	Palaearctic	Holarctic	Cosmopolitan	creeks	fluvialile		lacustrine	still water	estuarine	mud flats
Bithyniidae cont.																					
<u>Hydrobioides</u>																					
<u>dautzenberi</u> WALK.			X				X	X										X	X		
<u>Hydrobiidae</u>																					
<u>Pachydrodia</u>																					
<u>siamensis</u> BRANDT	X																				
<u>zilchi</u> BRANDT	X																				
<u>munenses</u> BRANDT																					
<u>crooki</u> BRANDT			X	X																	
<u>spinosa</u> POIRIER			X	X																	
<u>tuberculata</u> BR.			X	X																	
<u>harmandi</u> POIRIER			X	X																	
<u>variabilis</u> POIR.			X	X																	
<u>paradoxa</u> CR. & F.			X	X																	
<u>Pachydrobiella</u>																					
<u>brevis</u> BAVAY			X	X																	
<u>dubiosa</u> BRANDT	X																				
<u>Hubendickia</u>																					
<u>siamensis</u> BRANDT	X		X	?																	
<u>bandani</u> BRANDT			X																		
<u>Paraprososthenia</u>																					
<u>schlickumi</u> BR.	xx																				
<u>crooki</u> BRANDT			X																		
<u>schuetti</u> BRANDT			X																		
<u>Hydrorissoia</u>			X	X																	
<u>elegans</u> BAVAY			X	X																	
<u>Lacunopsis</u>																					
<u>monodonta</u> DESH.			X	X																	
<u>harmandi</u> POIRIER			X	X																	
<u>coronata</u> HEUDE																					
<u>radomani</u> BRANDT			X																		
<u>Jullienia</u>																					
<u>tricostata</u> DESH.			X	X																	
<u>crooki</u> BRANDT			X																		
<u>Tricula</u>																					
<u>bolliingeri</u> DAVIS	X	?													X	X					
<u>burchi</u> DAVIS	X	?													X	X					
<u>Rehderiella</u>																					
<u>parva</u> LEA	X																				
<u>siamensis</u> BRANDT	X																				

Species	Thailand and				Asia				Fresh Water						Remarks						
	Thailand only				South	Southeast	East	Insulinde	Australo-Pacific.	Paleotropical	Circumtropic	Palearctic	Holarctic	Cosmopolitan		creeks	fluvialile	lacustrine	still water	Br. W	
	Burma	Malaya	Laos	Cambodia																estuarine	mud flats
<u>Fairbankiidae</u>																					
<u>Fairbankia</u>					X	X	X	X											X	X	
berryi BRANDT		X																	X	X	
rohdei BRANDT		X																	X	X	
truncata BRANDT	X																		X	X	
<u>Assimineidae</u>													X						X	X	
<u>Assiminea</u>												X							X	X	
brevicula PFEIFFER					X	X	X	X											X	X	
borneensis ISSEL						X	X	X											X	X	
nitida PEASE						X	X	X	X	X									X	X	
woodmasoniana NEV.					X	X	X	X	X	X									X	X	
javana THIELS						X	X	X	X	X									X	X	
microsculpta NEV.					X	X	X	X	X	X									X	X	
bandoni BRANDT	X																		X	X	
semilirata BTG.						X			X										X	X	
thonburi BRANDT	X								X										X	X	
daengsvangi BR.	X																		X	X	
siamensis BRANDT	X																		X	X	
<u>Paludinella</u>											X								X	X	
carinata LEA	X				?														X	X	
fasciolata MOREL.	X																		X	X	
brunnea BRANDT	X																		X	X	
<u>Thiaridae</u>													X						X	X	
<u>Brotia</u> H. ADAMS					X	X	X	X							X	X	X	X	X	X	
siamensis BROT		X	X		X			X							X	X			X	X	
citrina BROT	X	?		?											X	X			X	X	
peninsularis BRAND				X											X	X			X	X	
pagodula GOULD	X														X	X			X	X	
binodosa BLANFORD	X														X	X			X	X	
armata BRANDT	X														X	X			X	X	
subgloriosa BR.	X														X	X			X	X	
pongensis BRANDT	X														X	X			X	X	
baccata GOULD		X													X	X			X	X	
pseudasperata BR.	X														X	X			X	X	
? housei LEA				X	X										X	X			X	X	
<u>Melanoides</u>															X	X	X	X	X	X	
tuberculata MLL.										X					X	X	X	X	X	X	
jugicosta BENSON	X				X										X				X	X	

Species	Thailand only				Thail. and Asia			Insulide	Australo-Pacific.	Paletropic	Circumtropic	Holarctic	Cosmopolitan	Fresh Water				Br. W		Remarks
	Burma	Malaya	Laos	Cambodia	South	Southeast	East							creeks	fluvialile	lacustrine	still water	estuarine	mud flats	
	Thiaridae cont.																			
<u>Tarebia</u>					X	X	X	X	X						X	X	X	X		
<u>granifera</u> LAM.					X	X	X	X	X						X	X	X	X		
<u>bangpraensis</u> BRANDT	X																			
<u>Sermyla</u>					X	X	X	X	X									X	X	
<u>riquei</u> GRATELOU					X	X	X	X	X									X	X	
<u>krungtepi</u> BRANDT	X																	X	X	
<u>Thiara</u>					X	X	X	X	X	?					X	X	X	X		Maenam Chao Phaya
<u>scabra</u> O.F. MULLER					X	X	X	X	X						X	X	X	X		East Africa
<u>Faunus</u>					X	X	X	X	X									X	X	
<u>ater</u> L.					X	X	X	X	X									X	X	
Pleuroceridae													X							
<u>Semisulcospira</u>							?	X							X	X	X	X		
<u>? housei</u> LEA															X	X	X			
<u>Paludomus</u>					X	X	X	X	X						X	X	X	X		
<u>siamensis</u> BLANFORD	X														X	X	X	X		
<u>petrosa</u> GOULD		X													X	X	X	X		
<u>burmanica</u> NEVILL		X													X	X	X	X		
<u>ornata</u> BENSON		X													X	X	X	X		
Potamididae													X					X	X	except cold region
Cerithidea													X					X	X	
<u>weyersi</u> DAUTZENBERG					X	X			X									X	X	
<u>charbonieri</u> PETIT					X	X			X									X	X	
<u>alata</u> PHILIPPI					X	X			X									X	X	
<u>obiusa</u> LAM					X	X	X		X	X								X	X	
<u>quadrata</u> SOWERBY					X	X	X		X	X								X	X	
<u>cingulata</u> GMELIN					X	X	X		X	X								X	X	
<u>dadjariensis</u> MARTIN					X	X			X	X								X	X	
<u>Telescopium</u>					X	X			X	X								X	X	
<u>telescopium</u> L.					X	X			X	X								X	X	
<u>moritsi</u> BUTOT									X	X								X	X	telescopium frm.?
<u>Terebralia</u>					X	X	X		X	X								X	X	
<u>palustris</u> BRUG.					X	X	X		X	X								X	X	
<u>spec. ind.</u>							X		X									X	X	
<u>sulcata</u> BORN					X	X			X									X	X	
Margainellidae													X					X		marine
<u>Rivomarginella</u> BRANDT																		X		only fresh-water
<u>morrisoni</u> BRANDT	X																	X		genus and species

Species	Thailand and				Asia				Fresh Water						Br. W	Remarks						
	Thailand only				South	Southeast	East	Insulinde	Australo-Pacific	Palearctic	Circumtropic	Palearctic	Holarctic	Cosmopolitan	creeks		fluvialile	lacustrine	still water	estuarine	mud-flats	
	Burma	Malaya	Laos	Cambodia																		
<u>Buccinidae</u>														X							predom. marine	
<u>Clea</u>					X	X	X									X						
<u>cambodiensis</u> SOW.				X	X										X							
<u>siamensis</u> n.			X												X							
<u>crooki</u> n.			X												X							
<u>Anentome</u>					X										X	X	X	X				
<u>baudoniana</u> MAB. & LM					X										X	X	X	X				
<u>Chicoreus</u>					X	X	X	X	X												X	
<u>capucinus</u> LAM					X	X	X	X													X	
<u>Allectron</u>					X	X	X	X												X	X	
<u>taenus</u> GMELIN					X	X	X	X												X	X	
<u>Littorinidae</u>														X						X	X	marine
<u>Littorinopsis</u>					X	X	X	X	X											X	X	and marine
<u>angulifera</u> LAM.					X	X	X	X												X	X	
<u>melanostoma</u> GRAY					X	X	X	X												X	X	
<u>Ellobiidae</u>														X						X	X	and terrestrial
<u>Ellobium</u>										X										X	X	
<u>aurisjudae</u> L.					X	X		X	X											X	X	
<u>aurismidae</u> L.					X	X		X	X											X	X	
<u>Melampus</u>										X										X	X	and amphibious
<u>fasciatus</u> DESH.					X	X	X	X	X											X	X	
<u>singaporensis</u> PFR.					X	X	X	X	X													coastal zone
<u>siamensis</u> PFR.	X																					
<u>Laemodonta</u>											X										X	
<u>punctigera</u> ADAMS					X	X	X	X	X												X	
<u>siamensis</u> MARTENS	X																				X	
<u>Pythia</u>										X											X	
<u>trigonis</u> TROSCHL					X	X		X	X												X	
<u>plicata</u> BORN					X	X		X	X												X	
<u>Cylindrotis</u>						X		X													X	coastal zone
<u>quadrasi</u> MLLDFF.						X		X													X	
<u>Cassidula</u>					X	X	X	X	X												X	
<u>aurisfelis</u> BRUG					X	X	X	X	X												X	
<u>mustelina</u> DESH.					X	X		X													X	
<u>Auriculastra</u>					X	X	X	X	X												X	
<u>subula</u> QUOY & GAIM					X	X	X														X	

Species	Thailand only		Thail. and		Asia		Fresh Water							Br. W		Remarks										
	Burma	Malaya	Laos	Cambodia	South	Southeast	East	Insuline	Australo-Pacifc.	Paleotropic	Circumtropic	Palearctic	Holarctic	Cosmopolitan	creeks		fluvialile	lacustrine	still water	estuarine	mud.flats					
	<u>Pyramidellidae</u>																									
<u>Morrisonia</u> MS	X													X						X	X					marine
krungtepi BRANDT	X																			X	X	X				
gracilis BRANDT	X																			X	X	X				
acicula BRANDT	X																			X	X	X				
bandoni BRANDT	X																			X	X	X				
spiralis BRANDT	X																			X	X	X				
<u>Chrysallida</u>																										
hanseni BRANDT	X													X								X	X			marine
<u>Arcidae</u>																										
<u>Scaphula</u>																										
chaoprayaensis	X				X	X																X	X			marine
<u>Mytilidae</u>																										
<u>Modiolus</u>																										
siamensis MORELET							X															X	X			marine
evansi SMITH	X																					X	X			—
<u>Anomiidae</u>																										
<u>Anomia</u>																										
aenigmatica LAM								X	X			X										X	X			mangrove swamps
<u>Ostreidae</u>																										
<u>Alectryonia</u>																										
folium L.											X											X	X			marine
? gryphoides SCHLOTH.							X	X				?										X	X			
<u>Unionidae</u>																										
<u>Unio</u>																										
dorri WATTEBLED																										
<u>Oxynaia</u>																										
jourdyi MORLET																										
<u>Ovadrulidae</u>																										
<u>Pseudodon</u>																										
mouhoti LEA							X	X														X	X			
inoscularis GOUL																						X	X			
vondenbuschi v. H.																						X	X			
<u>Trapezoideus</u>																										
foliaceus GOULD							X	X														X	X			

Species	Thailand and Asia										Fresh Water					Remarks				
	Thailand only				Asia						Br. W									
	Burma	Malaya	Laos	Cambodia	South	Southeast	East	Insulinde	Australo-Pacific.	Paleotropical	Circumtropic	Palaearctic	Holarctic	Cosmopolitan	creeks		fluviate	lacustrine	still water	estuarine
<u>Ensidens</u>						X									X	X	X			
<u>ingallsianus</u> LEA						X									X	X	X			
<u>Contradens</u>						X		X							X	X	X	X		
<u>ascia</u> HANLEY		X													X	X	X	X		
<u>semidecoratus</u> MOREL				X	X										X	X	X	X		
<u>tumidulus</u> LEA			X	X											X	X				
<u>rustica</u> LEA				X												X				
<u>Nannonaia</u>					X	X	?	X							X					
<u>pilatus</u> LEA			X	X											X					
<u>substriata</u> LEA		?	X	X											X					
<u>Pilbryoconcha</u>					X	X		X							X	X	X	X		
<u>temeslei</u> MORLET			X	X													X	X		
<u>exilis</u> LEA					X			X							X	X	X	X		
<u>Unionetta</u>																				
<u>fabagina</u> DESH. & J.			X	X											X					
<u>Physunia</u>					X	X		X							X					
<u>eximius</u> LEA			X	X											X					
<u>gravidus</u> LES		X						X							X					
<u>Hyrtopsis</u>					X	X		X							X	X	X			
<u>bialatus</u> SIMPSON			X	X	X										X	X	X			
<u>delaportei</u> CR. & F.			X	X											X	X				
<u>modelli</u> BRANDT	X														X					
<u>myersiana</u> LEA			X	X	X										X	X				
<u>Chamberlainia</u>																				
<u>hainesiana</u> LEA	X		?	?											X					
<u>Cristaria</u>						X									X	X				
<u>plicata</u> LEACH						X									X	X				
<u>Scabies</u>					X	X									X	X	X			
<u>scobinata</u> LEA					X	X									X	X	X			
<u>crispata</u> GOULD						X									X					
<u>phasellus</u> LEA			X	X											X					
<u>morrisoni</u> BRANDT MS	X														X					
<u>Pletholophus</u>						X									X					
<u>inangulatus</u> HAAS			X	X											X					
<u>Modellnaia</u>	X														X					
<u>munensis</u> BRANDT	X														X					
<u>Solenaia</u>					X	X	X											X		
<u>emarginata</u> LEA	X																X			

=superbus LEA?

end. Mun River
—
not yet found

Species	Thailand and Asia				Fresh Water						Remarks											
	Thailand only				Br. W																	
	Burma	Malaya	Laos	Cambodia	Insulinde	Australo-Pacific	South Asia	SE Asia	East Asia	Paleotropic		Circumtropic	Palaearctic	Holarctic	Cosmopolitan	creeks & streams	fluvialite	lacustrine	still water	estuarine	mud-flats	
<u>Psammobiidae</u>														X					X	X	and marine	
<u>Psammotaea</u>											X											- -
layardi REEVE							X	X											X	X		
<u>Psammotella</u>											X								X		and marine	
spec. nov.?	X																	X	X			
<u>Psammobia</u>														X					X		and marine	
violacea LAM.					X	X	X	X										X	X	X		
<u>Glaucomyidae</u>					X	X	X	X	?						X			X	X	X		
corrugata LAM							X	X										X	X	X		
krungtepi BR.	X																	X	X	X		
<u>Solenidae</u>														X		X		X	X	X	predominantly marine	
<u>Novaculina</u>							X	X							X	X		X	X	X		
siamensis MORELET	X														X	X		X	X	X		
<u>Pholadidae</u>														X				X	X	X	predominantly marine	
<u>Martesia</u>							X	X										X	X	X		
rivicula SOW	X																	X	X	X		
<u>Teredinidae</u>														X				X	X	X	predominantly marine	
<u>Nausitora</u>																		X	X	X		
smithi BARTSCH	X																	X	X	X		

Summary and Conclusion.

Zoogeography. The general survey on non-marine molluscs in Thailand has been concluded in March 1967. In the four years of this faunistic survey 277 species of molluscs were found in fresh and brackish water, 97 in brackish or tidal water, 180 in fresh-water, five of which may also be found in estuarine water. Of these 277 species 75 species seem to be endemic for Thailand, at least they have not yet been found in other countries. It is understandable that this group contains the bulk of the undescribed species, 55 of 61. Eighty-three species are known from one or more neighboring countries, 118 are distributed over larger areas of Asia, Three of these species may be called paleotropic. No circumtropic or even cosmopolitan species is known from Thailand. All larger species and many of the smaller ones are related to parasitology, most of the local genera and almost all of the families have been proved to be of importance to human and veterinarian medicine. The description of the new species is in press, the complete fauna will be finished in about two months time.

Parasitology. Cases of Heterophyes, identified by a Japanese taxonomist as H. heterophyes, lead to the collecting of large numbers of Cerithidea, the closest local relative of the African intermediate host, Pirinella conica. Of nearly 17000 collected specimens, which belong to seven species, none has shed heterophoid cercariae. The cercariae which were found are not related to human or veterinarian medicine.

Echinostomiasis is widely distributed in Thailand, and also reported from coastal villages. As clams of the genus Geloina and snails of the genera Cerithidea, Terebralia and Telescopium are used as food in those areas several species of these genera were examined for metacercariae. In none of the 843 Geloinae and 1500 Potamididae did we find metacercariae. Therefore it is very improbable that these species serve as intermediate hosts. As among several thousand Cerithideae no infested snails was found, this genus can definitely be excluded from the list of potential second intermediate hosts. It seems highly improbable, that any brackish water species will be infested with metacercariae of Echinostomatidae, as the known first intermediate hosts are strictly confined to freshwater only.

The program for the next three months is the study of the cercariae shed by Ferrissia, Tricula and the Basommatophorae of the mud-flats, as some of these serve as food in Thailand.