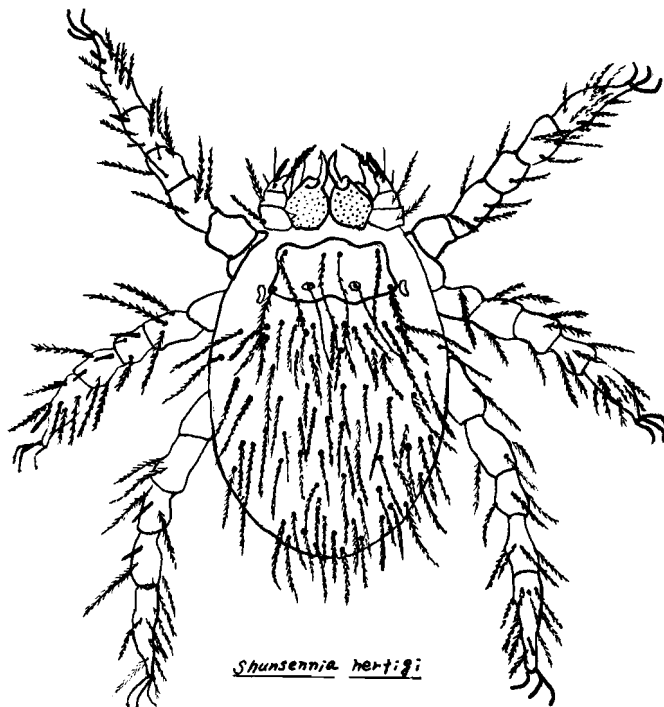


5TH PREVENTIVE MEDICINE UNIT

65TH MEDICAL GROUP, FASCOM



ECTOPARASITE SURVEY

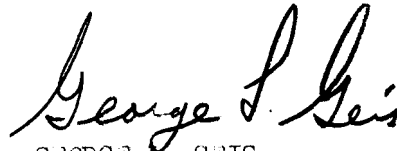
OF SOUTH KOREA

PROGRESS REPORT

JULY 1968

FOREWORD

MANY LONG HOURS OF DEDICATED WORK BY THE PERSONNEL IN THE SURVEY SECTION OF THE 5TH PREVENTIVE MEDICINE UNIT HAVE BEEN CONTRIBUTED IN THE PREPARATION OF THIS PUBLICATION. UNDER THE DIRECTION OF CAPTAIN J. WANLESS SOUTHWICK, THE SECTION SURVEYED MANY GEOGRAPHICAL AREAS IN THE REPUBLIC OF KOREA FOR DATA ON ECTOPARASITES AND THEIR HOSTS. EXCELLENT SUPPORT WAS RENDERED BY UNITED STATES ARMY UNITS, UNITED STATES AIR FORCE, AND THE REPUBLIC OF KOREA NAVY IN ALL AREAS SURVEYED. IT IS HOPED THAT THE INFORMATION CONTAINED HEREIN WILL BE OF USE FOR REFERENCE INFORMATION IN FUTURE ENDEAVORS OF RESEARCH IN THE FIELD OF DISEASE PREVENTION IN THE REPUBLIC OF KOREA.



GEORGE E. GEIS
CPT, MSC
COMMANDING

ECTOPARASITE SURVEY OF SOUTH KOREA PROGRESS REPORT

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
A. Methods and Procedure.	2
B. Results.	2
C. Acknowledgments.	3
II. MAP OF KOREA	5
III. A CHECKLIST TO THE ECTOPARASITES OF SOUTH KOREA, BY HOST	6
IV. ECTOPARASITE KEYS.	14
A. Key to the Korean Mesostigmatid Mites.	14
B. Key to the Larval Trombiculid Mites of Korea	18
C. Key to the Korean Species of Anoplura.	24
V. ECTOPARASITE COLLECTION DATA	26
VI. REFERENCES	115

INTRODUCTION

The purpose of this report is to consolidate the data available at 5th Preventive Medicine Unit pertaining to ectoparasites of South Korea. For many years data about ectoparasites has been collected in conjunction with epidemic hemorrhagic fever studies, but these data have often been lost due to frequent turnover of military personnel.

Data for this report are from two main sources, (1) from microscope slides prepared in years prior to 1967 and (2) from a large scale ectoparasite survey during 1967.

No real attempt has been made to analyze data or to draw conclusions. It is hoped that future workers concerned with ectoparasites of South Korea will be able to use these data as a foundation upon which to build. Microscope slides of ectoparasites, skulls and skins of hosts and original data cards have been preserved in the laboratory for future reference by subsequent researchers.

Because of the fear that these data would be lost, the preparation of this report was considered essential. Some urgency was attached to its preparation because of the impending departure of the officer-in-charge of the Survey Section. This urgency precluded many refinements that otherwise would have been accomplished, for example: numerical sequence of hosts listed on raw data sheets was not always maintained and attempts to alphabetize were usually thwarted. Arrangement of animals in logical taxonomic sequence was hardly attempted. This urgency will probably be revealed as the father of undiscovered errors despite strict efforts to attain accuracy.

Methods and Procedure

The 1967 ectoparasite survey was accomplished by field teams of four men. The field team used a laboratory van mounted on a 2 1/2 ton truck, and a 1/4 ton truck (jeep) with trailer. They moved to a pre-selected site and collected small mammals and occasionally birds of the area for seven (7) days. Snap traps and shotguns were the main collection tools used. Captured animals were given a number, placed in a bag with chloroform, and placed in a freezer for storage. A data card on each host was initiated in the field.

Frozen hosts were flown to the 5th Preventive Medicine Unit Laboratory where they were maintained in a deep freezer until they could be processed for ectoparasites. Ectoparasites were combed from the thawed hosts and placed with the host number in an alcohol vial. The host animal skulls and skins were preserved for future taxonomic reference. Sometimes skins were destroyed by shrews feeding on the captured animals in the field, and sometimes hair slippage was so bad that skins were thrown away. Ectoparasites were mounted on microscope slides by taxonomists and classified.

The survey began in September 1967 in the central part of the country, moved across the peninsula near the DMZ to the east coast and then down the east coast to Pusan and Cheju Island.

Results

Data for each host were recorded on a single data card. Taxonomic identifications of both ectoparasites and hosts were checked by other

entomologists and mammalogists wherever possible. Some uncommon specimens were sent to expert taxonomists for identification. Unfortunately some of the information from experts was not available at the time of printing, therefore identification of some specimens, especially the ticks, was incomplete as can be seen from the raw data sheets.

Data for this report is presented in two ways (1) check list of ectoparasites found in Korea and (2) raw data of each ectoparasite collection record. Also preliminary keys to the laelaptid mites, chigger mites and lice are presented.

Acknowledgments

Many individuals participated in the 1967 survey and in preparing this report. The life blood of the survey was the field collection team who collected host animals. Team members included:

Mr. Chong, Chun-sik	Sp4 Catanello, Joseph V.
Sp5 Butterfield, Allan A.	Sp4 Falls, Daward L.
Sp5 Cox, George R.	Sp4 Johnson, Vernon
Sp5 Jenkins, Johnny V.	Sp4 McFarland, Steven L.
Sp5 Killin, Robert D.	PFC Drysdale, James R.
Sp5 Townsend, Richard W.	PFC Jang, Ki-je
SGT Choi, Nam-ha	PFC Morton, Ronald A.
SGT Jo, Young-ho	PFC Ogle, Lea B.
SGT Yang, Won-suk	PFC Sims, Steven R.

Dr. No, Byong-ui was responsible for processing the host animals for ectoparasites, for mounting host skins and for saving and tagging host skulls. Dr. No accomplished the majority of this work himself although, he utilized enlisted personnel of the laboratory to aid in keeping up with the heavy volume of specimens. He also made primary taxonomic identification of host mammals.

Processing, mounting and identification of ectoparasites was accomplished by the Korean Entomologists employed by the Laboratory. Their taxonomic skill was the foundation of this study. Authorship of this work should be accorded these taxonomists:

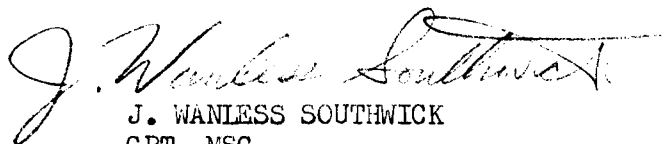
Mr. Yu, Hyo-sok
Mr. Chong, Chun-sik

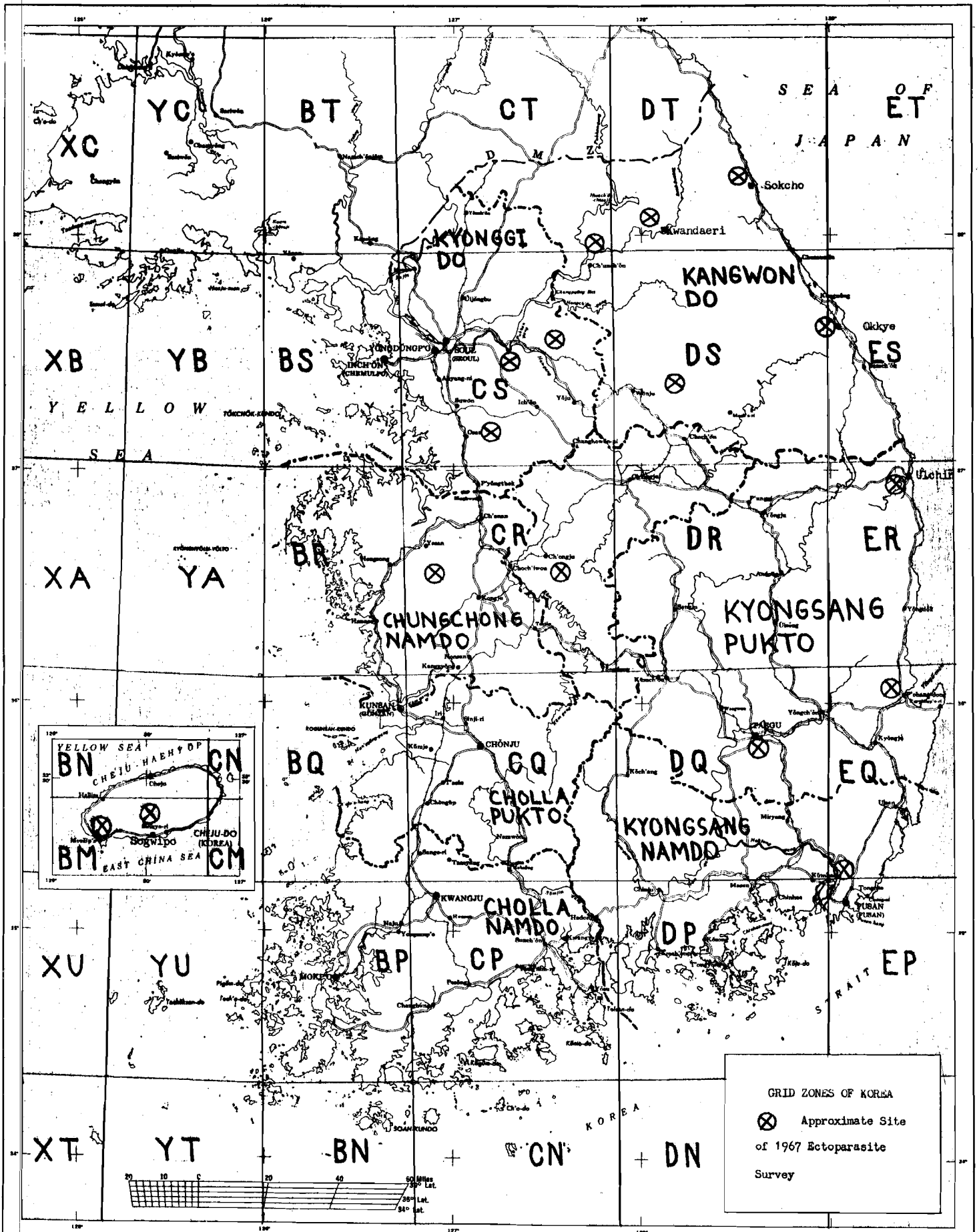
Mrs. Cho, Hu-cha
Mrs. Chu, Chong-ae

After the identifications had been made and the data cards completed, the responsibility for assembling the data fell upon the officer-in-charge who relied upon PFC Ronald A. Morton for transcription of data from cards to data sheets. PFC Morton did the typing for the report. Mr. Yu, Hyo-sok played an important role in reviewing transcribed data for errors. Mr. Yu also prepared the taxonomic keys presented in this report.

Special thanks go to those who aided in the identification of ectoparasites and hosts: Dr. Edwin L. Tyson and Dr. Won, Pyong-hooi for their help in identifying the mammal hosts; LTC Vernon J. Tipton, Dr. Robert Traub, Dr. Glen M. Kohls and Dr. M. Nadchatram for their help in identifying ectoparasites.

Special help in meeting transportation requirements were gratefully obtained from 377th Medical Company (Air Ambulance), 55th Aviation Company (Army), 2nd Aviation Battalion A Company, 7th Aerial Port Squadron Detachment 55 (Air Force), and Chief of Naval Operations, Republic of Korea Navy.


J. WANLESS SOUTHWICK
CPT, MSC
OIC, Survey Section



GRID ZONES OF KOREA

⊗ Approximate Site of 1967 Ectoparasite Survey

A CHECKLIST TO THE ECTOPARASITES
OF SOUTH KOREA, BY HOST

Host	Ectoparasite	Number of Occurrences
<u>Apodemus agrarius</u>	<i>Cheladonta ikaoensis</i>	12
	<i>Echinolaelaps echidninus</i>	5
	<i>Eulaelaps stabularis</i>	118
	<i>Euschongastia koreaensis</i>	100
	<i>Gahrliopia comataxilla</i>	3
	<i>Haemogamasus ambulans</i>	18
	<i>Haemogamasus kusumotoi</i>	2
	<i>Haemolaelaps glasgowi</i>	66
	<i>Hirstionyssus carnifex</i>	29
	<i>Laelaps agilis</i>	320
	<i>Laelaps nuttalli</i>	17
	<i>Leptotrombidium gemiticula</i>	63
	<i>Leptotrombidium hiranumai</i>	1
	<i>Leptotrombidium halidasys</i>	1
	<i>Leptotrombidium orientalis</i>	202
	<i>Leptotrombidium pallida</i>	188
	<i>Leptotrombidium palpalis</i>	215
	<i>Leptotrombidium scutellaris</i>	45
	<i>Leptotrombidium subintermedia</i>	37
	<i>Leptotrombidium zeta</i>	128
	Myobiidae	2
	<i>Neotrombicula ichikawai</i>	13
	<i>Neotrombicula japonica</i>	48
	<i>Neotrombicula southardi</i>	2
	<i>Neotrombicula talmiensis</i>	9
	<i>Neotrombicula tamiyai</i>	77
	<i>Ornithonyssus bacoti</i>	3
	Parasitidae	31
	<i>Shunsennia tarsalis</i>	1
	<i>Dermacarus</i> sp.	21
	<i>Ctenophthalmus congener</i>	33
	<i>Doratopsylla coreana</i>	2
	<i>Hystrihopsylla microti</i>	1
	<i>Monopsyllus anisus</i>	3
	<i>Neopsylla bidentatiformis</i>	10
	<i>Nosopsyllus fasciatus</i>	1
	<i>Rhadinopsylla concava</i>	4
	<i>Rhadinopsylla insolita</i>	3
	<i>Rhadinopsylla valenti</i>	5
	<i>Stenoponia montana</i>	3

A CHECKLIST TO THE ECTOPARASITES
OF SOUTH KOREA, BY HOST

Host	Ectoparasites	Number of Occurrences
<u>Apodemus agrarius</u> (con't)	<i>Stenoponia sidimi</i>	39
	<i>Xenopsylla cheopis</i>	2
	<i>Hoplopleura acanthopus</i>	1
	<i>Hoplopleura affinis</i>	30
	<i>Hoplopleura oenomydis</i>	1
	<i>Hoplopleura</i> sp. "A"	1
	<i>Polyplax reclinata</i>	3
	<i>Polyplax serrata</i>	52
	<i>Polyplax spinulosa</i>	26
<u>Apodemus peninsulae</u>	<i>Eulaelaps stabularis</i>	3
	<i>Euschongastia koreaensis</i>	1
	<i>Haemolaelaps glasgowi</i>	1
	<i>Laelaps agilis</i>	6
	<i>Leptotrombidium orientalis</i>	8
	<i>Leptotrombidium pallida</i>	2
	<i>Leptotrombidium palpalis</i>	2
	<i>Leptotrombidium subintermedia</i>	6
	<i>Leptotrombidium zeta</i>	5
	Myobiidae	1
	<i>Neotrombicula ichikawai</i>	1
	<i>Neotrombicula japonica</i>	1
	Parasitidae	2
	<i>Shunsennia tarsalis</i>	1
	<i>Dermacarus</i> sp.	1
	<i>Ctenophthalmus congener</i>	1
<i>Nosopsyllus fasciatus</i>	1	
<i>Stenoponia sidimi</i>	1	
<i>Polyplax serrata</i>	1	
<u>Micromys minutus</u>	<i>Eulaelaps stabularis</i>	1
	<i>Leptotrombidium subintermedia</i>	2
	<i>Neotrombicula tamiyai</i>	2
<u>Mus musculus</u>	<i>Cheladonta ikaoensis</i>	1
	<i>Eulaelaps stabularis</i>	2
	<i>Euschongastia koreaensis</i>	3
	<i>Haemolaelaps glasgowi</i>	2
	<i>Hirstionyssus carnifex</i>	4
	<i>Hirstionyssus isabellinus</i>	1

A CHECKLIST TO THE ECTOPARASITES
OF SOUTH KOREA, BY HOST

Host	Ectoparasite	Number of Occurrences
<u>Mus musculus</u> (con't)	<i>Laelaps agilis</i>	8
	<i>Laelaps nuttalli</i>	2
	<i>Leptotrombidium orientalis</i>	3
	<i>Leptotrombidium pallida</i>	6
	<i>Leptotrombidium palpalis</i>	9
	<i>Leptotrombidium scutellaris</i>	3
	<i>Neotrombicula tamiyai</i>	1
	<i>Ornithonyssus bacoti</i>	1
	<i>Nosopsyllus fasciatus</i>	2
	<i>Hoplopleura acanthopus</i>	1
	<i>Hoplopleura affinis</i>	1
	<i>Hoplopleura oenomydis</i>	1
	<i>Polyplax reclinata</i>	1
	<i>Polyplax spinulosa</i>	1
	<u>Clethrionomys rufocanus</u>	<i>Haemogamasus kusumotoi</i>
<i>Haemolaelaps glasgowi</i>		6
<i>Hirstionyssus carnifex</i>		1
<i>Laelaps agilis</i>		1
<i>Laelaps nuttalli</i>		1
<i>Leptotrombidium gemitricula</i>		8
<i>Leptotrombidium orientalis</i>		34
<i>Leptotrombidium pallida</i>		2
<i>Leptotrombidium palpalis</i>		24
<i>Leptotrombidium subintermedia</i>		12
<i>Leptotrombidium zeta</i>		14
<i>Neotrombicula japonica</i>		3
<i>Neotrombicula pomeranzevi</i>		1
<i>Neotrombicula southardi</i>		5
<i>Neotrombicula tamiyai</i>		5
<i>Ornithonyssus bacoti</i>		1
Parasitidae		1
<i>Shunscornia tarsalis</i>		3
<i>Otonopthalmus congener</i>		9
<i>Peromyscopsylla</i> sp.		2
<i>Rhadinopsylla concava</i>		2
<i>Stenoponia sidimi</i>		3
<i>Hoplopleura acanthopus</i>	4	

A CHECKLIST TO THE ECTOPARASITES
OF SOUTH KOREA, BY HOST

Host	Ectoparasite	Number of Occurrences
<u>Microtus fortis</u>	<i>Eulaelaps stabularis</i>	1
	<i>Euschongastia koreaensis</i>	1
	<i>Gahrliopia comataxilla</i>	1
	<i>Haemolaelaps glasgowi</i>	8
	<i>Hirstionyssus isabellinus</i>	1
	<i>Laelaps agilis</i>	1
	<i>Leptotrombidium orientalis</i>	5
	<i>Leptotrombidium pallida</i>	3
	<i>Leptotrombidium patens</i>	4
	<i>Leptotrombidium scutellaris</i>	1
	<i>Leptotrombidium zeta</i>	1
	<i>Neotrombicula japonica</i>	1
	<i>Neotrombicula tamiyai</i>	7
	<i>Hoplopleura acanthopus</i>	4
	<i>Hoplopleura affinis</i>	1
<u>Crocidura lasiura</u>	<i>Eulaelaps stabularis</i>	4
	<i>Euschongastia koreaensis</i>	4
	<i>Haemogamasus ambulans</i>	3
	<i>Haemolaelaps glasgowi</i>	4
	<i>Hirstionyssus carnifex</i>	4
	<i>Laelaps agilis</i>	3
	<i>Leptotrombidium miticula</i>	2
	<i>Leptotrombidium orientalis</i>	2
	<i>Leptotrombidium zeta</i>	1
	Myobiidae	1
	<i>Neotrombicula ichikawai</i>	1
	<i>Neotrombicula japonica</i>	4
	<i>Neotrombicula nagayoi</i>	1
	<i>Neotrombicula tamiyai</i>	3
	<i>Oryctolaelaps bibikovae</i>	1
	<i>Shunsenia hertigi</i>	1
	<i>Ctenophthalmus congener</i>	8
	<i>Nosopsyllus fasciatus</i>	1
	<i>Rhadinopsylla valenti</i>	2
	<i>Stenoponia montana</i>	1
<i>Stenoponia sidimi</i>	3	
<i>Polyplax reclinata</i>	4	
<i>Polyplax serrata</i>	2	

A CHECKLIST TO THE ECTOPARASITES
OF SOUTH KOREA, BY HOST

Host	Ectoparasite	Number of Occurrences
<u>Crocidura suaveolens</u>	<i>Euschongastia koreaensis</i>	1
	<i>Hirstionyssus carnifex</i>	3
	<i>Leptotrombidium pallida</i>	1
	<i>Leptotrombidium palpalis</i>	1
	<i>Neotrombicula japonica</i>	1
	<i>Polyplax reclinata</i>	1
	<i>Polyplax serrata</i>	2
<u>Sorex sp.</u>	<i>Leptotrombidium gemitricula</i>	1
	<i>Leptotrombidium orientalis</i>	1
	<i>Neotrombicula japonica</i>	1
	<i>Neotrombicula nagayoi</i>	1
	<i>Shunsennia hertigi</i>	1
	<i>Doratopsylla coreana</i>	1
<u>Sorex caecutiens</u>	<u><i>Eulaelaps stabularis</i></u>	1
<u>Rattus norvegicus</u>	<i>Echinolaelaps ochidninus</i>	31
	<i>Eulaelaps stabularis</i>	5
	<i>Euschongastia koreaensis</i>	1
	<i>Haemogamasus ambulans</i>	1
	<i>Haemolaelaps glasgowi</i>	13
	<i>Hirstionyssus carnifex</i>	1
	<i>Laelaps agilis</i>	2
	<i>Laelaps nuttalli</i>	27
	<i>Leptotrombidium gemitricula</i>	4
	<i>Leptotrombidium orientalis</i>	5
	<i>Leptotrombidium pallida</i>	5
	<i>Leptotrombidium palpalis</i>	18
	<i>Leptotrombidium scutellaris</i>	3
	<i>Leptotrombidium subintermedia</i>	1
	<i>Leptotrombidium zeta</i>	2
	<i>Neotrombicula ichikawai</i>	2
	<i>Neotrombicula japonica</i>	1
	<i>Neotrombicula southardi</i>	1
	<i>Ornithonyssus bacoti</i>	8
	Parasitidae	5
	<i>Ctenocephalides canis</i>	2
	<i>Ctenophthalmus congener</i>	3
	<i>Monopsyllus anisus</i>	9

A CHECKLIST TO THE ECTOPARASITES
OF SOUTH KOREA, BY HOST

Host	Ectoparasites	Number of Occurances
<u>Rattus norvegicus</u> (cont)	<i>Nosopsyllus fasciatus</i>	4
	<i>Paradiplosyllus curvispinus</i> ?	1
	<i>Paradiplosylla valenti</i>	2
	<i>Stenoponia sidimi</i>	2
	<i>Xenopsylla cheopis</i>	8
	<i>Hoplopleura oenomydis</i>	1
	<i>Polyplax spinulosa</i>	1
<u>Rattus rattus</u>	<i>Echinolaelaps echidninus</i>	10
	<i>Eulaelaps stabularis</i>	2
	<i>Euschongastia koreaensis</i>	1
	<i>Haemolaelaps glasgowi</i>	2
	<i>Laelaps agilis</i>	1
	<i>Laelaps nuttalli</i>	7
	<i>Leptotrombidium orientalis</i>	3
	<i>Leptotrombidium pallida</i>	4
	<i>Leptotrombidium palpalis</i>	8
	<i>Leptotrombidium scutellaris</i>	5
	<i>Leptotrombidium subintermedia</i>	1
	Pyobiidae	1
	<i>Neoschongastia asakawai</i>	1
	<i>Neotrombicula japonica</i>	1
	<i>Neotrombicula tamiyai</i>	1
	<i>Ornithonyssus bacoti</i>	14
	Parasitidae	2
	<i>Monopsyllus anisus</i>	6
	<i>Neopsylla bidentatiformis</i>	1
	<i>Phadinopsylla concava</i>	1
	<i>Xenopsylla cheopis</i>	11
	<i>Hoplopleura affinis</i>	1
	<i>Hoplopleura oenomydis</i>	1
	<i>Hoplopleura</i> sp. "A"	1
<i>Polyplax serrata</i>	1	
<i>Polyplax spinulosa</i>	4	
<u>Apodemus agrarius</u> (nest)	<i>Hirstionyssus carnifex</i>	1
	<i>Otenophthalmus congener</i>	1
<u>Micromys minutus</u> (nest)	<i>Haemolaelaps glasgowi</i>	1

A CHECKLIST TO THE ECTOPARASITES
OF SOUTH KOREA, BY HOST

Host	Ectoparasite	Number of Occurrences
<u>Microtus fortis</u> (nest)	<i>Haemogamasus kusumotoi</i>	1
	<i>Haemolaelaps glasgowi</i>	1
	<i>Hirstionyssus carnifex</i>	1
	Parasitidae	1
Rodent nest	<i>Eulaelaps stabularis</i>	1
	<i>Hirstionyssus carnifex</i>	1
	<i>Neotrombicula tamiyai</i>	1
	<i>Ctenophthalmus congener</i>	2
<u>Talpa micrura</u>	<i>Gahrleipia comataxilla</i>	1
<u>Cricetulus triton</u>	<i>Cheladonta ikaoensis</i>	3
	<i>Euschongastia koreaensis</i>	4
	<i>Gahrleipia comataxilla</i>	3
	<i>Hirstionyssus carnifex</i>	2
	<i>Leptotrombidium orientalis</i>	4
	<i>Leptotrombidium pallida</i>	2
	<i>Leptotrombidium palpalis</i>	4
	<i>Leptotrombidium subintermedia</i>	1
	<i>Leptotrombidium zeta</i>	2
	<i>Neotrombicula japonica</i>	1
	<i>Neotrombicula tamiyai</i>	2
	Parasitidae	1
	<i>Dermacarus</i> sp.	1
	<i>Hoplopleura acanthopus</i>	1
<i>Hoplopleura oenomydis</i>	2	
<u>Tamias sibiricus</u>	<i>Eulaelaps stabularis</i>	1
	<i>Leptotrombidium orientalis</i>	3
	<i>Leptotrombidium palpalis</i>	1
	<i>Leptotrombidium subintermedia</i>	1
	<i>Neotrombicula ichikawai</i>	1
	<i>Neotrombicula japonica</i>	5
	<i>Neotrombicula pomeranzevi</i>	1
	<i>Neotrombicula tamiyai</i>	2
<i>Monopsyllus indages</i>	1	
<u>Sciurus vulgaris</u>	<i>Hirstionyssus carnifex</i>	3
	<i>Neotrombicula ichikawai</i>	3
	<i>Monopsyllus indages</i>	2

A CHECKLIST TO THE ECTOPARASITES
OF SOUTH KOREA, BY HOST

Host	Ectoparasite	Number of Occurrences
<u>Sciurus vulgaris</u> (con't)	Leptotrombidium pumilis	1
<u>Mustela sibirica</u>	Neotrombicula japonica	1
<u>Canis familiaris</u>	Leptotrombidium palpalis	1
	Pulex irritans	2
<u>Pipistrellus abramus</u>	Leptotrombidium subakamurai	1
<u>Pipistrellus savii</u>	Leptotrombidium myotis	3
<u>Vespertilio superans</u>	Leptotrombidium subakamurai	1
	Trombicula kochuori	2
	Cimex pilosellus	1
<u>Alauda arvensis</u>	Ornithonyssus sylviarum	1
<u>Corvus corone</u>	Leptotrombidium palpalis	1
<u>Emberiza cioides</u>	Ornithonyssus sylviarum	1
<u>Gallus gallus</u>	Dermanyssus gallinae	1
<u>Phasianus colchicus</u>	Helenicula miyagawai	7
	Dermacarus sp.	1
<u>Phoenicurus phoenicurus</u>	Leptotrombidium palpalis	1
<u>Tetrastes bonasia</u>	Neoschongastia asakawai	1
<u>Lepus coreanus</u>	Haemaphysalis flava	1
	Ixodes (persulcatus?)	1

KEY TO KOREAN MESOSTIGMATID MITES
(Based on Females)

1. - Dorsal plate divided in two by narrow suture of unarmored integument; palpal tarsus with three-tined seta PARASITIDAE
 - Dorsal plate usually entire, if two shields are present, they are separated widely; palpal tarsus with two-tined seta 2
2. - Dorsal surface heavily clothed with setae; epigynial plate with ten or more setae (HAEMOGAMASIDAE) 8
 - Dorsal surface not heavily clothed with setae; epigynial plate with eight or less setae 3
3. - Chelae prominently sclerotized with pilus dentalis on fixed digit; movable digit with a corona of setae at the base; peritremal and parapodal plates separated; corniculi well defined
 - (IANILAPUDAE) 4
 - Chelae poorly sclerotized without pilus dentalis on fixed digit; movable digit without a corona of setae at the base; peritremal and parapodal plates usually continuous; corniculi poorly defined
 - (DERMANYSSIDAE) 10
4. - Epigynial plate with only one pair of setae gamolaelaps glasgovi
 - Epigynial plate with three to four pairs of setae 5
5. - Epigynial plate with three pairs of setae; sternal plate twice as wide as long with third pair of setae off the plate; dorsal plate with concave (undulated) margins. Oryctolaelaps bibikovae
 - Epigynial plate with four pairs of setae; sternal plate less than twice as wide as long with three pairs of setae on the plate; dorsal plate with evenly rounded margin 6

6. - Sternal plate as long as wide; epigynial plate expanded distally with posterior margin distinctly concave; large sized mite (more than 1 mm). Chinolaelaps ochidninus
- Sternal plate distinctly wider than long; epigynial plate not expanded with posterior margin more or less straight or rounded; medium sized mite (less than 1 mm). . . (Genus Laelaps) 7
7. - Medial hypostomal setae longer than gnathosomal setae; a pair of adanal setae more than half as long as a postanal seta; tarsus II with 2 heavy, blunt setae; pilus dentalis inflated basally
. Laelaps nuttalli
- Medial hypostomal setae slightly shorter than gnathosomal setae; a pair of adanal setae less than half as long as a postanal seta; tarsus II with 3 heavy, blunt setae; pilus dentalis not inflated basally Laelaps agilis
8. - Metapodal plates triangular, almost as large as anal plate with sculptured surface; epigynial plate prominently expanded distally; anal plate triangular, broader than long with 3 setae
. Eulaelaps stabularis
- Metapodal plate not triangular, small in size without sculptured surface; epigynial plate drop-shaped, moderately expanded distally; anal plate ovoidal, longer than broad with more than three setae (Genus Haemogamasus). 9
9. - Pilus dentalis unbranched, inflated basally; epigynial plate with less than 50 accessory setae; metapodal plate more or less ovoidal, less than the length of anus. Haemogamasus ambulans

- Pilus dentalis 8 to 10 branched, not inflated basally; epigynial plate with more than 80 accessory setae; metapodal plate crescent shaped, longer than the length of anus . . . Haemogamasus kusumotoi
- 10. - Chelicerae elongate, attenuated apical two-thirds with a pair of needle-like chelae; coxa II without an anterior dorsal spur
 (DERMANYSSINAE) Dermanyssus gallinae
- Chelicerae retain uniform thickness with scissor-like chelae; coxa II with anterior dorsal spurs . . . (MACRONYSSINAE) 11
- 11. - With Two dorsal shields subequal; primarily parasitic on bats . . .
 Genus Steatonyssus
- With one dorsal shield 12
- 12. - With ventral spurs on coxae II and III
 (Genus Hirstionyssus) 13
- Without ventral coxal spur 14
- 13. - Tarsus II with two short, peg-like setae ventrally; third pair of sternal setae separated more than twice as far as first pair of sternal setae Hirstionyssus carnifex
- Tarsus II without peg-like setae; third pair of sternal setae separated usually twice as far as first pair of sternal setae.
 Hirstionyssus isabellinus
- 14. - Epigynial plate evenly rounded posteriorly; dorsal plate more or less parallel-sided before distal one fifth; coxae II and III with a slight semicircular protuberance posteriorly; parasites of bats .
 Genus Ichoronyssus

- Epigynial plate narrowed posteriorly with pointed tip; dorsal plate convex-sided and tapered posteriorly; coxae II and III without semicircular protuberance (Genus *Ornithonyssus*)15
- 15. - Sternal plate with 3 pairs of setae; epigynial plate gradually tapered posteriorly; setae on dorsal shield almost equal in size to those of unarmored dorsal integument. *Ornithonyssus bacoti*
- Sternal plate with 2 pairs of setae, occasionally a third pair of setae touch posterolateral corner of sternal plate; epigynial plate abruptly tapered before basal one third to posteriorly; setae on dorsal shield conspicuously smaller than those of unarmored dorsal integument. *Ornithonyssus sylviarum*

KEY TO THE LARVAL TROMBICULID MITES OF SOUTH KOREA

1. - All legs with six segments; two setae on coxa I; scutum with two median setae (*Leeuwenhoekinae*) 2
 - Leg I with seven segments; one seta on coxa I; scutum with median seta less than two 3
2. - Posterior margin of scutum with marked median convexity; ventral tibial seta of palpus feathered (B/B/BBB); cheliceral blade without minute teeth ventrally *Shunsennia tarsalis*
 - Posterior margin of scutum with moderate concavity; ventral tibial seta of palpus nude (B/B/BNN); cheliceral blade with minute teeth ventrally *Shunsennia hertigi*
3. - Legs II and III with six segments; anteromedian scutal seta absent (*Gahrlepiinae*) *Gahrlepia comataxilla*
 - Legs II and III with seven segments; anteromedian scutal seta present (*Trombiculinae*) 4
4. - Sensillae flagelliform (*Trombiculini*) 5
 - Sensillae expanded distally (*Schongastiini*) 25
5. - Scutum more or less pentagonal 6
 - Scutum rectangular or trapezoidal 13
6. - Mastitarsala III absent; parasitic on bats
 - (Genus *Trombicula*) *Trombicula koomori*
 - One or more mastitarsala III present; parasitic principally on rodents (Genus *Neotrombicula*) 7
7. - One mastitarsala III present; tibiala III absent
 - (*autumnalis* group) 9

- Two or three mastitarsalae III present; tibiala III present. . . 8
- 8. - Two mastitarsalae III present; one mastifemorala III present . . .
. (microti group) Neotrombicula pomeranzevi
- Three mastitarsalae III present; mastifemorala III absent.
. (bisignata group) Neotrombicula taaiyai
- 9. - Two pairs of humeral setae; dorsal setae less than 38; sensillary
bases on a line or slightly behind a line connecting the bases of
posterolateral setae Neotrombicula japonica
- One pair of humeral setae; dorsal setae less than 50; sensillary
bases various. 10
- 10. - Tarsus III less than 90 microns long; SD less than 65 microns; 2nd
posthumeral row of setae less than 8 11
- Tarsus III more than 90 microns long; SD more than 65 microns; 2nd
posthumeral row of setae more than 8 12
- 11. - Tarsus III about 70 microns long; 1st posthumeral row of setae
usually 6; sensillary bases in advance of line connecting the
bases of posterolateral setae. Neotrombicula ichikawai
- Tarsus III about 80 microns long; 1st posthumeral row of setae
usually 8; sensillary bases slightly behind a line connecting the
bases of posterolateral setae. Neotrombicula talmiensis
- 12. - 1st and 2nd posthumeral rows of setae less than 20 altogether,
arranged as 2-8-10-; galeal and palpal dorsal tibial setae usually
nude Neotrombicula nagayoi
- 1st and 2nd posthumeral rows of setae more than 20 altogether,
arranged as 2-10-2-8- or 2-10-10-; galeal and palpal dorsal tibial

- setae usually branched Neotrombicula southardi
13. - Scutum longer than wide; surface of scutum verrucose with sensillae nude; palpal claw two pronged; mastitarsala III present.
. (nasal chigger of bats) Genus Microtrombicula
- Scutum wider than long; surface of scutum never verrucose with sensillae feathered; palpal claw three to four pronged; mastitarsala III absent. (Genus Leptotrombidium) 14
14. - Ventral tibial seta of palpus feathered; coxal seta III on or close to anterior margin of the coxa 15
- Ventral tibial seta of palpus nude; coxal seta III separated from anterior margin of the coxa by more than twice the setal diameter 17
15. - Base of sensillae with small but conspicuous, divergent basal barbs; 1st posthumeral row of setae usually eight.
. Leptotrombidium orientalis
- Base of sensillae nude or with very minutely appressed barbs; 1st posthumeral row of setae usually ten or more 16
16. - Scutum medium with PW about 80 microns; base of sensillae with minutely appressed barbs; 1st posthumeral row of setae ten to twelve Leptotrombidium gemiticula
- Scutum small with PW about 65 microns; base of sensillae usually nude; 1st posthumeral row of setae usually ten
. Leptotrombidium palpalis

17. - Base of sensillae with small but conspicuous, divergent basal
 barbs; 1st posthumeral row of setae twelve to fourteen
 Leptotrombidium pallida
- Base of sensillae nude or with very minute closely appressed
 barbs; 1st posthumeral row of setae usually eight or ten 18
18. - Sensillary bases in advance of a line connecting PL; posterolateral
 seta inserted at angulated posterior corner of scutum 19
- Sensillary bases behind a line connecting PL; posterolateral seta
 inserted in an anterior part of rounded posterior corner of scutum
 21
19. - Dorsal tibial seta of palpus nude; telofemur III with one nude
 seta; posterior lateral corner of scutum sharply angulated;
 posterior margin of scutum more or less straight with slight un-
 dulation Leptotrombidium subakamushi
- Dorsal tibial seta of palpus feathered; telofemur III without nude
 seta; posterior lateral corner of scutum not sharply angulated;
 posterior margin of scutum evenly rounded or with median sinus . .
 20
20. - Posterior margin of scutum evenly rounded; 1st posthumeral row of
 setae usually ten. Leptotrombidium scutellaris
- Posterior margin of scutum sinuate medially; 1st posthumeral row
 of setae usually eight Leptotrombidium myotis
21. - 1st posthumeral row of setae usually eight 22
- 1st posthumeral row of setae usually ten 24

22. - Scutum broad with PW more than 80 microns; posterior margin of scutum not sinuate; dorsal setae 32 - 36 in number 23
- Scutum small with PW about 70 microns; posterior margin of scutum biconvexed with median sinus; dorsal setae 27 - 32 in number Leptotrombidium pumilis
23. - Scutum consistently broad, PW about 90 microns; dorsal setae long about 70 microns; dorsal setal formula 2-8-6-6-6-4-2 Leptotrombidium zeta
- Scutum medium, PW about 80 microns; dorsal setae about 55 microns; dorsal setal formula 2-8-6-6-6-4-4 Leptotrombidium subintermedia
24. - Scutum less than twice as wide as long; palpal claw four pronged; dorsal setae 40 - 46 in number with arrangement 2-10-8-8-8-4-2 Leptotrombidium hiranumai
- Scutum more than twice as wide as long; palpal claw three pronged; dorsal setae 85 - 105 in number arranged irregularly Leptotrombidium halidasys
25. - Scutum entirely on the surface of dorsal integument. 26
- Scutum partially submerged beneath dorsal integument on posterior margin (Genus Neoschongastia) 30
26. - Base of anteromedian seta in advance of a line connecting bases of anterolateral setae; mastitarsala III present. (Genus Ascoschongastia) 27
- Base of anteromedian seta not in advance of a line connecting bases of anterolateral setae; mastitarsala III absent 28

27. - Posterior margin of scutum evenly rounded; 1st posthumeral row of setae usually ten or more. Ascoschongastia kitajimai
- Posterior margin of scutum slightly sinuate; 1st posthumeral row of setae usually eight Ascoschongastia arcaricola
28. - Base of sensillae close together, less than 15 microns apart; two setae on coxa III (1-1-2). Helenicula miyagawai
- Base of sensillae not close together, more than 20 microns apart; one seta on coxa III (1-1-1) 29
29. - Cheliceral blades serrate ventrally; palpal tarsus with 4 branched setae; humeral setae two pairs; lateral tibial seta of palpus feathered. Cheladonta ikaoensis
- Cheliceral blades not serrate ventrally, with usual tricuspid cap; palpal tarsus with 6 or 7 branched setae; humeral setae one pair; lateral seta of palpus nude. Euschongastia koreaensis
30. - One pair of humeral setae; 1st posthumeral row of setae eight; one mastitarsala III Neoschongastia posekanyi
- Two pairs of humeral setae; 1st posthumeral row of setae 12 - 17; two to six mastitarsalae III Neoschongastia asakawai

KEY TO THE KOREAN SPECIES OF ANOPLURA

- 1. - Eyes present, large, convexed; leg III without a sclerotized process between tibia and tarsus; parasitic on man 2
- Eyes absent; leg III with a sclerotized process between the tibia and tarsus; parasitic on mammals but not on man.
 (HAEMATOPINIDAE) 3
- 2. - Body more or less elongate, not crab-like; 1st abdominal segment with one pair of spiracles; abdominal segment with out lateral lobes (PEDICULIDAE) Pediculus humanus
- Body broadly oval, crab-like; 1st abdominal segment with three pairs of spiracles; abdominal segments with lateral lobes.
 (PHTHIRIIDAE) Phthirus pubis
- 3. - 1st sternal plate of third abdominal segment with two groups of 2 enlarged, stout setae; 2nd abdominal segment with its sternal plate extended laterally to articulate with the corresponding paratergal plate (Genus Hoplopleura) 4
- 1st sternal plate of third abdominal segment without enlarged, stout setae; 2nd abdominal segment with its sternal plate not extended to articulate with the corresponding paratergal plate
 (Genus Polyplax) 6
- 4. - Paratergal plates of abdominal segment 7 with one acute posterior lobe Hoplopleura affinis
- Paratergal plates of abdominal segment 7 without an acute posterior lobe 5

5. - Paratergal plates of abdominal segments 4 to 6 with two posterior setae about as long as the depth of posteromedian emargination; paratergal plates of abdominal segment 6 with both posterior lobes acute or thorn-like. Hoplopleura acanthopus
- Paratergal plates of abdominal segments 4 to 6 with one minute seta and one seta about as long as the depth of posteromedian emargination; paratergal plates of abdominal segment 6 with a dorsal posterior lobe broadly truncate and a ventral posterior lobe acute. Hoplopleura oenomydis
6. - Paratergal plate of abdominal segment 4 with setae shorter than the length of the plate. Polyplax spinulosa
- Paratergal plate of abdominal segment 4 with one seta longer than the length of the plate. 7
7. - Paratergal plates of abdominal segment 5 with one seta longer than the length of the plate; spiracles noticeably enlarged Polyplax reclinata
- Paratergal plates of abdominal segment 5 with setae shorter than the length of the plate; spiracles not noticeably enlarged Polyplax serrata

ECHINOLAE LAPS ECHIDNINUS

Specimen Number	Host	Date	Locality	Grid Coord.	Elev.	Collector	Number of Parasites	Reference
00542	<u>Rattus rattus</u>	19 Nov 67	W of Sokcho, Kangwon-Do	DT6027	49m	5th FM Lab	1	
01104	<u>Rattus rattus</u>	11 Jan 68	N of Pusan, Kyongsang-Namdo	EP0698	102m	5th FM Lab	1	
01126	<u>Rattus rattus</u>	17 Jan 68	Near Mospo, Cheju-Do	BM4481	30m	5th FM Lab	8	
108	<u>Rattus rattus</u>	6 Nov 59	Hwa-young Ni, 57th Sig Co			37th Med Co	1	
37	<u>Rattus rattus</u>	27 Oct 59	Hq I Corps			37th Med Co	1	
	<u>Rattus rattus</u>	29 Oct 59	Hq I Corps, 2nd Battle Gp			37th Med Co	7	
	<u>Rattus rattus</u>	1 Dec 59	Tukdo Kungdong Ku, Kyonggi-Do			5th FM Lab	2	

