Identification of Vertebrate Hosts of Ectoparasites in Thailand

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OBJECTIVE: To provide proper scientific names for the wild vertebrates from which ectoparasites are collected or which are suspected of being reservoir hosts of disease.

DESCRIPTION: Vertebrates, especially those voucher hosts of ectoparasites, are prepared as study specimens and identified by comparisons with other specimens in museums. For the rodents and some of the birds this entails a taxonomic revision with examination of type specimens, further collecting, and study of their ecology, cytogenetics, and karyology.

PROGRESS: The checklist of rats and mice of Thailand, Table 1, has been changed because of finding four species of the niviventer–fulvescens group on Doi Inthanon and discovering that the lesser bandicoot of Thailand is not Bandicota bengalensis but a distinct species, B. savilei. Table 1 includes identifications of lice found on rats and mice. It will be seen that each subgenus of rats is characterized by two unique species of lice, one from Hoplopleura, the other from Polyplax. Additional collections of lice by Vandee and Marshall, now being studied, are all accompanied by voucher museum specimens of their hosts. They will fill most gaps on the table. Karyotypes are similarly diagnostic of the subgeneric groupings of rats and mice; the karyology study is now ready for publication. Taxonomic revision of the genus Mus exclusive of Africa is also ready for publication, with results shown in the accompanying key to Eurasian species. The six native species of Thai mice have now been colonized for cytogenetic study in 10 laboratories around the world.

SUMMARY: The number of species of rats and mice occurring in Thailand is now understood to be 36 of which 11 are commensal with man and one is non-native (R. norvegicus). Progress in the taxonomic revision of these rodents, in order to provide scientific names, has involved karyology, cytogenetics, host-specific ectoparasites, ecology, and anatomical study of the skull.

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Table 1.

Check–list of Rats and Mice of Thailand, Status of Louse Identifications (from Dr. K.C. Emerson) and Back–up Specimens of Hosts Actually Preserved in Museums

underline = museum skin and skull identified by Marshall
"....." = museum skin and skull, from the literature

	Hoplopleura	Polyplax
Bandicoots		
Bandicota indica	malabarica "skins in USNM"	asiatica
B. savilei curtata	malabarica "skins in USNM", V184	asiatica "Elbel F875"
Subgenus Berylmys		
Rattus berdmorei	kitti "skins in USNM from Aranya Pradet"	spinulosa
R. bowersi	diaphora JTM 6780	
R. mackenziei		
Subgenus Stenomys		
R. mulleri	dissicula	
Subgenus Rattus		
R. remotus	pacifica	
R. rattus thai (north and central Thailand)	pacifica "skins in USNM"	spinulosa "skins in USNM are Elbel F935, F949 RE1333, RE1723, RE1725, RE1781, RE464, RE465
R. rattus robinsoni (Koh Samui)	pacifica	
R. r.? jalorensis	pacifica	spinulosa
R. r.? diardii		
R. sladeni		
R. nitidus		
R. exulans	pacifica	spinulosa
R. losea exiguus		
R. argentiventer	pacifica	
R. norvegicus	pacifica	spinulosa "skin in USNM, Elbel Y206"
Subgenus Leopoldamys		
Rattus edwardsi		close to insulsa JTM 6746, 6753

	Hoplopleura	Polyplax
R. sabanus	malaysiana	insulsa (spinulosa)
Subgenus of Rajah Rats		
R. surifer	pectinata USNM 86750	
R. rajah pellax		
R. whiteheadi	(pectinata)	
Subgenus of Niviventer Group		
Rattus rapit orbus		
R. fulvescens	sicata ASRCT 54–654, 54–727	
R. bukit	(pectinata) sicata USNM 355181 ASRCT 54–707, 54–722	
R. niviventer		pricei ASRCT 54–738
R. cremoriventer	(pectinata) sicata ASRCT 54–661	
R. langbianus		
Subgenus Leggadilla		
Mus shortridgei	nov. sp. JTM 6686, JTM 6741	
Subgenus Coelomys		
Mus pahari	nov. sp. JTM 6779	
Subgenus Mus		
Mus cookii		
Mus caroli	johnsonae JTM 6754, 6755b	
Mus cervicolor	johnsonae USNM 294944, 294946 JTM 6756 captiosa USNM 294944, 294946 294947; "RE 460" (Mus sp. ?)	
Mus musculus castaneus	captiosa	serrata
Genera of Tree–rats		
Chiromyscus chiropus		
Vandeleuria oleracea		
Chiropodomys gliroides		
Hapalomys longicaudatus		

KEY TO EURASIAN SPECIES OF THE GENUS MUS

GENUS MUS Length of first upper molar more than half the toothrow; postero—internal cusp of first molar absent; head and body about 100 mm; plantar pad round rather than long and pointed; prelambdoidal fenestra exposes a slender paraoccipital process at least in the young; anterolateral corner of parietal projects forward in a point.

KEY TO EURASIAN SUBGENERA OF THE GENUS MUS

1 Supraorbital ridge present, eye and ear large (rat—like adaptation) . . . . . Subgenus Leggadilla
1' No supraorbital ridge 2
2 Interorbitum broader than 4 mm, incisive foramina broad and short, fur velvety or spiny, eye small (shrew—like adaptation). Subgenus Coelomys
2' Interorbitum narrower than 4 mm, incisive foramina slender and long, fur not spiny, eye large (commensal adaptation) . . . . . Subgenus Mus

KEY TO SPECIES OF THE SUBGENUS LEGGADILLA

1 The only southeast Asian species, fur spiny, dorsal color light gray—brown, ventral fur white with conspicuously gray bases, anterior border of zygomatic plate swept back in convex arc, incisive foramina penetrating deep between the first molars, molars broad lacking accessory cusp, upper incisors notched, mammae 3+2, grass beneath deciduous forest in Burma, Thailand, Cambodia . . . . . Mus shortridgei
1' Indian species, ventral fur white including the bases 2
2 Mammae 4+2, anterior border of zygomatic plate arched forward in a convex semicircle, incisive foramina long, functional anterior accessory cusp on first upper molar, medium size, skull averaging 25 mm, notch shallow to none . . . . . Mus saxicola (There are two subspecies: M. s. gurkha with soft fur, dorsal surface light sandy brown, Simla, Nahan, Kumaon, Nepal; and M. s. saxicola with dorsal fur spiny and grayish brown, Sind, Kangra, Cutch, Poona, Madras).
2' Mammae 3+2, anterior border of zygomatic plate approximately vertical or curved back, incisive foramina reaching only to level of anterior cusp of first molar (exception: see no. 4, below) no accessory cusp, fur spiny above and below 3
3 Large size, skull 26—30 mm averaging 27, no notch on upper incisors, black spot on hind foot, Punjab? (type of spinulosus not seen), Kumaon, Bihar, Poona, Deccan, Kanara, Coorg. Mus platythrix (There is subspecific variation in color. Sooty brown in the north, purplish brown with ochraceous flanks in Coorg).
3' Smaller size, skull 21—25 mm averaging 22.6, notch of incisors variable, purplish brown with ochraceous flanks/white, Central Provinces, Bellary, Madras, Ceylon . . Mus phillipsi (The distinctive subspecies, M. p. fernandoni, with foreshortened skull, occupies Ceylon).
4 Same as 3' but with long incisive foramina and no notch, Rajputana, Gujerat, Central Provinces . . . . . Mus sp?

KEY TO SPECIES OF THE SUBGENUS COELOMYS

1 Pelage spiny or stiff, not wooly, ear small 2
1' Pelage dense, wooly, velvety, ear large 3

2 Size large, skull length greater than 27 mm, Ceylon ..... Mus mayori

2' Size medium, skull length under 27 mm, Sikkim to Vietnam ..... Mus pahari (with three subspecies: jacksoniae, Assam and N. Burma to Yunnan and Szechuan; pahari, Sikkim, Darjeeling; gairdneri, mountains of northern Thailand, Laos, and Vietnam).

3 Skull long and slender as in mayori and pahari, supraorbital area smoothly rounded 4

3' Skull short and broad with flattened top of rostrum like Mus musculus and sharp supraorbital angle like Mus cookii, mammae 1+2, coloration dark brown/ochraceous buff, Nilgiri Hills of southern India ..... Mus famulus

4 Coloration similar to that of M. famulus with dark feet and tail and pelage chocolate brown/bronzy buff, mammae 1+2, tail shorter than 105 mm, incisive foramina 5 mm or longer, mountains of Java ..... Mus vulcani

4' Coloration steely gray/silvery, feet white, tail longer than 110 mm, incisive foramina shorter than 5 mm, mammary formula unknown, mountains of Sumatra. Mus crociduroides

KEY TO SPECIES OF THE SUBGENUS MUS

1 Upper incisors curve forward and downward perpendicular to palate (pro—odont), narrow interpterygoid space, ventral color whitish, tail bicolored 2

1' Upper incisors markedly recurved (opisthodont) 3

2 Nasals very short, exposing to dorsal view the upper incisors, whose anterior surface is brown; incisive foramina intruding only slightly between anterior tips of first upper molars, posterior palatine foramina situated at rear of palatal bridge; tail blackish on top and longer than head and body; ricefields and grassy areas in Ryukyu Islands, Taiwan, southeastern China to Thailand, reappearing in Sumatra, Java, Madura and Flores ..... Mus caroli
(Well marked subspecies of Mus caroli include a long—furred, richly colored form on mountains of Vietnam, and lighter brownish—gray subspecies in Thailand of which that of the north has silvery gray underparts, that of central and southeast Thailand is almost pure white ventrally).

2' Nasals longer, overhanging the upper incisors, which are buff colored on anterior surface; bicolored tail paler gray on top than in caroli and shorter than head and body; feet always pure white; incisive foramen extending between anterior molars; posterior palatine foramina in middle of palatal bridge (as in all species except caroli); Nepal to Vietnam, reappearing in Java ..... Mus cervicolor
(There are three subspecies: M. c. cervicolor, small, weight averaging 15 g., brownish gray/white with pale gray bases, ricefields in Nepal, Burma, Vietnam, Thailand, Java. This commensal population surrounds the following two subspecies of larger size, averaging 22 g., and darker coloration, that live in natural forest. M. c. popaeus, brown/white with gray bases; grass beneath deciduous forest in Burma and Thailand. M. c. annamensis, deep brown/white with slate bases, ochraceous along flanks; mountains of Laos and Vietnam).

3. Length of upper molar row 4 mm or more, fur stiff and dense, ventral color whitish, incisive foramina terminating opposite anterior cusp of first molar as in M. caroli, broad interpterygoid space; grass in mountain forests of Assam, Burma Yunnan, Laos, northern Thailand, and Vietnam .... Mus cookii

3' Length of molar row less than 4 mm, fur soft 4

4 Rostrum shallow, its least depth only one—half of rostral length (measured from gnathion to inferior anterior corner of zygomatic plate), ventral fur whitish 5

4' Rostrum flat on top, deep (in side view), its least depth two thirds of rostrum length; rostrum short, cranium broad and flat on top; Eurasia ..... Mus musculus, with two groups of subspecies ... 7

5 Larger (a miniature of cookii), skull longer than 21 mm, tail averaging 77 mm at least as long as head plus body; vertical anterior border of broad, approximately square zygomatic plate; incisive foramina terminating opposite anterior cusp of first molar as in cookii: India (Poona), Nepal, Sikkim, Assam, Burma, Yunnan ..... Mus kakhyenensis (A dark, rich brown/buffy subspecies, M. k. palnica occurs in the mountains of southern India).

5' Smaller, skull less than 21 mm, tail less than 72 mm 6

6 An exact miniature of kakhyenensis with narrow, gracefully tapered and rounded skull; narrow delicate molars lacking bold division of cusps; tail averaging 63 mm, slightly less than head and body; skull length averaging 20 mm, incisive foramen rarely reaching level of antero–internal cusp of first molar; Poona, Madras, Ceylon . . . . . Mus fulvidiventris (with two subspecies: M. f. dunni, brownish–gray, Punjab and peninsular India. M. f. fulvidiventris of Ceylon, with richer rufous–brown dorsal coloration).

6' A miniature of molossinus (except for relatively shallower rostrum and relatively large teeth); skull, averaging 19 mm long, is broad–beamed, angular, robust; teeth large, squarish, broad, deeply sculptured with all cusps equally distinct, interpterygoid space very narrow; incisive foramina penetrating deeply between anterior molars; zygomatic plate broad, set out laterally from rostrum from which it is marked off beneath by a groove; its anterior border markedly arched forward in a semicircle, with robust masseteric knob at its base; tail averaging 51 mm, much shorter than head plus body; ricefields of Nepal, India, Burma . . . . . Mus booduga

7 Zygomatic plate slender, hugging close to rostrum, usually with straight vertical anterior border and slight masseteric knob; size medium to smallest; Eurasia except northeast and southeast Asia . . . . . BACTRIANUS Group of Subspecies:

(M. m. bactrianus and other desert forms; size medium; tail bicolored, shorter than head and body; fur long and silky, sandy buff–brown dorsally, with underparts and feet pure white; deserts of northern Africa, Mediterranian Region and Mid–East. M. m. homourus, size medium, tail as long as head and body, below white with gray bases and a peculiar singed brown color along the flanks; wild habitats in Ladak, Kashmir, Nepal, Sikkim. M. m. tantillus, like homourus except very small and tips of ventral fur either white or a salmon tint (like muralis); Szechuan, Shensi, northern Vietnam.

M. m. musculus, size medium, brownish gray/slate, tail longer than head and body; inside buildings of Europe, introduced to Americas, some Pacific islands, and Australia. Progenitor of large European laboratory strains.

M. poschiavinus. Dr. A. Gropp is accumulating evidence that this Swiss offshoot of M. m. musculus may be a distinct species. We have seen no specimens of it).

7' Zygomatic plate exactly as described for booduga (6'), size small, eastern Asia . . . . . MOLOSSINUS Group of Subspecies:

(M. m. wagneri and allies of northern Asian deserts, desert type silky pelage, coloration, and short tail as described above for bactrianus.)

M. m. molossinus, Japan (and allies such as yamashinai in Korea), dark gray/white with slate bases, short bicolored tail. Inhabits buildings and outdoors in Japan, where it is the only member of the genus. Progenitor of small Asian laboratory mouse.

M. m. castaneus, underparts concolorous with the back, which is dark ochraceous brown; tail longer than head and body; lives in buildings and warehouses in Ceylon, Calcutta, Kathmandu? (the type locality, but not collected there since Hodgson's specimens of 1845) Sikkim, Burma, Yunnan, Kweichow, Fukien, Taiwan, Pescadores, Vietnam, Thailand, Malaya, Singapore, Indonesia, Philippines, introduced into some Pacific islands where overlapping with musculus).