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The taxonomic status of *Rattus dammermani* Thomas and *Rattus toxi* Sody (Rodentia, Muridae) of Celebes

GUY G. MUSSER

ABSTRACT

Rattus dammermani Thomas, 1921 is known from southwestern Celebes. *Rattus toxi* Sody, 1941 is a subjective synonym of that taxon. Although the name *dammermani* has been listed in the literature as a subspecies of *R. rattus*, it is actually a valid species that is morphologically more closely related to *R. rattus* than to any other species of *Rattus* known from Celebes.

The present report is another in a series dealing with taxonomy of *Rattus* that occur on Celebes (Musser, 1969a, 1969b, 1970b, and 1971). Here I document the taxonomic relationships of *Rattus dammermani*, a taxon named and described by Oldfield Thomas in 1921, and *R. toxi*, proposed by H. J. V. Sody in 1941. Both taxa represent the same species, a species known by only four specimens from two localities in southwestern Celebes. Among the forms of *Rattus* known to occur on Celebes, *R. dammermani* is morphologically most closely related to the house rat, *R. rattus*.

ABBREVIATIONS AND METHODS

The specimens discussed in this report are in the collections of the American Museum of Natural History in New York (AMNH), the British Museum (Natural History) in London (BM), the Rijksmuseum van Natuurlijke Historie in Leiden (RMNH), and the Zoological Museum of the University of Amsterdam (ZMA).

Measurements of length of head and body and length of tail of study skins were taken by the collectors and are from labels attached to the skins. I measured the length of hind foot of all dry skins, as well as all external dimensions of the two specimens of *R. dammermani* that are preserved in alcohol in the Zoological Museum of the University of Amsterdam. Cranial measurements were taken with dial calipers graduated to tenths of millimeters. Limits

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of most of these measurements are explained elsewhere (Musser, 1970a). I measured the greatest length and the greatest breadth of each tooth with the calipers under a dissecting microscope.

Latitudes and longitudes for some localities mentioned in this report were taken from a gazetteer of Celebes issued by the Hydrographic Office of the United States Navy Department (1944).

The association of *R. dammermani* with *R. toxi*

Oldfield Thomas named and described *Rattus dammermani* in 1921 (: 247) and twenty years later H. J. V. Sody named and described *R. toxi* (1941: 309). Each taxon was based upon one specimen. Thomas indicated that his specimen came from „Wadjo, N. Celebes, at the N.W. corner of the Gulf of Tomini" and Sody's holotype was obtained from „Wadjo, S. W. Peninsula of Celebes." The taxonomic relationships of the two forms have been unclear since the name of each was first proposed. In 1936 (: 524), George H. H. Tate listed *R. dammermani* as a species in the „*Rattus rattus* Group" and the taxon was later listed by John R. Ellerman in his classification of the genus *Rattus,* published in 1941, as a valid species within the „*rattus* Group" of the subgenus *Rattus* (: 182). In that same volume he noted that W. J. C. Frost had obtained three specimens from Celebes in 1938 that could be identified as *R. dammermani.* In 1949, however, Ellerman listed the name *dammermani* as a subspecies of *R. rattus* (: 61). In their list of the land mammals of New Guinea, Celebes, and adjacent areas, Laurie & Hill (1954) followed Ellerman and treated *dammermani* as a subspecies of *R. rattus.* In 1967, however, Schwarz & Schwarz, in their monograph on the *Rattus rattus* group (: 120), considered the name *dammermani* to be a synonym of „*Rattus rattus norvegicus,*" although they did not state their reasons for this allocation.

From the time that the original description of *Rattus toxi* was published in 1941, no other specimens have been allocated to that taxon, either in the published literature or in collections of museums I have worked in. Its taxonomic status has remained unclear and Laurie & Hill (1954: 121) listed the name as *Incertae sedis.*

In the fall and winter of 1969 I worked in the British Museum (Natural History), where I studied the holotype of *R. dammermani,* in the Rijksmuseum van Natuurlijke Historie, where the holotype of *R. toxi* is stored, and in the Zoological Museum of the University of Amsterdam, where I found two other specimens of *R. dammermani.* The names *dammermani* and *toxi* represent the same taxon, and that taxon is a valid species of *Rattus* that is now known only from southwestern Celebes. Evidence for this statement is documented below.

In his original description, Thomas described *R. dammermani* as „Size about as large as in *R. mülleri.* Fur exceedingly poor, harsh, and thin, with hardly any underfur, the chief part of the pelage formed by the numerous narrow spinous hairs. General color above rufous-brown, the spiny hairs whitish at base, with dark brown tips. Under surface dull whitish, fairly

sharply defined, the hairs light to their bases; middle line of chest faintly darker. Limbs more reddish brown, hands and feet whitish. Tail long, short-haired, uniformly brown. Mammae 3—3 = 12." Thomas went on to describe the skull as „strongly built, elongate, with long narrow nasals, strongly developed supraorbital ridges, which sweep evenly round to the outer corners of the interparietal without forming any postorbital process or angle. Zygomatic plate strongly convex. Palatal foramina long, reaching past the level of the front root of m^1. Bullae fairly large. Incisors orthodont. Molars proportionally small." Thomas also commented that „This fine species, which I have named in honour of Dr. Dammerman of Buitenzorg, is readily distinguishable by its thin harsh fur, very different from that of *R. mülleri*, its reddish-brown color, and long narrow skull. Its alliance would seem to be with the *rattus-neglectus* group, judging by its 3 — 3 = 12 mammae, but it does not seem very closely related to any described form."

Sody's description of *R. toxi* (1941: 309) is short and vague: „The specimen is much discolored, but, apart from that, I cannot identify it with any of the known Celebes species. Back thinly but rather long haired. Fur consisting of woolly hairs, many long, not very hard spines and, especially on the hind parts of the back, a number of long bristles (up to 38 mm). Certainly the rather uniform rufous buff colour of the upper side is not the orginal one. Belly white, not sharply defined at the sides. Tail dark, with about 9 rings to the cm. Mammae: 2 + 3 = 10." Sody listed some external and cranial measurements of the holotype and stated that „The skull somewhat resembles that of *R. norvegicus*, but has the supraorbital ridges wider apart and not so parallel, different position and form of bullae, incisors more opisthodont."

The holotypes of *R. dammermani* (BM 21.2.9.7.) and *R. toxi* (RMNH 9802) are in good condition and each consists of a study skin and complete skull. Rolled up within the skull of each specimen is a slip of paper with the notation, "Ep. celebensis," an identification that was apparently made when the specimens first arrived at Buitenzorg. Both specimens are adult females and are approximately the same age and size (Table I). They are indistinguishable from one another in color and texture of pelage and they are closely similar in configuration of skulls. Both have ten large and conspicuous mammae — one pectoral pair, one axillary pair, one abdominal pair, and two inguinal pairs. Thomas was incorrect in stating that the holotype of *R. dammermani* had 12 mammae. Both specimens were apparently preserved originally in alcohol and skinned later. The reddish brown tone of the upper parts of head and body mentioned by both Thomas and Sody is an alteration of the original color and is common in old specimens that were initially preserved in fluid. Morphological differences between the two holotypes are slight and represent individual variation, not interspecific variation; both, in fact, could have been part of the same litter. *Rattus toxi* Sody, 1941, is clearly a subjective synonym of *R. dammermani* Thomas, 1921.

Table I. External and cranial measurements (in mm) of adults of *Rattus dammermani* and *R. rattus* from Celebes.

	R. dammermani				*R. rattus*							
	Wadjo		Tempe		Boetoeng Island Southern Celebes[a]				Boemboelan and Mapangat Northern Celebes[b]			
	BM 21.2.9.7 (Holotype)	RMNH 9802 (Holotype of *R. toxi*)	ZMA 12.458	ZMA 12.713								
Sex	Female	Female	Male	Female	Combined				Combined			
Length of head and body	210	220	—	205	184.3	(162—217)	11[c]		197.6	(167—221)	27	
Length of tail	246	222	208	217	195.1	(170—220)	10		196.4	(170—240)	26	
Length of hind foot	45	46	47	45	37.2	(35—40)	11		37.6	(35—42)	27	
Length of ear	18	19	22	23	21.3	(18—23)	11		22.0	(20—24)	27	
Greatest length of skull	50.0	49.8	48.4	47.2	44.9	(40.5—48.3)	11		42.8	(39.6—45.5)	26	
Zygomatic breadth	24.7	22.5	23.3	22.9	21.2	(19.0—23.1)	11		19.9	(17.9—23.0)	26	
Interorbital breadth	7.2	6.6	—	6.2	6.4	(5.8—7.4)	11		6.2	(5.6—7.0)	27	
Length of nasals	19.5	19.0	17.6	17.7	16.8	(15.1—18.3)	11		15.9	(14.0—17.1)	25	
Length of rostrum	16.5	15.8	15.1	14.8	13.8	(12.4—15.2)	11		13.3	(11.9—14.7)	26	
Breadth of rostrum	9.4	8.6	8.5	8.2	7.8	(6.6—8.8)	11		7.5	(6.7—9.0)	26	
Breadth of braincase	18.0	—	17.9	16.3	16.5	(15.3—17.2)	11		16.0	(14.7—17.9)	27	
Height of braincase	13.1	12.7	11.3	11.9	11.9	(10.7—12.9)	11		11.5	(10.8—12.9)	27	
Breadth across incisor tips	3.3	3.3	2.8	2.8	2.4	(2.0—2.7)	11		2.4	(2.0—3.0)	26	
Breadth of zygomatic plate	6.4	6.0	5.9	4.7	5.2	(4.2—6.1)	11		4.7	(3.6—5.6)	27	
Length of diastema	13.7	13.1	12.6	11.9	12.4	(11.1—13.4)	11		11.8	(10.3—13.8)	27	
Palatilar length	24.0	24.1	23.0	22.1	21.8	(19.7—23.5)	11		20.8	(19.1—22.1)	27	
Palatal length	27.3	27.2	26.3	25.2	24.6	(22.1—26.2)	11		23.7	(21.8—25.3)	27	
Length of palatal foramina	9.1	8.9	9.4	8.7	8.6	(7.8—9.5)	11		8.0	(7.1—8.9)	27	
Breadth of palatal foramina	3.6	3.4	2.9	2.6	3.3	(2.9—3.7)	11		2.7	(2.2—3.5)	27	
Length of palatal bridge	9.9	10.0	9.7	9.8	9.1	(8.2—9.9)	11		8.6	(8.1—9.6)	27	
Breadth of palatal bridge at M^1	4.6	4.8	4.5	3.7	4.4	(3.8—5.0)	11		4.1	(3.4—5.5)	27	
Breadth of mesopterygoid fossa	3.3	3.1	3.3	3.3	2.9	(2.7—3.1)	11		2.6	(2.2—3.1)	27	
Length of bulla	8.4	7.9	8.0	8.2	7.6	(6.9—8.3)	10		7.1	(6.5—8.1)	27	
Alveolar length of M^{1-3}	8.7	8.4	8.4	8.4	7.5	(6.9—8.3)	11		7.1	(6.5—7.8)	27	
Length of M^1	3.8	3.7	3.8	3.9	3.3	(3.0—3.5)	11		3.2	(2.9—3.5)	25	
Breadth of M^1	2.5	2.2	2.2	2.3	2.0	(2.0—2.1)	11		1.9	(1.8—2.1)	25	

[a] RMNH 21167, 21169—21173, 21175—21179.
[b] Boemboelan: AMNH 152944, 152950—152956, 152959, 152960, 152984—152986, 152988, 152989, 152992, 152995—153004. Mapangat: RMNH 9816.
[c] Mean, extremes (in parentheses), size of sample.

Morphological relationships of *Rattus dammermani*

Rattus dammermani is known by four specimens: the two holotypes from Wadjo and two specimens that are in the Zoological Museum of the University of Amsterdam. The latter were collected in 1888 by Max Weber from Tempe (4° 08′ S., 120° 02′ E.), a village in the district of Wadjo in the southwest peninsula of Celebes. Weber (1890) indicated that he worked in Tempe during the period from October 15 to 21. Both specimens were originally preserved in alcohol and were identified by Jentink (1890: 119) as "*Mus decumanus*," a name applied at that time to what is now called *R. norvegicus*, the Norway rat. The two specimens are adults. The male (original number 341) is registered in the Zoological Museum of the University of Amsterdam as 12.658 and the female (original number 342) is registered as 12.713. Through the courtesy of Drs. Peter J. H. van Bree, I was able to borrow the specimens and extract and clean their skulls.

The name *dammermani* is apparently the oldest name that can be applied to the distinctive population of rat represented by these four specimens. *Rattus dammermani* is morphologically closely related to taxa that Ellerman (1949) placed in the "*rattus* Group," a conclusion reached earlier by Thomas (1921); the species is not closely related to *R. norvegicus* as implied by Schwarz & Schwarz (1967). Among the forms in the "*rattus* Group" that occur on Celebes, the specimens of *R. dammermani* require comparison only with samples of house rats, *R. rattus*. Six scientific names apply to samples of house rats from Celebes. The names *palelae* Miller & Hollister (1921: 69) and *argyraceus* Sody (1941: 275) apply to samples from the mainland of northern and middle Celebes; *lalolis* Tate & Archbold (1935: 2) and *makassarius* Sody (1941: 266) apply to samples from southern Celebes; *sapoensis* Sody (1941: 306) applies to samples from the Togian Islands; and *pelengensis* Sody (1941: 267) applies to samples from Peleng Island. I have examined holotypes of all six taxa and studied over 100 specimens of *R. rattus* from the mainland of Celebes and offshore islands. I will document the taxonomic status of these names in a paper now in preparation. For purposes of the present report I need only to point out that external and cranial dimensions of series from northern Celebes average slightly smaller than those from southern Celebes, as Sody (1941) noted. In Table I external and cranial measurements of *R. dammermani* are contrasted with a series of *R. rattus* from northern Celebes and a smaller series of that species from southern Celebes. Crania of the two examples of *R. dammermani* from Tempe are compared with the skull of a specimen of *R. rattus* in figures 1 and 2.

The four specimens of *R. dammermani* are superficially similar to samples of house rats in overall external features, but the two species differ conspicuously in actual and relative lengths of tail and hind feet, and in length and texture of pelage covering upper parts of head and body. Tails of *R. dammermani* average absolutely longer and are much longer relative to length of head and body than in specimens of *R. rattus*. The hind feet of *R. dammermani* are longer and more robust than in any specimen of house rat I have

examined from Celebes and there is no overlap in measurements of length of hind foot between samples of the two species. Furthermore, the hind foot is not only actually longer in *R. dammermani*, but it is longer relative to length of head and body than in *R. rattus*. The pelage of *R. dammermani* is thinner, harsher, and the guard hairs are longer than in specimens of *R. rattus*. A larger percentage of the overhair of *R. dammermani* consists of spine-like hairs and the long guard hairs extend to 45 millimeters in length. The pelage of *R. rattus* is softer, denser, and the guard hairs rarely reach beyond 25 millimeters in length. Because the pelage of the four specimens of *R. dammermani* is discolored I cannot evaluate differences in color between samples of the two species.

Crania of *R. dammermani* are similar to those of *R. rattus* in overall configuration and in most proportions. Cranial dimensions of *R. dammermani* average larger than comparable dimensions of skulls of *R. rattus* but the range of variation for each measurement overlaps. The most conspicuous differences

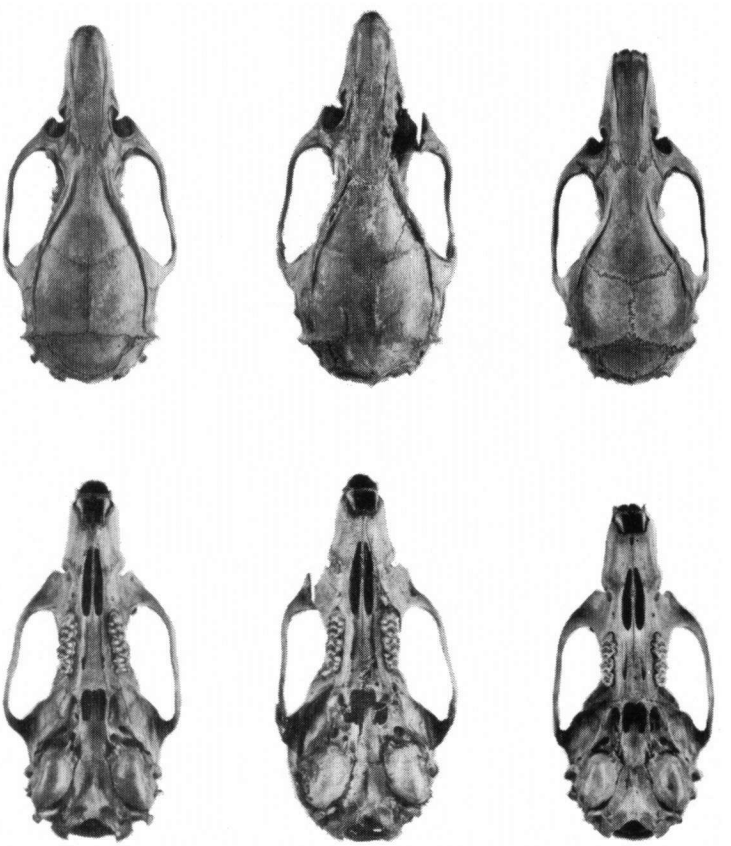

FIG. 1. Dorsal (top) and ventral (bottom) views of crania. From left to right: *Rattus dammermani*, ZMA 12.713 and 12.658, Tempe, southwestern Celebes; and *R. rattus*, AMNH 152996, Boemboelan, northern Celebes. All natural size.

between the two species are in shape of the braincase, width of zygomatic plate, size of bullae, and size of teeth. In *R. dammermani*, the ridges bounding the dorsolateral margins of the frontal bones over the interorbital region and the dorsolateral edges of the parietals over the braincase are higher, more robust, and displaced more laterally than in *R. rattus*. From the interorbital area, the ridges flow backwards to the occipital region in a smooth and graceful vase-shaped curve in skulls of *R. dammermani*. In *R. rattus*, the ridges over the frontals in the interorbital region meet those bounding the parietals at a conspicuous obtuse angle. The zygomatic plate of *R. dammermani* averages wider and is more robust than in skulls of *R. rattus*, and the tympanic bullae are longer, deeper, and appear to be more inflated. In *R. dammermani*

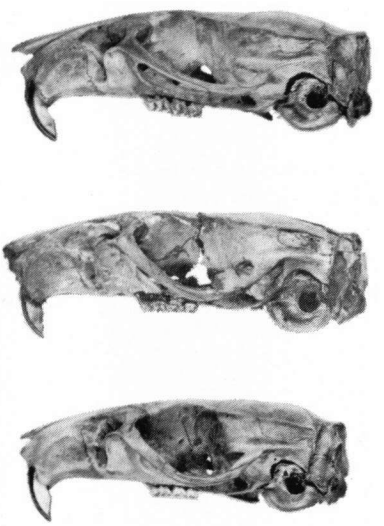

FIG. 2. Lateral views of crania of the specimens in figure 1. From top to bottom: *R. dammermani*, ZMA 12.713 and 12.658; and *R. rattus*, AMNH 152996. All natural size.

the maxillary toothrow is longer — there is no overlap between the two samples — and the individual teeth, particularly the first upper molars, are larger than any specimen of *R. rattus* that I have measured.

Probably because of their large size, specimens of *R. dammermani* have been confused with examples of *R. norvegicus*. The two species are easily distinguished in most external and cranial features. For example, pelage of the upper parts of *R. norvegicus* is dense, short, and soft, a marked contrast to the long, thin, and harsh pelage of *R. dammermani*. External dimensions of adults of *R. norvegicus* of comparable age are larger, except length of the tail, which is shorter than tails of *R. dammermani*, and much shorter than length of head and body. This is a characteristic feature of *R. norvegicus*, a trait that is unlike the long tail of *R. dammermani*, a tail that is longer than the head and body. The skulls of *R. norvegicus* are larger and more robust,

the ridges that bound the braincase form a definite rectangle as illustrated by Schwarz & Schwarz (1967: 122), and are conspicuously unlike the graceful vase-shaped configuration of the ridges in *R. dammermani*. Finally, in the first upper molars of *R. norvegicus*, the outer cusp of the first row is either absent or represented by a slight bump, a dental feature that separates every specimen of *R. norvegicus* I have examined from those of *R. rattus*. This cusp is well developed and conspicuous in both *R. dammermani* and *R. rattus*.

Rattus dammermani is known only from four adult specimens. Ellerman (1941: 219) identified three specimens as *R. dammermani* that had been obtained by W. J. C. Frost and deposited in the British Museum. The specimens were collected in 1938 from Tamalanti, middle Celebes. When I was working in the British Museum I could locate only two of these specimens; the skin and skull of one (BM 40.602) and the skull of anothor (BM 40.601). External and cranial features of both specimens are characteristic of *R. rattus* and not of *R. dammermani*.

The habitat of *R. dammermani* is poorly known. All four specimens were taken at localities in tropical flatlands below 100 meters in elevation. Weber (1890) indicated that the area around Tempe was unforested, but provided no other information about the site where the two rats were collected.

The type locality of *R. dammermani* requires restriction. I suspect that the holotypes of both *R. dammermani* and *R. toxi* were obtained from the same locality. The label attached to the skin of the holotype of *R. toxi* indicates that it was obtained from "Wadjo, S. W. Peninsula of Celebes" on April 12, 1915 by the Dutch "Controleur". Data on the label attached to the skin of the holotype of *R. dammermani* indicates only that the specimen was collected from "Wadjo, Celebes" also on April 12, 1915 by the "Controleur." There is no indication on the label of either specimen that it came from the northwest corner of the Gulf of Tomini in northern Celebes, and I do not know where Oldfield Thomas got that information. In the gazetteers available to me I have located four villages that are called Wadjo. All are in southern Celebes. Two (5° 17′S., 122° 31′E. and 5° 29′S., 122° 51′E.) are on the island of Boetoeng (also spelled Butung) off the coast of the southeast peninsula of Celebes, one (4° 03′S., 120° 09′E.) is in the district of Wadjo in the northern part of the southwestern peninsula of Celebes, and one (5° 07′S., 119° 24′E.) is in the district of Makassar, near the large seaport city of Makassar.

I suggest that the type locality of both *R. dammermani* and *R. toxi* be fixed at the village of Wadjo (4° 03′S., 120°09′E.) in the district of Wadjo in the northern part of the southwestern peninsula of Celebes. I have no data that explicitly indicates this is the actual site of collection, only the information that (1) the southwestern peninsula of Celebes was collected more intensively in the late 1800's and early 1900's than was southeastern Celebes and Boetoeng Island, and (2) the only other specimens that can be identified as *R. dammermani* were collected in the same general region in the district of Wadjo. Of the several hundred specimens of murid rodents that I have studied from Celebes, only the two specimens from Tempe and the two from Wadjo can be identified as *R. dammermani*. I suspect that both holotypes were collected at the

same place and on the same day, then given to the museum at Buitenzorg where they were originally identified as "Ep. celebensis." One specimen was subsequently sent to Thomas in London, and he described it as *R. dammermani*. The other specimen was studied by Sody when he was working at Buitenzorg. Apparently Sody was unware of the nature of the specimen which Thomas examined.

Discussion

I have compared *R. dammermani* most closely with *R. rattus* because most workers have considered the name *dammermani* to be valid as a subspecies of *R. rattus*, and because *R. dammermani* morphologically resembles house rats more than any of the other species of *Rattus* which are known to occur on Celebes. When the genus *Rattus* is taxonomically revised, however, the morphological affinities of *R. dammermani* may be found to be closer to species that occur outside of Celebes and not to house rats of that region.

There is an assemblage of taxa now included in recent checklists (for example, Chasen, 1940, and Ellerman, 1949) as subspecies of *R. rattus* that actually do not belong with that species, but instead represent populations that are reproductively isolated from house rats. Populations of these rats occur on islands near continental and subcontinental land masses in the Indo-Australian region. The taxa involved are: *germaini*, from the Condor islands off the southern coast of South Vietnam; *rogersi*, from the South Andaman islands; *remotus*, from Pennan and Samui islands off the coast of northeastern Malayan peninsula; and six taxa known from islands off the west coast of Sumatra: *simalurensis* from Simalur and Siumat islands, *babi* from Babi Island, *lasiae* from Lasia Island, *mentawi* from Sipora and Siberut islands, *lugens* from the Pagi Islands, and *adustus* from Enggano Island. Sody (1941) had already separated some of these taxa from the house rats and included them in this "LUGENS-SECTION." Both Joe T. Marhall, Jr. (personal communication) and myself independently have studied holotypes and large series of most of these taxa and have concluded that they form a tight morphological group of populations that are more closely related to one another than to house rats. Some populations, in fact, are sympatric with house rats. For example, in the American Museum of Natural History there are series of both *R. lugens* and *R. rattus* from the same locality in North Pagi Island. The biological relationships between the island populations represented by these nine taxa still need to be worked out, but our preliminary research has indicated that several species may be represented, and that none are subspecies of *R. rattus* as some of them are now listed in the literature.

The four specimens of *R. dammermani* share many features with samples of the nine island taxa: large size of external dimensions, long tails, harsh pelage, and configurations and proportions of the skull and dentition, for example. When these taxa are taxonomically revised, *R. dammermani* may prove to be more closely related to them than to house rats.

Whether *R. dammermani* is morphologically, and possibly phyletically,

more closely related to this assemblage of island populations, or whether it is actually more closely related to populations of house rats that occur on Celebes can only be determined after a thorough taxonomic revision of the genus *Rattus*, and only after more specimens of *R. dammermani* become available so the range of variation due to sex, age, and geography in that species can be determined. The only four specimens that I have been able to identify as *R. dammermani* are adults. Judged by their size and wear of teeth, none of them are either old, senile animals, nor are they young adults. All were apparently sexually mature when they were captured, for the testes are descended and well developed, and the mammae are large and were functional. The four specimens are easily distinguished from adult specimens of house rats of comparable age.

This paper has dealt with allocations of two of the 60 or more names that have been applied to samples of murid rodents from Celebes. Because of the many scientific names, and because of the poor documentation regarding the correct identifications and allocations of the taxa they represent, systematists and zoogeographers are hampered in drawing realistic conclusions about the morphological, phyletic, and geographic relationships of the rodent fauna of Celebes. This paper is a contribution on the level of clearing the nomenclatorial debris that has to date hindered the construction of a solid and realistic foundation upon which taxonomy of *Rattus* and its allies in the Indo-Australian region can be based.

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LITERATURE

CHASEN, F. N.
1940 A handlist of Malaysian mammals (A systematic list of the mammals of the Malay Peninsula, Sumatra, Borneo and Java, including the adjacent small islands). — Bull. Raffles Mus., **15** : i—xx, 1—209, map.

ELLERMAN, J. R.
1941 The families and genera of living rodents, **II**; Family Muridae: i—xii, 1—690 (Trustees Brit. Mus., London).
1949 The families and genera of living rodents, **III**, pt I: i—v, 1—210 (Trustees Brit. Mus., London).

HYDROGRAPHIC OFFICE, UNITED STATES NAVY DEPARTMENT
1944 Gazetteer (No. 5) of Celebes (2nd ed.). — Hydrographic Office Pub. 885 : i—iv, 1—205, map.

JENTINK, F. A.
1890 Mammalia from the Malay archipelago, II. Rodentia, Insectivora, Chiroptera. In: M. Weber (Ed.), Zoologische Ergebnisse einer Reise in niederländisch Ost-Indien **I** : 115—130, 4 pls (Brill, Leiden).

LAURIE, E. M. O. & J. E. HILL
1954 List of land mammals of New Guinea, Celebes and adjacent islands, 1758—1952 : 1—175, 2 pls, map (Trustees Brit. Mus., London).

MILLER Jr., G. S. & N. HOLLISTER
1921 Descriptions of sixteen new murine rodents from Celebes. — Proc. Biol. Soc. Washington, **34** : 67—76.

MUSSER, G. G.
1969a Results of the Archbold Expeditions, No. 89. Notes on the taxonomic status of Rattus aspinatus Tate & Archbold and Mus callitrichus Jentink (Rodentia, Muridae). — Amer. Mus. Novitates, 2365 : 1—9.
1969b Results of the Archbold Expeditions, No. 92. Taxonomic notes on Rattus dollmani and Rattus hellwaldi (Rodentia, Muridae) of Celebes. — Amer. Mus. Novitates, 2386 : 1—24.
1970a Species-limits of Rattus brahma, a murid rodent of northeastern India and northern Burma. — Amer. Mus. Novitates, 2406 : 1—27.
1970b Results of the Archbold Expeditions, No. 93. Reidentification and reallocation of Mus callitrichus and allocations of Rattus maculipilis, R.m. jentinki, and R. microbullatus (Rodentia, Muridae). — Amer. Mus. Novitates, 2440 : 1—35.
1971 Results of the Archbold Expeditions, No. 94. The taxonomic status of Rattus tatei and R. frosti, two taxa of murid rodents known from middle Celebes. — Amer. Mus. Novitates, 2454 : 1—19.

SCHWARZ, E. & H. K. SCHWARZ
1967 A monograph of the Rattus rattus group. — Anal. Esc. Nac. Cienc. Biol. Mexico. **14** : 79—178, 5 maps.

SODY, H. J. V.
1941 On a collection of rats from the Indo-Malayan and Indo-Australian regions (with descriptions of 43 new genera, species and subspecies). — Treubia **18** : 255—325.

TATE, G. H. H.
1936 Results of the Archbold Expeditions, No. 13. Some Muridae of the Indo-Australian region. — Bull. Amer. Mus. Nat Hist., **72** : 501—728.

TATE, G. H. H. & R. ARCHBOLD
1935 Results of the Archbold Expeditions, No. 2. Twelve apparently new forms of Rattus from the Indo-Australian region. — Amer. Mus. Novitates, 802 : 1—10.

THOMAS, O.
1921 On a new genus and species of shrew, and some new Muridae from the East-Indian Archipelago. — Ann. Mag. Nat. Hist., (6) **18** : 241—250.
WEBER, M.
1890 Einleitung. In: M. Weber (Ed.), Zoologische Ergebnisse einer Reise in niederländisch Ost-Indien **1** : I—XII, 3 maps (Brill, Leiden).

Guy G. MUSSER,
Department of Mammalogy
The American Museum of Natural History
Central Park West at 79th Street
New York City, New York 10024 — U.S.A.

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