On a collection of bats and rats from the Kangean Islands, Indonesia (Mammalia: Chiroptera and Rodentia)

By W. Bergmans and P. J. H. van Bree

Institute of Taxonomic Zoology (Zoological Museum), University of Amsterdam

Receipt of Ms. 21. 2. 1986

Abstract

Studied and described is a recent collection of small mammals from the Kangean Islands. Ten bat species represent new records for the islands: *Rousettus amplexicaudatus, Nycteris javanica, Rhinolophus madurensis, Hipposideros bicolor, H. cervinus, H. cineraceus, H. diadema, H. larvatus, H. macrobullatus* and *Myotis adversus.* The series of *Nycteris javanica* is described as a new subspecies, *N. j. bastani. Rhinolophus borneensis parvus* is considered a synonym of *Rh. madurensis. Hipposideros bicolor macrobullatus* is raised to specific rank. Two species of rats are recorded: *Rattus argentiventer* and *R. rattus diardii.*

Introduction

In his recent survey of the literature on Indonesian mammals van der Zon (1979) mentions the following Chiroptera from Kangean Island (Fig. 1): *Pteropus alecto aterrimus* Matschie, 1899; *Cynopterus brachyotis insularum* Andersen, 1910; *Macroglossus minimus minimus* (Geoffroy, 1810); *Macroglossus sobrinus* (Andersen, 1911); *Megaderma spasma trifolium* Geoffroy, 1810; *Pipistrellus imbricatus* (Horsfield, 1824); *Kerivoula hardwickii* (Horsfield, 1824).

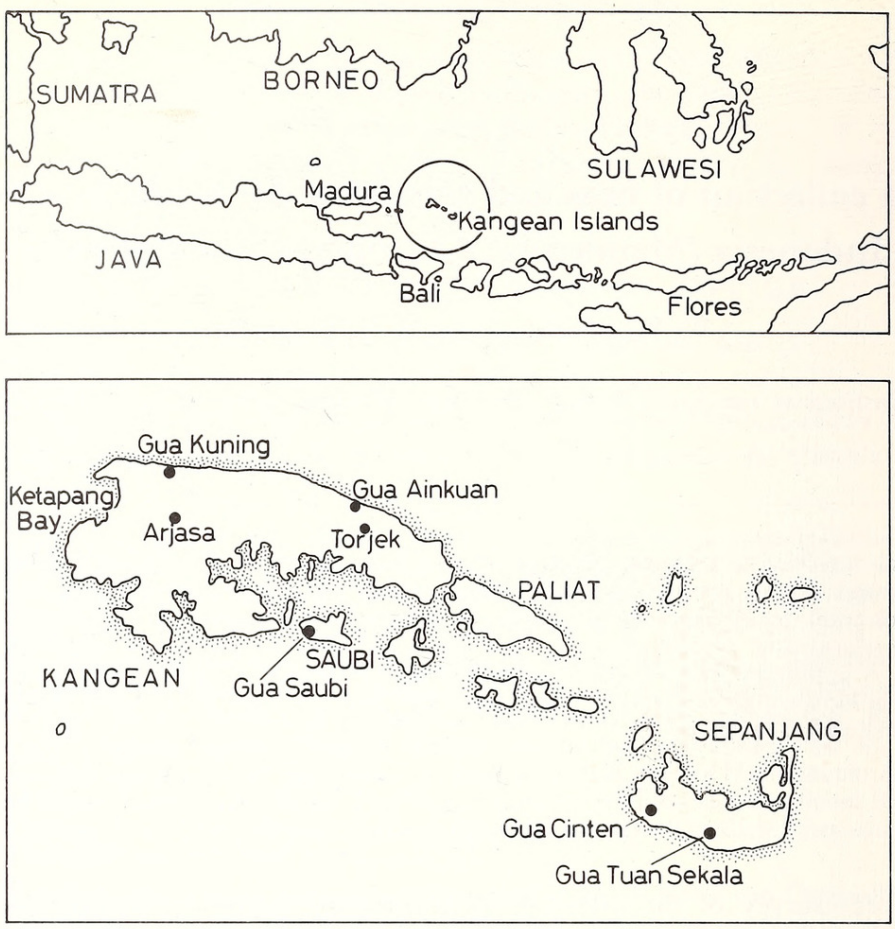
According to Dr. N. J. van Strien (in verbis, 4-IX-1985) the following species should be added to this list: *Rhinolophus affinis affinis* Horsfield, 1823. In the course of an investigation of the alleged occurrence of a large cat species on Kangean Island, Ir. H. H. de Iongh and Ir. B. E. van Helvoort visited the island in June 1982; they also made a short stop on the small island of Saubi.

They used this opportunity to study and collect some of the smaller mammal species too. As their first evidence for the cat's presence was both promising and insufficient, van Helvoort, working on Bali at the time, embarked on a second trip to Kangean in January 1984 upon receiving a message that a large cat had been caught and killed there. The cat appeared to represent *Panthera pardus* (L., 1758) and has been reported elsewhere (van Helvoort et al. 1985). During this second trip, van Helvoort again collected a number of small mammals, mainly Chiroptera, not only on Kangean but also on Sepanjang Island, the southeastern and second largest island of the Kangean archipelago (see Fig.).

Altogether 80 bats were collected, representing 13 species, ten of which apparently new records for the islands. The seven species collected on Sepanjang Island and the one from Saubi Island are the first bats ever reported from there. Apart from bats, ten rats were taken, representing two widespread species. The present paper contains a report on the taxonomy and zoogeography of the bats, and some notes on the rats and some other mammals which were observed on the islands. One old sample of bats from Kangean present in the Zoölogisch Museum in Amsterdam but never reported before has also been included.

U.S. Copyright Clearance Center Code Statement: 0044-3468/86/5106-0329 $ 02.50/0
Z. Säugetierkunde 51 (1986) 329–344

ISSN 0044-3468



The position of the Kangean Islands (above) and the position of the bat collecting localities on Kangean, Saubi and Sepanjang (below)

Material and methods

Part of the first collection, made by DE IONGH and VAN HELVOORT on Kangean in 1982, has been deposited directly in the Museum Zoologicum Bogoriense at Bogor, Indonesia (MZB). We owe the identifications of those specimens to BOEADI of that museum. The remainder of the 1982 collection was presented to the Zoölogisch Museum in Amsterdam (ZMA).

The second collection, made by VAN HELVOORT on Kangean and Sepanjang in 1984, was brought to Amsterdam first, and part of it was sent to the museum at Bogor after identification by the present authors.

Afterwards, some ZMA samples of leaf-nosed bats of the genus *Hipposideros* have been studied and re-identified by Dr. J. E. HILL of the British Museum (Natural History). In some cases, comparisons have been made with specimens in the Rijksmuseum van Natuurlijke Historie at Leiden (RMNH). The individual specimens are enumerated in the Taxonomic Section. Unless otherwise stated, specimens are adult and preserved in alcohol. Due to lack of technical assistance, only few skulls have been extracted. Collectors' names are as quoted in the Introduction and are not repeated in the Taxonomic Section. Measurements are all given in mm. Some used abbreviations are: FA = forearm length; E = ear length; GSL = greatest skull length; CBL = condylobasal length; C^1-M^2 or C^1-M^3 = upper tooth row length; M_3 = length of third lower molar.

Results

From the collectors' field notes and reports (DE IONGH et al. 1982; VAN HELVOORT 1984) the following pertains to the caves (gua = cave) they visited. Bats were usually collected with mistnets just outside the caves.

Kangean Island

Gua Ainkuan: A fairly wide and deep cave, at about 1.5 km west of Torjek village, at about 250 m from the north coast, northeast Kangean. Species collected: *Nycteris javanica, Rhinolophus madurensis, Rh. affinis, Hipposideros cineraceus, H. larvatus.*

Gua Beringin: This cave was visited by DE IONGH only. There are no precise notes on its position, but it is not far from Torjek village and at most a few km from Gua Ainkuan (there even being a small chance of the two caves being identical; depending on their village of origin, or even their generation, the local people may use different names for the same cave), northeast Kangean. Species collected: *Rhinolophus madurensis, Hipposideros larvatus, Hipposideros macrobullatus.*

Gua Kuning: At 3 km north of Arjasa, within hearing distance from the sea, northwest Kangean. Species collected: *Rousettus amplexicaudatus, Cynopterus brachyotis, Hipposideros larvatus, Myotis adversus.*

Saubi Island

Gua Saubi: At kampung Loanak, southwest Saubi. Species collected: *Rhinolophus madurensis.*

Sepanjang Island

Gua Cinten: Near Sepanjang Barat village, kampung Singareme, some 12 km west of Gua Tuan Sekala, southwest Sepanjang. Species collected: *Megaderma spasma, Rhinolophus affinis.*

Gua Tuan Sekala (= Gua Cabia): Near Tanjung Kiaok village, kampung Pelat, central south Sepanjang. Species collected: *Megaderma spasma, Rhinolophus madurensis, Hipposideros bicolor, Hipposideros cervinus, H. diadema, H. larvatus.*

Taxonomic Section

MEGACHIROPTERA – PTEROPODIDAE

Rousettus amplexicaudatus (Geoffroy, 1810)

Material: 1 ♀, immature, skull extracted, near Gua Kuning, Kangean, 12-VI-1982 (ZMA 21.821).

Remarks: The specimen was taken in a teak plantation. Some measurements are: FA 68.2, E 13.7, GSL 32.7, CBL 31.2, C^1-M^2 11.7 and M_3 1.3. The latter measurement indicates that this immature specimen represents *Rousettus amplexicaudatus* (see ROOKMAAKER and BERGMANS 1981). This appears to be the first record of this species from Kangean. Because of its immaturity, no subspecific allocation has been undertaken.

Cynopterus brachyotis insularum Andersen, 1910

Material: 1 ♂, 1 ♀, immatures, skull of ♀ extracted, near Gua Kuning, Kangean, 12-VI-1982 (MZB 13352; ZMA 21.872).

Remarks: Although the ZMA specimen is slightly immature, it already clearly represents the subspecies *insularum,* which is larger and has relatively longer arms and digits than the typical form.

Measurements: ZMA 21.872, FA 67.1, 3rd metacarpal length 44.7, E 16.6, GSL 29.5, CBL 28.5.

MICROCHIROPTERA – MEGADERMATIDAE

Megaderma spasma ? *celebensis* Shamel, 1940

Material: 1 ♂, Gua Tuan Sekala, Sepanjang, 23-I-1984 (ZMA 22.453); 4 ♂♂, 3 ♀♀, Gua Cinten, Sepanjang, 24-I-1984 (3 ♂♂, 2 ♀♀: ZMA 22.454-22.458; 1 ♂, 1 ♀: MZB 14247a–b).

Remarks: Forearm lengths in 4 adult ♂♂ are 53.0, 54.2, 55.3 and 55.5, and in 2 adult ♀♀ 54.6 and 56.7, respectively. SINHA (1977) recognizes only two subspecies of *Megaderma spasma*, and in his view the present specimens would represent the typical form. We feel, however, that the evidence presented by SINHA does not justify that conclusion. Specimens from Kangean have hitherto been referred to the subspecies *trifolium* Geoffroy, from Borneo, South Sumatra and Java (e.g. ANDERSEN 1918; HILL 1983); forearm lengths in 19 adult Javanese *trifolium* range from 54 to 59 (mean 56.6) (SODY 1936) and in 11 (adult?) specimens from southwestern Borneo and some small islands off its coast from 55.0 to 61.0 (LYON 1911). HILL (1983), who also makes mention of material from Java, does not consider the subspecies *pangandarana* Sody, 1936 from South Central Java. (From SINHA's paper referred to above it appears as if that author had no access to some relevant publications, among which the one by SODY). Forearm lengths in eight specimens of *pangandarana* range from 57 to 62 (mean 59.9) (SODY 1936).

In body dimensions, the Sepanjang specimens appear to be smaller than those from Java and agree better with *celebensis* Shamel, 1940 (see for measurements HILL 1983). Cranial dimensions in 3 specimens from Kangean in the British Museum (Natural History) agree with those of *trifolium* from Java (HILL 1983).

The specimen from Sepanjang with the longest forearm (♀, ZMA 22.455) has a condylocanine length of 21.3; again, this indicates leanings towards *celebensis* rather than Javanese *trifolium* as measured by HILL. Either Kangean and Sepanjang are inhabited by mutually different populations, or size variation within the Kangean Archipel is extremely great – which would obscure currently recognized subspecific distinctions.

Two ♀♀ were suckling young at the time of capture: specimen ZMA 22.455 had a ♀ young with a forearm length of 32.4, and the 2 specimens in the MZB collection are a ♀ with a ♂ young with a forearm of 30.1.

NYCTERIDAE

Nycteris javanica bastiani n. subsp.

Holotype: 1 ♀, Gua Ainkuan, Kangean, 19/21-I-1984, leg. B. E. VAN HELVOORT, field number 81 (MZB 14241a). Paratypes: 3 ♂♂, 6 ♀♀, Gua Ainkuan, Kangean, 19/21-I-1984, leg. B. E. VAN HELVOORT, field numbers 77, Y59 (MZB 14241a–b) and 43, 46, 48, 78, 79, 83, Y62 (ZMA 22.487–22.493).

Reference material (all in alcohol) of Javanese *Nycteris javanica javanica* Geoffroy, 1813 in the RMNH and ZMA collections: 4 ♂♂, 2 ♀♀, Weltevreden, Jakarta, XI-1911, leg. P. BUITENDIJK (RMNH 28147; 34051–34053; 34055–34056); 1 ♂, 2 juveniles, Jakarta, V-1907, leg. P. N. VAN KAMPEN (RMNH 28143); 1 ♀, Bogor, 1890, leg. J. F. VAN BEMMELEN (RMNH 28140); 8 ♂♂, 1 ♀, Bogor, V-1909, leg. H. W. VAN DER WEELE (RMNH 28148; 34025–34032); 1 ♂, Bogor, 24-XII-1981, leg. W. BERGMANS (ZMA 21.542); 1 ♀, Garut, 6-XI-1930, leg. W. C. VAN HEURN (RMNH 33042); 1 ♀, Semarang, V-1910, leg E. JACOBSON (RMNH 28144); 3 ♂♂, 2 ♀♀, Semarang, VIII-1910, leg. E. JACOBSON (RMNH 28145; 34021–34024); 1 ♂, 1 ♀, Semarang, VIII-1911, leg. E. JACOBSON (ZMA 19.218–19.219); 2 juvenile ♂♂, Surabaja, 31-V-1938 and 9-VI-1936, leg. W. C. VAN HEURN (RMNH 33041, 33043); 1 ♂, Java (ZMA 19.220). (Another RMNH alcoholic sample, 28146 and 34057–34086, collected by P. BUITENDIJK in X-1911 at Meester Cornelis, West Java, contains 19 ♂♂ and 12 ♀♀, but was not studied.)

Diagnosis: As for the species but distincly smaller in all dimensions and with a more or less contrasting rufous fur on back side and sides of head and around neck.

Description: The smallest representative of *Nycteris javanica,* with a distinct sexual dimorphism in size. Seven ♀♀ have forearm lengths of 43.8 to 46.7 (mean 45.1) and 3 ♂♂ of 43.3 to 44.3 (mean 44.0), respectively; greatest skull lengths in 3 ♀♀ are 19.2, 19.4 and 19.5, and in 1 ♂ 19.0. Apart from dimensional aspects, *bastiani* does not show morphological distinctions from *javanica.* In all specimens the upper incisors are essentially trifid; a certain degree of wear may obscure this character in older specimens. The form of the distal end of the tragus is quite variable, albeit within modest limits: the anterior side may be either straight, slightly concave, or – in one specimen – very slightly convex; the posterior side is slightly convex but in two specimens shows a weak S-curve; the distal side is about straight, in between a more or less acute angle with the anterior side and a round and broad 'angle' with the posterior side. The colour of the fur on back and belly appears to be somewhat lighter than in typical *javanica.* The most striking difference is found in the colour of the fur around the neck and on the back and sides of the head, which is clearly rufous in most specimens and only slightly less so in a few.

The new subspecies is the easternmost representative of the genus known so far.

Derivatio nominis: We dedicate this new subspecies to its first collector, BASTIAAN E. VAN HELVOORT.

Measurements: Table 1.

Table 1

Measurements of *Nycteris javanica bastiani* n. subsp. and of a specimen of *N. j. javanica* Geoffroy, 1813

Measurements of the MZB specimens have been taken by BOEADI

	Nycteris javanica bastiani				*N. j. javanica*
	MZB 14241a holotype ♀	MZB 14241b paratype ♀	ZMA 22.493 paratype ♀	MZB 14241c paratype ♂	ZMA 19.219 Semarang ♀
Forearm length	46.4	43.9	46.7	44.3	48.8
Greatest skull length	19.4	19.2	19.5	19.0	20.9
Condylobasal length	17.7	17.1	17.4	16.9	18.4
Rostrum length			5.7		6.6
Palatal length			4.4		5.1
Mandible length			13.3		14.4
Cranium width	8.5	8.3	8.5	7.8	9.2
Interorbital width			5.0		6.1
Zygomatic width	11.9	11.7	12.0	11.6	12.9
Measured over cingula:					
C^1–C^1 width			4.7		5.5
C^1–M^3 length	7.0	7.0	7.1	7.0	7.7
M^3–M^3 width			7.6		8.0
C_1–M_3 length			7.6		8.3

Remarks: *Nycteris javanica* is known from Tenasserim in Burma, Thailand, Malacca, Sumatra, Borneo, Java and Bali and/or Nusa Penida. (TATE 1941b, records it from "Nusa Penida, Bali", which possibly stands for "Nusa Penida near Bali".) An old record from Timor based on a purchased specimen (DOBSON 1878) has been doubted by various authors and pending further evidence we are inclined not to accept it. CARTER et al. (1946) mention Sulawesi as part of its range, which appears to be based on an error.

Few measurement ranges have been published. MEDWAY states it to be uncommon in Malaya "but widespread on the mainland". ANDERSEN (1912) makes mention of 26 adult typical *javanica* in the collection of the British Museum (Natural History) but gives no

body measurements. TATE (1941b) lists 61 specimens from three localities in the Archbold Collection in the American Museum of Natural History, without giving measurements.

The species *Nycteris tragata* (Andersen, 1912), described from Bidi Caves, Sarawak, and also recorded from the Malay Peninsula (ANDERSEN 1912), Sumatra (TATE 1941b), and Tenasserim (ELLERMAN and MORRISON-SCOTT 1951) has been distinguished on the basis of a differently shaped tragus and bigger skull and teeth. CHASEN (1940) lists it as a subspecies of *javanica,* and so do most authors after him. ELLERMAN and MORRISON-SCOTT (1955) do not agree; according to them, *tragata* would have bifid upper incisors instead of trifid as in *javanica,* and should therefore stand as a species. LEKAGUL and MCNEELY (1977) state that the upper incisors are variable in both *tragata* and *javanica,* and treat *tragata* as a subspecies with bigger teeth, longer palate, longer rostrum, and slightly lighter-coloured pelage than the nominate form.

From what little data have been published, the 'western' *tragata* seems distinctly larger than the 'central' *javanica*, which in its turn is again larger than the 'eastern' *bastiani.* TATE (1947) reports that in *tragata* the forearm is somewhat longer than in *javanica.* LEKAGUL and MCNEELY (1977) give as forearm length for presumably Thai specimens 50–51. MEDWAY (1978) gives 50–55 as the range of this length in 4 specimens from West Malaysia and Singapore. ANDERSEN (1912) does not mention the forearm length of his single type specimen of *tragata* (a "probably nearly full-grown" ♀) from Sarawak, and MEDWAY (1977) states the forearm length in specimens from Borneo to be "about 50". LYON (1911) mentions an (adult?) ♀ from southwest Borneo with a forearm of 47.0. ALLEN (1908) measured 8 specimens from Bogor on West Java and gives as forearm length range 47–49.5 (mean about 48.2); one of his largest specimens (49.5) was a ♀. Of the reference material from Java presently studied, 19 ♂♂ have forearm lengths of 45.2 to 48.7 (mean 47.0) and 9 ♀♀ of 45.6 to 49.1 (mean 47.6).

Not only do these measurements confirm that *tragata* is larger than *javanica* but they also indicate that at least in *javanica* ♀♀ have slightly longer forearms than ♂♂. This sexual dimorphism is quite apparent in the series of *bastiani.*

We do not have specimens of *tragata* at hand but suggest that its taxonomic status be re-investigated. The possible dimensional difference between the sexes would make it more distinct from *javanica,* which in combination with the differences as summed up by LEKAGUL and MCNEELY (1977) would possibly justify a reappraisal.

RHINOLOPHIDAE

Rhinolophus affinis Horsfield, 1824

Material: 1 ♀, Gua Ainkuan, Kangean, 19/21-I-1984 (ZMA 22.258); 8 ♂♂, ZMA 22.466 with skull extracted, Gua Cinten, Sepanjang, 24-I-1984 (MZB 14242a-b-c; ZMA 22.462–22.466).

Measurements: Table 2.

Remarks: ANDERSEN (1905) describes the geographic variation within this species, which in his concept ranges from the Himalayas to Lombok, as "the more southern or south-eastern the habitat, the longer the ears, the broader the horse-shoe, the longer the tibia, the larger the skull, the broader the nasal swellings and the longer the tooth-rows". He excluded the typical form from Java, of which he then could not give a definite diagnosis because of lack of material. In 1907, he describes additional material from Java as intermediate between *R. a. superans* Andersen, 1905 from the Malay Peninsula and Sumatra, and *R. a. princeps* Andersen, 1905 from Lombok.

With forearm lengths ranging from 47.2 to 49.6 (mean 48.3) in 8 ♂♂ and 47.9 in 1 ♀, and with a greatest skull length (to front of canines) of 22.0 in 1 ♂ (ZMA 22.466), it would appear that the present series averages smaller than any of the subspecies ANDERSEN recognized (with the possible exception of *R. a. tener* Andersen, 1905, from Pegu, north-

northeast of Rangoon, Burma); all these appeared to have forearms of 50 or more, and skulls of 21.9 or more. At the time, ANDERSEN had no specimens from Borneo. MEDWAY (1977) gives 50–51 as forearm length in Bornean specimens: these too may average larger than the present specimens. Unfortunately, the ZMA collection holds few specimens for comparison: 2 ♂♂, Karuni, West Sumba, VIII/IX-1932, leg. L. P. KRIJGER (ZMA 1571–1572); 1 ♀, skull extracted, Gua Cermin, West Flores, 10-III-1984, leg. B. E. VAN HELVOORT (ZMA 22.172). From their measurements in Table 2 it appears that specimens from the Lesser Sunda Islands, including the subspecies *princeps* from Lombok, are larger than those from the Kangean Islands. But in view of the very few measurements of Javanese (or Madurese) specimens known to us, we refrain for the present from attaching a subspecific name to the Kangean Islands populations. It is of interest to notice here that specimens from Thailand appear to be quite small too, with forearm lengths of 46–50 (LEKAGUL and MCNEELY 1977), while in the Malay Peninsula this measurement would range from 47 to 54 (HARRISON 1966; MEDWAY 1978).

Incidentally, the above mentioned specimen from Flores appears to be the first record of the species from that island.

Rhinolophus madurensis Andersen, 1918

Rhinolophus borneensis parvus Goodwin, 1979; fig. 2. New synonymy.

Material: 1 ♂, 1 specimen, Gua Beringin, Kangean, 16-VI-1982 (ZMA 21.828; MZB 13348); 1 ♂, 1 specimen, skull of ♂ extracted, Gua Saubi, Saubi, 18-VI-1982 (ZMA 21.829; MZB 13348); 1 ♂, 1 ♀, Gua Ainkuan, desa Torjek, Kangean, 19/21-I-1984 (MZB 14240; ZMA 22.459); 2 ♂♂, Gua Tuan Sekala, Sepanjang, 23-I-1984 (MZB 14240; ZMA 22.460).

Measurements: Table 2.

Remarks: Since ANDERSEN's description of this species, a short diagnosis based on a ♀ type specimen from Sumenep, East Madura (and presumably on one additional specimen, as ANDERSEN gives two values for each measurement), no further specimens seem to have been ascribed to it. The present specimens, both from Kangean and Sepanjang, fully agree with this diagnosis. They extend the known forearm length range of 38–39 (ANDERSEN 1918): 5 ♂♂ have forearm lengths of 37.8 to 40.8 (mean 40.1) and 1 ♀ one of 39.9.

HILL (1983) tentatively suggests that *madurensis* may be a subspecies of *Rhinolophus celebensis* Andersen, 1905 but at the same time observes that its very small size might justify its specific distinction from this. We certainly agree that the two taxa are closely related. The forearm length range in the present series of *madurensis* even narrows the dimension gap thought to exist between the two (37.8–40.8 in 6 specimens of *madurensis* against 39.7–44.2 in 19 of *celebensis;* see BERGMANS and ROZENDAAL 1982; HILL 1983), although it also confirms a certain difference in average size. The differences in skull and teeth measurements appear to be relatively more important (see Table 2).

	madurensis	*celebensis*
C^1	*labial part of cingulum weak, not forming a distinct ridge*	*labial part of cingulum a distinct ridge*
P^1	*in contact with* M^1	*not in contact with* M^1
P^2	*labial part of cingulum weak, not forming a distinct ridge*	*labial part of cingulum a distinct ridge*
I_2	*in contact with canine*	*not in contact with canine*
P_1	*in contact with canine; narrow, distinctly longer than wide; almost touching* P_3	*just free from canine; broad, width about equal to length; separated from* P_3 *by* P_2
P_2	*distal to tooth row line*	*in tooth row line*

Table 2

Some measurements taken from alcohol specimens and skulls of *Rhinolophus affinis* Horsfield, 1824, *Rh. madurensis* Andersen, 1918 *Hipposideros bicolor bicolor* (Temminck, 1834) and *H. macrobullatus* Tate, 1941

Species	Specimen	Sex	Island	Forearm length	Tibia length	Ear length	Horse-shoe width	Greatest skull length (occiput-premaxillae)	Condy-locanine length	Supra-orbital length	Median nasal swellings length × width	Upper tooth row length (C^1–M^3)
Rhinolophus affinis	ZMA 1571	♂	Sumba	49.0								
	ZMA 1572	♂	Sumba	54.6								
	ZMA 22.172	♀	Flores	54.4	26.0	22.4	10.4	24.1	21.2			9.65
	ZMA 22.258	♀	Kangean	47.9	22.8	18.2	8.6					
	ZMA 22.462–22.466[1]	5 ♂♂	Sepanjang	47.2–49.6 (48.2)	22.6–24.4 (23.2)	18.3–20.9 (19.8)	9.1–10.4 (9.6)	22.3	19.4			9.0
Rhinolophus madurensis	ZMA 21.829	♂	Saubi	38.8		14.6		17.4	15.0	4.9	2.1 × 3.5	6.4
Hipposideros b. bicolor	ZMA 22.483	♀	Sepanjang	45.4	21.2	16.4	5.8	18.3	15.9		2.0 × 4.9	6.4
	RMNH 33654[2]	?	Java	± 46.4				18.9			2.3 × 4.7	6.6
Hipposideros macrobullatus	MZB 13351	♂	Kangean	41.6	18.0	20.3	5.4	17.5	15.3		2.2 × 4.9	5.9
	ZMA 21.826	♂	Kangean	40.0	17.6	19.6		17.0	14.9		2.1 × 4.7	5.9
	ZMA 21.827	♀	Kangean	40.9	18.0	19.2	5.2					

[1] Ranges and means; skull and tooth row measurements: ZMA 22.466. – [2] Lectotype specimen.

The dorsal profile of median and posterior nasal swellings is near continuous in *madurensis,* whereas in *celebensis* it shows a weak angle by the relatively steeper rise of the median swellings. Moreover, differences in morphology and position of some dental elements, as listed below, may prove to be of value in distinguishing the two taxa.

Admittedly, we could only compare one skull of *madurensis* directly to one of *celebensis* (ZMA 21.818, from Moinakom River, Dumoga National Park, North Sulawesi). The observed differences do therefore not account for individual variation. It would surprise us, however, if they would not reflect some generally valid and taxonomically important distinctive developments.

In 1979 GOODWIN described a series of a small and obviously closely related *Rhinolophus* species from Timor as *R. borneensis parvus.*

GOODWIN considered *R. celebensis* as conspecific with *R. borneensis* Peters, 1861, a conclusion not fully endorsed by HILL (1983) because of material limitations and also to be left with GOODWIN by the present authors, for the same reason. Forearm length in *parvus* ranges from 38.6 to 41.7; means in two subseries, each consisting of 11 specimens, are 40.1 and 40.0, respectively (GOODWIN 1979) – very much the same as in our measured 5 ♂♂ of *madurensis.* In all other characters, *parvus* also fully agrees with *madurensis.* According to HILL (1983) "the two may be separated only by the slightly less globular narial inflations of *madurensis*". This character is possibly subject to some slight individual variation (if it can be judged by length and width of the median nasal swellings; compare Table 1 in GOODWIN 1979), but we agree with HILL that it does not justify specific distinction. Whether subspecific distinction, as proposed by HILL, is justified, we are not in a position to assess.

HIPPOSIDERIDAE

Hipposideros bicolor bicolor (Temminck, 1834)

Material: 2 ♀♀, skull of ZMA 22.483 extracted, Gua Tuan Sekala, Sepanjang, 23-I-1984 (MZB 14244; ZMA 22.483).

Measurements: Table 2.

Remarks: The Sepanjang ♀♀ have forearm lengths of 44.9 and 45.4, respectively, and agree closely with the description of *H. bicolor bicolor* as given by HILL (1963). As this subspecies is known from Java, its occurrence on the Kangean Islands is not wholly unexpected. Specimen ZMA 22.483 has been compared directly to the lectotype specimen of *H. b. bicolor* in the RMNH collection. As this is a faded, dry, mounted specimen (with stretched wings) there is not much to say about their general resemblance – apart from the dimensions of the various wing bones and of the feet, which seem very much of the same order of magnitude in the two specimens. The comparison has been concentrated on the skulls, which are very much in accordance with one another. In the skull of the lectotype specimen the basocranial part and most of the left zygoma are lacking. A few minor differences were noted: in the Sepanjang specimen, which on the whole is very slightly smaller, the upper incisors are somewhat smaller, with their outer cusps not as clearly separated from the inner as in the lectotype specimen, and the anteorbital foramen is somewhat shorter, with its posterior side only just reaching the level of the anterior side of the second upper molar – which it somewhat surpasses in the lectotype specimen –, and narrower. In all other respects, such as position of anterior upper premolar, relative mass of zygomata, and form and dimensions of nasal swellings, the two specimens are very similar. Contrary to what TATE (1941a: 360) wrote, the upper canines in both specimens have a vestigial posterior cusp. The ears are large and slightly wider than long, with a very weak concavity just behind the tip, and 14 transverse ridges. The tragus is a short, relatively thick, rounded lappet. The antitragal fold is distinct, with a near-disjunction near the ear margin. The ear bases are whitish and the top halves brownish transparent.

The noseleaf is nearly unpigmented, slightly tinged with yellowish brown, the posterior

leaf almost pure white. The anterior margin of the anterior leaf is curved up in the middle. The internarial septum is almost parallel-sided and only very slightly converging backwards; when viewed in profile its median part is slightly higher than its anterior part. The internarial lappets are weakly developed. The intermediate part of the noseleaf bears 4 long vibrissae, and concentrations of short hairs laterally on its posterior part. The posterior leaf has slightly concave lateral margins, a greatest width surpassing that of the anterior leaf, three distinct but very weak posterior septa, and an indistinct median recess or fold on its posterior margin just above the middle septum. Behind the posterior leaf there is at either side a tubercle bearing two long vibrissae, and in the middle a shallow, transverse frontal sac with relatively short hairs growing from the inside and a peculiarly formed lappet-like projection just in front of it.

The dorsal fur is long, up to 11.5 on middle of back, with hairs white at the basis and darkening towards the dark (reddish-)brown distal end, which varies in relative length. Ventrally, the fur is much lighter, consisting of light buff hairs with short white bases.

Flight and tail membranes are dark greyish brown, translucent. The skin of arms, legs and feet is light brown dorsally and whitish ventrally. The skin of the tail is whitish ventrally. Specimen ZMA 22.483 has been studied also by Dr. J. E. Hill of the British Museum (Natural History) who wrote (in lit., 1-VIII-1985) that it agrees very closely with his concept of *H. bicolor,* and that it is probably best referred to the typical subspecies. We have not seen specimen ZMB 13351, which Boeadi had identified as *H. bicolor,* which is very probably correct; because of identification problems with some other members of the *bicolor* group in the Kangean collection (see hereafter), however, there is a small chance that it represents another species.

We like to use this opportunity to report on the type series of the species. Although our measurements (see Table 2) are slightly different from those given by Tate (1941a), we can confirm Hill's conclusion (1963) that Andersen (1918: 379), in his review of the *bicolor* group, applied a wrong concept of the species *bicolor.* The lectotype specimen is distinctly larger than the specimens considered by Andersen; the morphology of its internarial septum could not be ascertained: it is dried and damaged. Concerning the other dry specimens of the syntype series of *bicolor,* now all labelled "paralectotype" – we have not seen spirit specimens –, some notes may be useful. Those from Java, RMNH 33652 and 33653 (Jentink 1888: 168, specimens b and c, respectively), mounted adults with skulls inside, clearly represent a member of the *bicolor* group but most probably not *bicolor* itself. Some approximate measurements are: 33652, FA 37.4, 3rd metacarpal 27.3, 5th metacarpal 27.7; 33563, FA 34; the (visible) lower incisors are distinctly smaller, and the lower canines somewhat shorter, than in the lectotype specimen of *bicolor.* The "paralectotypes" from Ambon, RMNH 33655 and 33656 (Jentink 1888: 168, specimens f and g, respectively), also mounted adults with skulls inside, have forearm lengths of about 45.9 and 42.2, respectively, and what can be seen of incisors and canines is quite as in the lectotype specimen; their internarial septa probably had parallel sides. Specimens RMNH 33657 and 33658 (Jentink 1887: 272, specimens a and b, respectively), also "paralectotypes", from Ambon, skulls, 33657 with GSL 16.0, CBL 13.9 and zygomatic width about 8, and 33658 with GSL 17.0 and zygomatic width 8.2, are considerably smaller, cranially, than the lectotype.

Hipposideros cervinus cervinus (Gould, 1854)

Material: 2 ♂♂, 1 ♀, skull of ZMA 22.486 extracted, Gua Tuan Sekala, Sepanjang, 23-I-1984 (MZB 14245; ZMA 22.485–22.486).

Remarks: Jenkins and Hill (1981) reviewed the status of *Hipposideros galeritus* Cantor, 1846 and *H. cervinus* (Gould, 1854), and clarified the problems related to the distinction of these two species. They also gave figures of the – quite different – nose leaves, skull profiles and auditory regions of representatives of both species.

The present specimens, with forearm lengths of 43.9, 44.7 and 44.8 respectively, fall within the lower size ranges of the typical subspecies. Specimen ZMA 22.486 has been studied and identified by Dr. J. E. HILL, who remarks (in lit., 1-VIII-1985) that it "agrees with *cervinus* in narrow intermediate leaf, low rounded antitragus, pointed antitragal projection, narrow internarial septum, flat rostral profile, small tympanic bulla (anulus), upper incisors not bicuspid and M^3 reduced". JENKINS and HILL (1981) give as range for the species Malaya, Sumatra and Philippine Islands east to New Hebrides. HILL (1983) reported the first specimens from Sulawesi.

Sepanjang represents a new locality, which moreover suggests the species' occurrence on Java and Madura.

Hipposideros cineraceus Blyth, 1853

Material: 6 ♂♂, 6 ♀♀, skulls of ZMA 22.475 and 22.476 extracted, Gua Ainkuan, Kangean, 19/21-I-1984 (2 ♂♂, 2 ♀♀: MZB 14246a–d; 4 ♂♂, 4 ♀♀: ZMA 22.474–22.481).

Remarks: The 6 ♂♂ have forearm lengths of 33.9 to 35.4 (mean 34.6) and the 6 ♀♀ have forearm lengths of 34.5 to 36.0 (mean 35.5), which seems to indicate a slight sexual dimorphism. Dr. J. E. HILL has examined specimen ZMA 22.475 and the skull of ZMA 22.476 and found them to represent *cineraceus*, "so far unrecorded from Kangean or from Java for that matter"; he further remarks (in lit., 1-VIII-1985) that the mentioned specimens have slightly smaller upper canines than specimens from Borneo. If compared to the forearm measurements of *cineraceus* from several regions as given by HILL and FRANCIS (1984), the Kangean specimens appear to have quite short forearms and to be rather in agreement, in this respect, with specimens from the southeast Asian mainland than with those from Borneo.

Hipposideros diadema diadema (Geoffroy, 1813)

Material: 1 ♂, skull extracted, Gua Tuan Sekala, Sepanjang, 23-I-1984 (ZMA 22.484).

Remarks: With FA = 94.4, CBL = 30.9, condylocanine length = 30.7, and C-M^3 = 13.85 the present specimen appears to be larger than any other reported specimen of *diadema* that we know of, regardless of subspecies. Specimens from Java, Sumbawa and Timor have been assigned to the typical subspecies, which according to HILL (1963) would have a forearm length range of about 78.5–90.5. GOODWIN (1979) mentions a series of 7 adult ♂♂ from Bali in the American Museum of Natural History with forearm lengths of 87.5–93.0, which he believed to be consubspecific with the typical form. It seems best, therefore, to regard the Sepanjang specimen as a very large representative of *H. d. diadema.*

It is of interest to note here that the largest subspecies of *diadema* as recorded by HILL (1963) is *euotis* Andersen, 1905 from Bacian Island, Moluccas, and later also reported from Sulawesi (HILL 1968), with recorded forearm lengths of about 86.5–91.5 (HILL 1963).

Hipposideros larvatus (Horsfield, 1823)

Material: 4 ♂♂, 2 ♀♀, Gua Beringin, Kangean, 16-VI-1982 (1 ♂, 1 ♀: MZB 13350a–b; 3 ♂♂, 1 ♀: ZMA 21.822–21.825); 1 ♀, Gua Kuning, Kangean, 12-VI-1982 (ZMA 21.871); 1 ♂, 7 ♀♀, ZMA 22.496 with skull extracted, Gua Ainkuan, Kangean, 19/21-I-1984 (1 ♂, 2 ♀♀: MZB 14243a–b–c; 5 ♀♀ ZMA 22.494–22.498); 1 ♂, Gua Tuan Sekala, Sepanjang, 23-I-1984 (ZMA 22.499).

Remarks: With forearm lengths of 52.7–55.4 (mean 54.1) in 5 ♂♂ and 50.3–53.8 (mean 52.6) in 8 ♀♀, the present specimens average distinctly smaller than the Javanese subspecies *larvatus* which has a forearm length range of 54 to about 60 (sexes combined; OEY and VAN DER FEEN 1958; HILL 1963), and than the known specimens of the subspecies *sumbae* Oei, 1960 from Sumba, with forearm lengths of 55.0, 55.1 and 55.7 in 3 ♂♂ and 55.5 in 1 ♀, respectively (OEI 1960). The single extracted skull (♀, ZMA 22.496) has a greatest length of 21.2 and would agree, in this respect, with the latter subspecies. The Kangean Island populations confirm the notion by HILL (1963) that *larvatus* sensu lato

exhibits a geographical size cline, from larger on the southeast Asian mainland to smaller on Java. The continuation of this cline beyond Java appears to be dichotomic, with still smaller but mutually different specimens on both the Kangean Islands and Sumba. The subspecies of the latter island has not been included in HILL's remark, which it appears to confirm.

The alleged occurrence of the smaller but closely related *Hipposideros speoris* (Schneider, 1800) on Timor (see GOODWIN 1979 for details) may well be based on representatives of *larvatus*.

Hipposideros macrobullatus Tate, 1941

Hipposideros bicolor macrobullatus Tate, 1941: 357

Material: 2 ♂♂, skulls extracted, 1 ♀, Gua Beringin, desa Torjib, Kangean, 16-VI-1982 (MZB 13351; ZMA 21.826–21.827). Reference material: 1 ♀, cave Bulu Sipong, near Maros, southwest Sulawesi, 24-IX/6-X-1888, leg. M. WEBER (ZMA 1494).

Measurements: Table 2.

Remarks: The MZB ♂ has a forearm length of 41.6, the ZMA ♂ one of 40.2 and the ZMA ♀ one of 41.0. Dr. J. E. HILL (in lit., 1-VIII-1985) remarks that the smaller size of the (ZMA) specimens when compared with *H. bicolor* suggests that they represent *H. ater* Templeton, 1848, from which they differ, however, in having large cochleae and large tympanic bullae, and larger ears. As *macrobullatus* appears to be sympatric with *H. bicolor bicolor* on the Kangean Islands it cannot be a subspecies of *bicolor*. As it appears to be sympatric with *H. ater* as well (on Sulawesi: Dr. HILL, in lit.; see also TATE 1941) it cannot be conspecific with that species. Therefore, *macrobullatus* should be considered specifically distinct. We prefer to leave the further elaboration of this new idea to its originator in his currently undertaken review of the *bicolor* group. Besides the characters already mentioned, the specimens share the following: anterior upper premolar obsolescent, wedged between the outer halves of canine and second upper premolar (the latter two not in contact); anterior lower premolar very slightly shorter than the second, about two thirds its height; anterior noseleaf without median emargination; internarial septum not greatly expanded or modified, only slightly thickened; posterior leaf with three supporting septa, its lateral parts, also each with one supporting septum, continuing distally as ridges below the anterior leaf.

The skulls of specimens MZB 13351 and ZMA 21.826 have a constricted orbital region; the anterior half of the free part of the zygomatic arch as massive as the posterior part, the latter with a low superior projection; and a thickened posterior vomer projection. Fur and ears and membranes in specimen MZB 13351 are rather medium to reddish brown, while in the other two specimens the fur, ears and membranes are much darker brown.

VESPERTILIONIDAE

Myotis adversus adversus (Horsfield, 1824)

Material: 3 ♀♀, ZMA 21.868 with skull extracted, Gua Kuning, Kangean, 12-VI-1982 (2 ♀♀: MZB 13349a–b; 3 ♀♀: ZMA 21.868–21.870).

Remarks: With forearm lengths of 43.2, 43.7 and 44.0, and a greatest skull length of 16.85 in specimen ZMA 21.868 the 3 ♀♀ in the ZMA collection appear typical representatives of this subspecies.

Kerivoula hardwickii hardwickii (Horsfield, 1824)

Material: 2 ♀♀, specimen ZMA 17.346 with skull extracted, 2 ♂♂, cave at the bay of Ketapang, west coast of Kangean, 20/21-II-1900, leg. Siboga Expedition (Station 317) (ZMA 17.346–17.349).

Remarks: HILL (1965) includes a specimen from Kangean in the typical subspecies. We have two specimens of this subspecies from Bali at our disposal: 1 ♂, 1 ♀, skulls extracted, Ubud, Bali, 25-III-1939, leg J. P. KLEIWEG DE ZWAAN (ZMA 17.338–17.339). Compared to these specimens, and to the measurements in HILL (1965), it is clear that the Kangean specimens belong here. Forearm lengths are 32.9 and 32.0 in the 2 ♀♀, and 29.9 and 30.1 in the 2 ♂♂, respectively.

RODENTIA – MURIDAE – MURINAE

Rattus rattus diardii (Jentink, 1880)

Material: 1 ♀, ZMA 21.830, alc., Desa Torjib, Kampong Aeng Lombi, Kangean, 14-VI-1982; 1 ♂, ZMA 21.831, alc., Desa Torjib, in forest near Gua Lalang Pandjang, Kangean, 15-VI-1982; 1 ♂, ZMA 21.832, alc., Desa Torjib, Kampong Aeng Lombi, Kangean; 1 ♂ ZMA 21.833, alc., Desa Torjib, Kampong Pondok Kelor, Kangean, 17-VI-1982; 1 ♀ ZMA 21.834, alc., cf Desa Torjib, Kangean, 14–17-VI-1982; 1 ♂, MZB 13353, data the same as the last-mentioned specimen.

Rattus argentiventer (Robinson & Kloss, 1916)

Material: 3 ♂♂, ZMA 21.835, 21.836, 21.837, alc., Desa Batuputih, Kampong Ramosalengka, Kangean, 14-VI-1982; 1 ♀, MZB 13354 (provisionally identified as *Rattus tiomanicus*), same data as the other specimens.

OTHER MAMMAL SPECIES

In the report by DE IONGH et al. (1982) besides the bats and rodents they collected, also other mammal species were mentioned. These species were observed during the survey. They were: *Macaca fascicularis* (Raffles, 1821), another monkey species, probably *Presbytis cristata* (Raffles, 1821), *Muntiacus muntjak* (Zimmermann, 1780), *Cervus timorensis* de Blainville, 1822, *Viverricula indica* (Desmarest, 1817), and *Paradoxurus hermaphroditus* (Pallas, 1777). During this survey also foot prints were found which almost certainly were made by a Panther, *Panthera pardus* (Linnaeus, 1758) and in the village Torjib on Kangean the left tibia and fibula of a Panther killed in 1980 were bought (ZMA 22.551). Only two years later VAN HELVOORT (1984) could obtain the skin and the damaged skull of an adult specimen (VAN HELVOORT et al. 1985). The skin and skull were sent to the Museum Zoologicum Bogoriense but due to an unlucky coincidence the skull never arrived. The skin is registered as MZB 14291.

Discussion

With the exception of *Cynopterus brachyotis* all bat species collected by DE IONGH and VAN HELVOORT are cave dwellers. The cave origin of the old sample of *Kerivoula hardwickii* is not certain. The only indication is a passage in the popular account of the Siboga Expedition (1899–1900) during which it was collected, by Mrs. A. WEBER-VAN BOSSE (1904). She wrote (in translation): "The cave of Kangean still yielded lots of algae and bats, two regular inhabitants of each large cave." Of those lots of bats the *Kerivoula* sample is somehow the only one which now remains in the Zoölogisch Museum in Amsterdam. Most bat species reported from the Kangean Islands previous to the present report are no cave bats, however, so we assume that all other Kangean bats from the Siboga Expedition were lost, unless they were sent to another institution for study by a specialist. The latter, then, appears not to have reported them and certainly has not returned the bats to Amsterdam.

Most data in this paragraph are cited from DE IONGH et al. 1982. The Kangean Islands consist of uplifted (probably due to vulcanic forces) limestone sediments. Kangean itself is

the largest of the group, measuring about 40 km from west to east and about 25 km from north to south. The greater part of central Kangean exists of a hilly ridge attaining a maximum height of 400 m, covered with forest and with many smaller and larger stalactitic caves. Despite the considerable human population – near 60,000 on Kangean and near 23,000 on the remaining islands including Saubi and Sepanjang – the caves apparently still harbour a rich and varied community of Microchiroptera and a population of *Rousettus amplexicaudatus.* They also serve as shelter for panthers (DE IONGH et al. 1982). On Sepanjang there would be only one additional cave, besides the two that were visited, according to local people (VAN HELVOORT, in lit., 6th Sept. 1985).

Of the earlier reported bat species from Kangean, several are also contained in the present collection by DE IONGH and VAN HELVOORT. Not collected were *Pteropus alecto, Macroglossus minimus* and *M. sobrinus, Pipistrellus imbricatus* and *Kerivoula hardwickii.* As only relatively little time could be devoted to the collecting of bats, there is no reason to assume that all species inhabiting any of the caves visited have been sampled. Nor is it at all likely that the species which were not collected would not occur on the islands any more, with the possible exception of *Pteropus alecto.* Flying foxes of the genus *Pteropus* are not only threatened by deforestation in many parts of Indonesia, they are also hunted locally for human consumption. On the nearby island of Bali, where they are eaten, they seem to have become very rare already and it is not unlikely that the Balinese people have also affected the Kangean *Pteropus* population (if the Kangean people themselves do not eat them, for which there is no prove). VAN HELVOORT and DE IONGH do not recall having seen any *Pteropus* on Kangean, Saubi or Sepanjang, neither in the wild nor in captivity (VAN HELVOORT, in lit., 6th Sept. 1985). The only natural cause for their absence one could think of is some yearly migratory movement.

Geologically, the Kangean Islands form part of the Sunda shelf, and the apparent faunal relationships with Java and Madura offer no surprise. For bats, even today the islands between Madura and Kangean, such as Sapudi and Raas and some smaller ones, might act as stepping stones for wandering species. The supposed Sulawesian or even Moluccan affinities of some species is more spectacular; *Megaderma spasma* and *Hipposideros diadema* are represented by specimens with leanings towards Sulawesian rather than Javanese subspecies, and *Hipposideros macrobullatus,* originally described from Sulawesi, is not known from islands west of Sulawesi or Kangean. On the other hand, it should be kept in mind that it may still be found there.

Hipposideros bicolor offers an illustrative example: described in 1834 from specimens collected on West Java in 1820 or 1821, the species appears never to have been collected on that island again. Reports on some other bat species in the present paper also show that relatively little is known of their distribution and taxonomy over large parts of Southeast Asia, including Java, despite the many zoologists who have visited that island.

The two rat species are, according to MUSSER and NEWCOMB (1983), most probably introduced to the islands on the Sunda Shelf, as they are mostly found near human habitations and in rice fields, grassland, scrub and plantations. The only observed mammal species are typical for the Sunda Shelf area, although it is known that Long-tailed Macaques, Common Palm Civets, Barking Deer and Rusa Deer are often transported from one island to another.

The occurrence of the Panther on Kangean is, however, an enigma, just as its occurrence on Java. This species is not found on Sumatra and Kalimantan (Borneo) and no fossil remains have been found either on the two islands. An explanation might be that this large cat species was brought to Java during the Middle Ages when there was a close cultural, commercial and religious contact between the people of Java and the inhabitants of India. That was the time that the Hindu/Buddhistic religion came to Indonesia where it has been now replaced, except on the Island of Bali, by Mohammedanism.

It is known that large mammals were used for socio-religious reasons in former times.

On Java there were till the beginning of this century a kind of sacral festivities (called "rampok matjan"), whereby captive tigers and panthers were killed.

And it is also known that in the summer of 1839 the Rajah of Klungkung on Bali (at that time the island was still independent) requested the Dutch colonial authorities on Java to bring him a live Javan Rhinoceros, which happened. And as the Kangean Archipelago was formerly both a penal colony and a hunting area for the rulers of the Islands of Madura and Java, it is conceivable that Panthers were liberated on Kangean, where they found sufficient prey animals to stay alive till today.

Acknowledgements

We wish to thank Ir. H. H. DE IONGH and Ir. B. E. VAN HELVOORT and their travelling-companions for collecting the bats and rats described in this paper and for presenting them to the museums in Bogor and Amsterdam. We are very obligated to Bp BOEADI for providing us with a number of data on specimens in the Museum Zoologicum Bogoriense. Dr. G. G. MUSSER of the American Museum of Natural History in New York kindly identified the rats in the ZMA collection. We are much indebted to Dr. J. E. HILL of the British Museum (Natural History) in London for the identification of a number of specimens of the *Hipposideros bicolor* group and to allow us to include some of his unpublished ideas on the species concerned. Dr. C. SMEENK of the Rijksmuseum van Natuurlijke Historie at Leiden kindly gave us access to a number of specimens in the collection in his care for comparison.

Zusammenfassung

Über eine Sammlung von Fledermäusen und Ratten von den Kangean-Inseln, Indonesien (Mammalia: Chiroptera und Rodentia)

Eine neue Sammlung kleiner Säugetiere von den Kangean-Inseln wird untersucht und beschrieben. Zehn Fledermausarten repräsentieren neue Nachweise für diese Inseln: *Rousettus amplexicaudatus, Nycteris javanica, Rhinolophus madurensis, Hipposideros bicolor, H. cervinus, H. cineraceus, H. diadema, H. larvatus, H. macrobullatus* und *Myotis adversus*. Die Serie von *Nycteris javanica* wird als neue Subspecies *N. J. bastiani* beschrieben. *Rhinolophus borneensis parvus* wird als Synonym von *Rh. madurensis* angesehen. *Hipposideros bicolor macrobullatus* wird zur Species erhoben. Zwei Arten von Ratten werden nachgewiesen: *Rattus argentiventer* und *Rattus rattus diardii*.

Literature

ALLEN, G. M. (1908): Notes on Chiroptera. Bull. Mus. comp. Zool. Harvard **52**, 25–62.

ANDERSEN, K. (1905): On some bats of the genus *Rhinolophus*, with remarks on their mutual affinities, and descriptions of twenty-six new forms. Proc. zool. Soc. London II, 75–145.

— (1907): Chiropteran notes. Ann. Mus. Civ. Stor. Nat. Genova **3**, 473–478.

— (1912): Brief diagnoses of eight new *Petalia*, with a list of the known forms of the genus. Ann. Mag. nat. Hist. **10**, 546–550.

— (1918): Diagnoses of new bats of the families Rhinolophidae and Megadermatidae. Ann. Mag. nat. Hist. **2**, 374–384.

BERGMANS, W.; ROZENDAAL, F. G. (1982): Notes on *Rhinolophus* Lacépède, 1799 from Sulawesi, Indonesia, with description of a new species (Mammalia, Microchiroptera). Bijdr. Dierk. **52**, 169–174.

CARTER, T. D.; HILL, J. E.; TATE, G. H. H. (1964): Mammals of the Pacific World. 3. ed. New York: MacMillan.

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**, 1–209.

DOBSON, G. E. (1878): Catalogue of the Chiroptera in the collection of the British Museum. London: Trustees British Museum. I–XLII, 1–567, plates I–XXX.

ELLERMAN, J. R.; MORRISON-SCOTT, T. C. S. (1951): Checklist of Palaearctic and Indian mammals, 1758 to 1946. London: Trustees British Museum, 1–810.

— (1955): Supplement to Chasen (1940). A handlist of Malaysian mammals. London: Trustees British Museum. 1–66.

GOODWIN, R. E. (1979): The bats of Timor: systematics and ecology. Bull. Amer. Mus. nat. Hist. **163**, 73–122.

HARRISON, J. (1966): An introduction to the mammals of Singapore and Malaya. Singapore: Singapore Branch, Malayan Nature Society.

HELVOORT, B. E. VAN (1984): Kangean revisited or the return of the Pantaleikan. Report on a second

short mission (Jan. 15th–27th 1984) to the Kangean Archipelago to secure the skin and skull of a Panther *(Panthera pardus)*: 1–20, 9 appendices. Unpubl. report.
Helvoort, B. E. van; Iongh, H. H. de; Bree, P. J. H. van (1985): A leopard-skin and -skull (*Panthera pardus* L.) from Kangean Island, Indonesia. Z. Säugetierkunde **50**, 182–184.
Hill, J. E. (1965): Asiatic bats of the genera *Kerivoula* and *Phoniscus* (Vespertilionidae), with a note on *Kerivoula aerosa*. Mammalia **29**, 524–556.
— (1963): A revision of the genus *Hipposideros*, Bull Brit. Mus. Nat. Hist. (Zool.) **11**, 1–129.
— (1968): Notes on mammals from the islands of Rennell and Bellona. Nat. Hist. Rennell Isl., Brit. Solomon Isls **5**, 53–60.
— (1983): Bats (Mammalia; Chiroptera) from Indo-Australia. Bull. Brit .Mus. Nat. Hist. (Zool.) **45**, 103–208.
— ; Francis, C. M. (1984): New bats (Mammalia: Chiroptera) and new records of bats from Borneo and Malaya. Bull. Brit. Mus. Nat. Hist. (Zool.) **47**, 305–329.
Horsfield, T. (1824): Zoological Researches in Java and the Neighboring Islands. London: Kingsbury, Parbury and Allen.
Iongh, H. (H.) de; Atmosoedirdjo, S.; Helvoort, B. (E.) van; Sutanto, H. (1982): An ecological survey of the Kangean Island Archipelago in Indonesia. 1–55. Unpubl. report.
Jenkins, P. D.; Hill, J. E. (1981): The status of *Hipposideros galeritus* Cantor, 1846 and *Hipposideros cervinus* (Gould, 1854) (Chiroptera: Hipposideridae). Bull. Brit. Mus. Nat. Hist. (Zool.) **41**, 279–294.
Jentink, F. A. (1887): Muséum d'Histoire Naturelle des Pays-Bas, IX. Catalogue ostéologique des mammifères. Leide Brill., **1**, 1–360.
— (1888): Muséum d'Histoire Naturelle des Pays-Bas, XII. Catalogue systématique des mammifères (Rongeurs, Insectivores, Cheiroptères, Edentés et Marsupiaux). Leide Brill., **1**, 1–280.
Lekagul, B.; McNeely, J. A. (1977): The mammals of Thailand. Bangkok: Association for the Conservation of Wildlife.
Lyon, M. W. (1911): Mammals collected by Dr. W. L. Abbott on Borneo and some of the small adjacent islands. Proc. U.S. Nation. Mus. *40* (1809); 53–146.
Medway, Lord (1969): The wild mammals of Malaya and offshore islands including Singapore. I–XIX, 1–127, 15 pls. Kuala Lumpur, Singapore, London: Oxford Univ. Press.
— (1977): Mammals of Borneo. Field keys and an annotated checklist. Monograph of the Malaysian Branch Roy. Asiat. Soc. **7**, 1–172.
— (1978): The wild mammals of Malay (Peninsular Malaysia) and Singapore. 1–128. Kuala Lumpur: Oxford Univ. Press.
Musser, G. G.; Newcomb, C. (1983): Malaysian murids and the giant rat of Sumatra. Bull. Amer. Mus. nat. Hist. **174**, 327–598.
Oei [= Oey], H. P. (1960): Notes on bats from Bali, Lombok and Sumba. Hemera Zoa **67**, 23–32.
Oey, H. P.; Feen, P. J. van der (1958): Some remarks on *Hipposideros speoris* and *Hipposideros larvatus* (Chiroptera, Rhinolophidae). Beaufortia **6**, 225–241.
Pohle, H. (1950): Zur Säugetiergeographie der Kleinen Sundainseln. Syllegomena biologica – Festschrift Kleinschmidt: 319–346. Leipzig: Akad. Verlagsges. Geest and Portig, Wittenberg: A. Ziemsen Verlag.
Rookmaaker, L. C.; Bergmans, W. (1981): Taxonomy and geography of *Rousettus amplexicaudatus* (Geoffroy, 1810) with comparitive notes on sympatric congeners (Mammalia, Megachiroptera). Beaufortia **31**, 1–29.
Sinha, Y. P. (1977): The oriental bats of the genus *Megaderma* (Megadermatidae). Geobios **4**, 9–12.
Sody, H. J. V. (1936): Seventeen new generic, specific, and subspecific names for Dutch East Indian mammals. Natuurk. Tijdschr. Ned.-Ind. **96**, 42–55.
Strien, N. J. van (1986): Abbreviated checklist of the mammals of the Australasian Archipelago. Bogor: School of Environmental Conservation Management.
Tate, G. H. H. (1941a): Results of the Archbold Expeditions. No. 35. A review of the genus *Hipposideros* with special reference to Indo-Australian species. Bull. Amer. Mus. nat. Hist. **78**, 353–393.
— (1941b): Results of the Archbold Expeditions. No. 36. Remarks on some Old World leaf-nosed bats. Amer. Mus. Novit. 1140, 1–11.
— (1946): Geographical distributions of the bats on the Autralasian Archipelago. Amer. Mus. Novit. 1323, 1–21.
— (1947): Mammals of Eastern Asia. New York: MacMillan.
Weber-van Bosse, A. (1904): Een jaar aan boord van H. M. Siboga. Leiden: Brill.
Zon, A. P. M. van der (1979): Mammals of Indonesia. Draft version. Bogor: Special Report FO/INS/78/O61X, FAO, National Park Development Project.

Authors' address: Drs. W. Bergmans and Dr. P. J. H. van Bree, Department of Mammals, Institute of Taxonomic Zoology (Zool. Museum), 36 Plantage Kerklaan, NL-1018 CZ Amsterdam, the Netherlands