

New insights into the taxonomy of *Macaca pagensis* of the Mentawai Islands, Sumatra

by A.C. KITCHENER and C. GROVES¹

¹Department of Geology and Zoology, National Museums of Scotland,
Chambers Street, Edinburgh EH1 1JF, UK.

E-mail: a.kitchener@nms.ac.uk

²Department of Archaeology and Anthropology,
Australian National University, Canberra, ACT 0200, Australia.

Summary. – Although macaques (*Macaca pagensis*) have been known from the Mentawai Islands since the early twentieth century, none were known from one of these, Pulau Siberu, until the 1970s. The Siberu macaque was inadvertently given a scientific name, *M. p. siberu* by Fuentes and Olson (1995). Only two specimens are known of the Siberu macaque: a male originally described as a hybrid from Padang, Sumatra that lived in London Zoo until 1933, and a male that lived in Bristol Zoo until 1997. In this paper we describe in detail for the first time the Siberu macaque based largely on these two specimens. We compare the Siberu macaque with other species in the *M. nemestrina* group and find that it is morphologically very distinct. We conclude that the Siberu macaque is a distinct species, *M. siberu*.

Résumé. – Bien que *Macaca pagensis* soit connu des Îles Mentawai depuis le début du XX^e siècle, on ne savait rien d'une de ces îles, Pulau Siberu, jusqu'en 1970. C'est par hasard que Fuentes et Olson (1995) ont nommé le macaque de Siberu *M. p. siberu*. Deux spécimens seulement de ce macaque sont connus: un mâle décrit comme un hybride de Padang, Sumatra, qui a vécu au Zoo de Londres jusqu'en 1933, et un mâle qui a vécu au Zoo de Bristol jusqu'en 1997. Dans cet article, nous décrivons en détail pour la première fois le macaque de Siberu, d'après ces deux spécimens. Nous l'avons comparé avec d'autres espèces du groupe *M. nemestrina* dont il est morphologiquement bien distinct. Sur la base de ces caractères, nous concluons qu'il représente bien une espèce distincte, *M. siberu*.

KEY WORDS: *Macaca pagensis*, Siberu, Pagai Islands, Mentawai Islands, taxonomy, morphology.

INTRODUCTION

The Mentawai Islands are home to four currently recognised endemic primates (Fig. 1) (Groves 2001), all of which have been subjected to traditional human hunting for millennia. However, there has been increasing concern in recent years, owing to the high levels of predation on some species coupled with high rates of rainforest destruction through timber extraction, relocation of people from elsewhere in Indonesia and

the impact of tourism (Fuentes and Ray 1996; Goeltenboth and Timotius 1996; Mitchell and Tilson 1986; Tenaza and Tilson 1985). Our taxonomic knowledge of these endemic primates is limited by the few specimens available in collections, most of which were collected at the beginning of the last century. Of all the endemic Mentawai primates, the macaques have received least attention of all, but given the rate of habitat loss on the Mentawai Islands, it is essential that their taxonomic status is reviewed, so that each island population can be given appropriate conservation status and action plans can then be implemented accordingly.

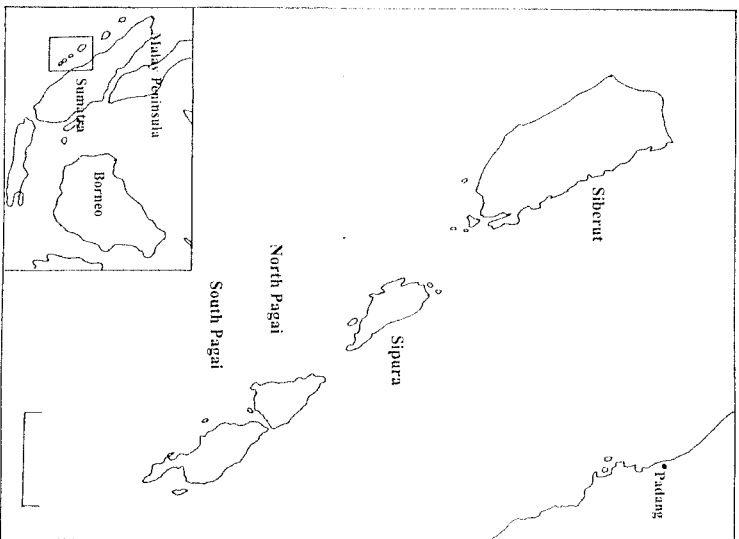


Fig. 1. — The Mentawai Islands (after Whitten & Whitten, 1982). Scale bar equals 50 km.

The presence of macaques (genus *Macaca*) on the Mentawai group was not made known until the beginning of the 20th century, when W.L. Abbott and C.B. Kloss visited «the Pagai Islands» (now Pagai Utara and Pagai Selatan) and other islands west of Sumatra and collected about 300 mammals (Fig. 1). The collection, together with Abbott's earlier collections, was described by Miller (1903), who made a female macaque from «South Pagai Island» (Pulau Pagai Selatan) the type of a new species, *Macacus [sic] pagensis*. Miller (1903) characterised *Macacus [sic] pagensis* as like *Macacus nemestrinus* but much smaller. General colour darker than in the related species, but sides of neck light yellowish brown, in strong contrast with dorsal surface.

In his general description, Miller (1903) noted that the tail is «much more thinly haired» than in «*Macacus nemestrinus*» (correctly, *Macaca nemestrina*), and that the direction of the hair on the head is different. On the forehead, he stated, the hairs all grow forward, whereas in *M. nemestrina* they grow back, meeting the crown hairs in a small ridge; and the cheek hairs all grow backward, with no indication of the «conspicuous semicircle of antrorse hairs surrounding front of ear in the larger species». The skull is said to be like *M. nemestrina* but smaller, lacking the latter's median longitudinal concavity of the anterior palate, and lacking the 5th cusp on either M¹ or M². He gave both flesh and skull measurements: the skull was 111 mm long, compared to 134 mm in a young adult female of *M. nemestrina* from Sumatra, and the upper molar row 22.6 mm compared to 26 mm in the latter. The only other specimen available to Miller was a young individual offspring of the type.

De Beaux (1923) referred them to *Rhesus [sic] nemestrina* and described a new subspecies, *Rhesus nemestrina mentawensis*, based on a juvenile male from Pulau Sipura. Chasen (1940), though in ignorance of de Beaux's contribution, likewise referred Mentawai macaques to *M. nemestrina*, using the combination *Macaca nemestrina pagensis* and adding «Said to occur on other islands of the Mentawai group, but no specimen has yet been obtained other than in the Pagai Islands».

C.B. Kloss revisited the Mentawai group in 1924, and collected on both Sipura and Siberut. He collected no macaques, but the Siberut representatives of the two species of langurs proved somewhat different from the Pagai forms, and were described by Chasen and Kloss (1928) as *Simiatus concolor siberu* and *Presbytis potentillanti siberu* respectively. No morphological differences have yet been recorded between the northern and southern Mentawai Islands for the other endemic primate, Kloss's gibbon, *Hylobates klassii*, probably owing to inadequate sample sizes.

Three quarters of the way through the 20th century, macaques were still not known from Pulau Siberut. Fooden (1975), under *Macaca nemestrina pagensis*, gave the range as just the islands of Sipura, Pagai Utara and Pagai Selatan, but in the Addenda he was able to cite a sight record by Tenaza from Pulau Siberut. According to Fooden's measurements for the three subspecies of *Macaca nemestrina* which he recognized, *M. n. pagensis* is about the same size as *M. n. leonina* (the subspecies from north of the Isthmus of Kra), but is smaller, on average or perhaps absolutely, than *M. n. nemestrina* (from the Malay peninsula, Sumatra, Bangka and Borneo). The dorsal colour is described as non-agouti chocolate brown, becoming paler on flanks, underside, and lower segments of limbs, and this contrasts with the agouti-banded hairs of the other two subspecies. The crown is golden brown, and has a «toupee» as in the other two subspecies, but this extends much further both anteriorly and laterally. On the throat and sides of neck, as far as the front of the shoulders, is a sharply marked ochraceous-buff zone. The tail, except at the very base, is very sparsely haired.

The first description of macaques from Pulau Siberut was by Wilson and Wilson (1977). They indicated that, because the Mentawai macaque «in size and habits resembles *M. fascicularis* more than *M. nemestrina*» (Wilson and Wilson 1977:216), they preferred to keep it separate from *M. nemestrina* and recognize *M. pagensis* as a distinct species. They described the Siberut macaque as «blackish, with grayish underside and white cheek tufts» (loc. cit.).

Whitten and Whitten (1982) reaffirmed the specific status of the Mentawai macaque, and gave a more detailed description of those on Siberut. They drew particular attention to the recurved tail-tip, as being quite different from any other macaque. All those which they saw on Siberut were «much darker, lacked the light-coloured sides of neck and front of shoulders, and had a distinctive pale cheek patch» (Whitten

and Whitten 1982:447). They identified a living monkey in Bristol Zoo as a Siberut macaque, as well as the skin in the British Museum (Natural History) of a monkey which had been imported alive to London Zoo from Padang, Sumatra, in 1924 (Fig. 1), and identified by Schwarz (1934) as a hybrid between *M. nemestrina* and Sulawesian *M. manara*. They felt able to make these identifications because the Siberut macaque is «irrefragably distinguishable» (Whitten and Whitten 1982:449).

Fuentes and Olson (1995) gave the first brief field description of *M. pagensis* in Pulau Pagai Utara, with a photo, and mentioned that «There appear to be two subspecies, *M. p. pagensis* (Miller 1903, of the Pagais and Sipura, and *M. p. siberu* (Wilson and Whitten 1977, Whitten and Whitten 1982), found on the northern island of Siberut». Evidently they assumed that, because both langur species have subspecies called *siberu*, the macaque must as well. Their bibliographic reference to two descriptions, particularly to Whitten and Whitten (1982), satisfies the requirements of the *International Code of Zoological Nomenclature*, 3rd ed., Art. 13 (a) (ii), and so the name *siberu* is available as from Fuentes and Olson (1995). (It is relevant to note that the name would not have satisfied the requirements of the 4th edition of the *Code*, which requires specific statements that the name is new, and a type specimen).

In summary, Mentawai macaques have always been poorly known, and the position today is still not ideal. Up until the mid-1970s, they were known only from the Pagai Islands and Sipura (Fig. 1); when fieldwork commenced in the Mentawai islands, it was Siberut that was initially best known, and it was assumed that the macaque of Siberut was the same as that on the other islands, or at most subspecifically distinct. There appears to be no specimen in any museum collection that was definitely recorded to have come from Siberut, but it has been plausibly argued that a specimen in the Natural History Museum, London, and a living specimen in Bristol Zoo, actually derived from there.

The Bristol Zoo individual died recently (5th October 1997), and his remains are in the National Museums of Scotland. Based on this specimen and the one in the Natural History Museum, we here take the opportunity to offer the first detailed description of the Siberut macaque, and to consider its taxonomic status.

MATERIALS AND METHODS

The skin, skull and skeleton, together with the penis, of the former Bristol Zoo animal is preserved in the National Museums of Scotland (formerly the Royal Scottish Museum), where it is registered as NMSZ 1999.24. We have seen it alive and have examined several photographs of the living animal (e.g. Whitten and Whitten 1982; Rowe 1996). This animal was imported as a *Simias concolor* in 1974 at about one year old. It was subsequently identified as *M. pagensis* before its arrival at Bristol Zoo in 1976 (D. Armitage, pers. comm.).

The skin, skull and skeleton of the London specimen, registered as a probable hybrid between *Macaca nemestrina* and *M. murina* on the authority of Schwarz (1934), is preserved in the Natural History Museum, London (formerly the British Museum [Natural History]), as BM (NH) ZD.1933.119.1.

Whitten and Whitten (1982) published a photo of a juvenile, apparently in the wild, on Siberut, and we have also examined photos of a juvenile kept as a pet in Muara Siberut, taken by Mr. V.C. Weizel in 1983.

The specimens and other sources of information above were compared with each other and specimens of other species in the *Macaca nemestrina* group. Measurements of skulls of the two Siberut macaques were made by ACK and for other species by CG. Body measurements and weight of the Bristol animal were made by Phil Howard and body measurements and weights were taken from specimen data labels.

RESULTS

The pelage in both skins is jet black dorsally, this tone extending to the fingers and toes, the crown, and the forehead. The hairs are somewhat elongated on the shoulders. Ventrally, the pelage is white in the London skin, silvery-white in the Edinburgh one, this tone extending from the posterior belly to the throat and the inner surface of the arms as far as the elbows; on the chin and jaw angles, and distally of the elbows on the inner side of the forelimbs, black hairs are intermingled with the grey and/or white, giving a dark grey impression in the living animal. On the chest and posterior throat, extending onto the front of the shoulders, hairs vary from extremely sparse to virtually absent, and they are absent on the distal three-quarters of the tail.

The upper half of the cheek whiskers is white; the hairs sweep slightly upward as well as back. The upper edge of the white zone continues, the line of the brow ridges; the lower margin begins level with the cheek bones and runs in a crescent upward and backward, ending in a little point somewhat in front of the ear.

There is a small hair-whorl on the top of the crown, slightly in front of a line joining the two ears. The short hairs radiating forward from this meet a backwardly-directed line of hairs behind the brow in a low ridge, and on those radiating laterally meet the white cheek-whiskers along a more conspicuous line. Photos of the Bristol Zoo animal show that the lateral crown hairs continue to meet postero-superiorly directed hairs along a line above the ears, in a conspicuous ridge, and that in front of the whorl they are raised into a small median crest. There is little trace of these two hair tracts in the preserved skins.

The skin is lightly pigmented on the underparts, so that light skin shows conspicuously through the sparse hairs on the chest and shoulders. The skin of the tail, as of the palms, soles and face, is black. The ischial callosities are light coloured (pale orange in a photo of the living juvenile in Muara Siberut), and transversely oval; their infero-medial borders about, with just a thin strip of perineum between them, and they then widen in a supero-lateral direction. In the skins there is a horizontal crease between the inferior third and the superior two-thirds; in the living juvenile, this appears to be a trough separating two slightly convex segments.

The tail is virtually hairless except for the basal quarter and is held stiffly backward, and hooked forward at the tip.

The glans penis (of the Edinburgh specimen) is blunt tipped, in general rounded, and about as broad as it is long, with a slit-like terminal urethral opening (Fig. 2). It extends proximally twice as far on the dorsal surface than on the ventral. The corona is notched in the midline dorsally, with two small tubercles at the «V» of the notch.

The skulls of both individuals, despite having been in captivity, show little sign of pathology except for some mild osteoporosis on the muzzle in the Edinburgh specimen (Fig. 3), and some tooth decay, with attendant tooth loss, in the London specimen. Both show strong facial prognathism, with the nasal tips protruding somewhat forward of the lateral margin of the nasal aperture. The interorbital pillar drops steeply from glabella to about the level of the lacrimal fossa, where the facial prognathism com-

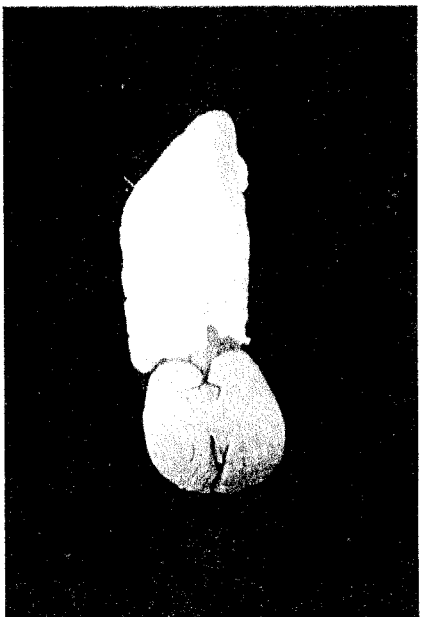


Fig. 2. — Dorsal view of the penis of a Siberut macaque. NMSZ1999.024 (N. McLean, NMS).

menes. The supraorbital ridges jut forward slightly, and are considerably thickened dorsoventrally; there is some forward protrusion of glabella, more in the London specimen than in the Edinburgh one, and in front view glabella is slightly concave. The supraorbital thickness diminishes sharply at the superolateral margins of the orbits, and falls away at 45° from the horizontal to the fronto-zygomatic suture, below which the frontal process of the zygomatic becomes very thickened bilaterally. The supraorbital notches are well developed, and there are small foramina on the supraorbital ridges themselves, and on the lateral ends of the fronto-zygomatic sutures. The palate extends considerably behind the level of the third molars, and has a long median process on the posterior margin. The palate narrows distally. The anterior lower premolar (P₂) is markedly sectorial (the two skulls are both male). The third lower molars are absent (lost antemortem) in the London skull; in the Edinburgh skull, they have a distinct hypoco-nulid, which is divided into two by a median longitudinal groove on the right, and into three on the left.

DISCUSSION

In what follows, we will compare the Siberut macaque primarily with those from the Pagai Is., and where necessary with other members of the *nemestrina* group of Fooden (1975). Groves (1996, 2001) argued that the other members of the group are all specifically distinct (*M. silenus*, *M. nemestrina* and *M. leonina* respectively).

Pagai macaques are non-agouti chocolate brown dorsally, becoming somewhat paler laterally and on the lower segments of the limbs (Fooden 1975:119); they differ thus from both *M. nemestrina* and *M. leonina*, which are agouti-brown all over. Siberut macaques are also non-agouti, but are unvaryingly jet black, like *M. silenus*. Pagai macaques lack any trace of the conspicuous white cheek patches of Siberut macaques, and these latter in turn lack any trace of the large ochraceous-buff patches on the sides of the neck which are so conspicuous in Pagai macaques (see, for example, the photo taken in the wild in Fuentes and Olson 1995). Pagai macaques lack the white on the underside, especially the chest, that is seen in Siberut macaques. The pattern on the

crown appears to be the same. The tail is hairless except at the base in both Pagai and Siberut macaques, but in Siberut macaques it is very much shorter. There is no indication that the ischial callosities of Pagai macaques are anything but a simple transverse oval shape like those of other members of the main *M. nemestrina* group, but without seeing living animals we cannot insist on this point.

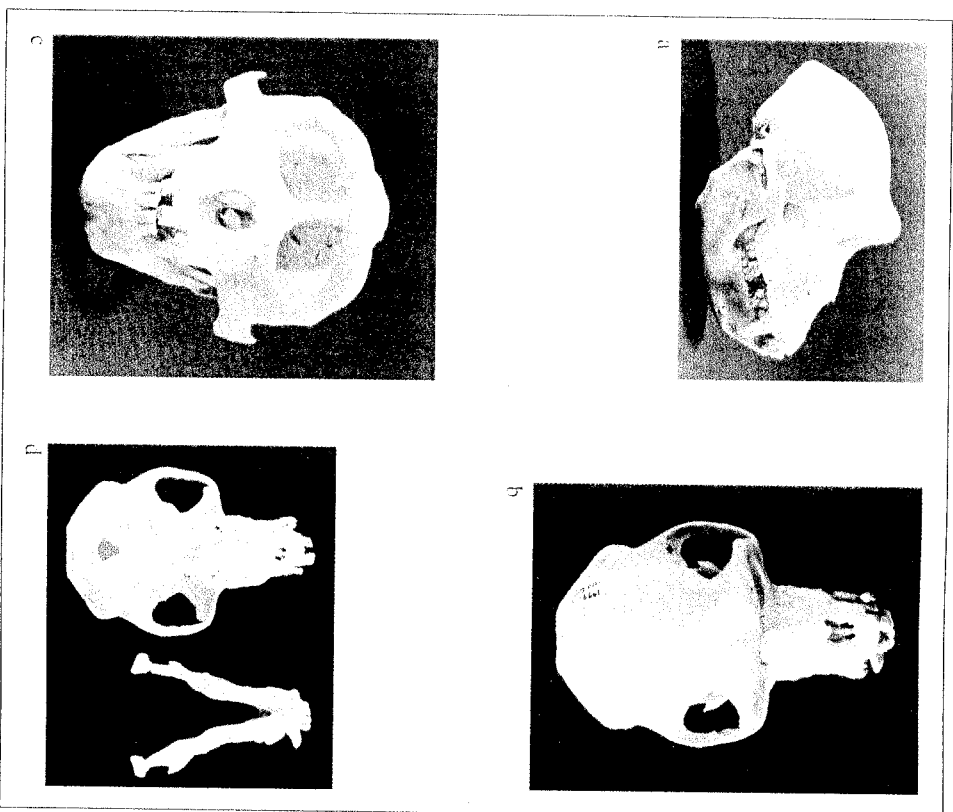


Fig. 3. — Lateral (a), dorsal (b), anterior (c) and ventral (including dorsal view of mandible) (d) views of the skull of a Siberut macaque. NMSZ1999.024 (N. McLean, NMS).

In the facial skeleton, the skulls of the two Siberut specimens are much broader than those of the Pagai macaques illustrated by Fooden (1975, Fig. 3); the supraorbital ridges and frontal processes of the zygomatic are much thicker, and the dorsal conca-

vity at glabella is unlike any other member of the main *M. nemestrina* group (Fig. 3). The skulls resemble South Sulawesian *M. maura* much more closely than they do those of the main *M. nemestrina* group. The degree of prognathism too similar to other members of the group, but the shape of the upper face, seen in side view, differs in the verticality of the interorbital pillar and the forward protrusion of the supraorbital ridges. The supraorbital ridges run nearly straight across, rather than sweeping backward bilaterally as in Pagai macaques; in this, they more resemble *M. nemestrina*. The zygomatic arches are straighter, less outbowed, than any other member of the group; in part this may reflect the great facial breadth, which means that their anterior ends are as widely apart as the posterior ends (as in many of the Sulawesi macaques). In the narrow-wing of the palate, the Siberut skulls resemble *M. nemestrina* and *M. leonina* rather than the Pagai macaque illustrated by Fooden (1975; Fig. 6).

The glans penis broadly resembles that of other members of the *M. nemestrina* group (Fig. 2), as illustrated and described by Fooden (1975), but appears to be rounder in both dorsal and lateral views, and the V-notch in the dorsal corona is different from the one of *M. leonina* figured by Fooden (1975:36). Fooden was unable to study any penis material of Pagai macaques.

CONCLUSIONS

Our conclusions on the affinities of the Siberut macaque are as follows:

1. It is certainly a member of the *Macaca nemestrina* group. This is shown by the form of the glans penis and of the tail, the elongated facial skeleton (not unique), and, very broadly, the hair pattern on the crown. This is confirmed also by a recent mitochondrial DNA phylogeny of Sulawesian macaques, which showed a specimen of *M. pagensis sibiru* as the sister taxon to *M. nemestrina* from Sumatra in a monophyletic clade (Evans *et al.* 1999).
2. Within this group, its affinities are with *Macaca pagensis*. Shared derived states are the non-agoni pelage, nature of the tail (haired only at the base, otherwise bare), and the pattern of hair on the crown.

TABLE 1. - Measurements (mm) for the four species of the *Macaca nemestrina* group, after Fooden (1975), Whitten and Whitten (1982), and our own data. Measurements are given as ranges and sample sizes in parentheses.

	<i>M. pagensis</i>	<i>M. leonina</i>	<i>M. nemestrina</i>	<i>M. sibiru</i>
Head and body length: female	435-456 (3)	400-490 (15)	434-576 (17)	473, 480
Relative tail length	0.25-0.33 (4)	0.23-0.48 (27)	0.28-0.44 (38)	0.14, 0.17
Skull length: Female	109.1-112.1 (3)	103.0-121.1 (19)	115.4-138.9 (35)	
Relative zygomatic breadth, male	134.2 (1)	124.1-140.1 (17)	139.5-174.5 (77)	132.3, 132.4
Relative zygomatic breadth, male	63.1 (1)	70.2 ± 0.58 (17)	64.5 ± 0.32 (76)	65.8, 70.3 (1)

TABLE 2. - Measurements (mm) and weights (kg) of Siberut macaques.

	NMSZ 1999:024	BMI 1933:11.9.1
Head and body length	480	473
Tail length	80.65	
Hind foot length	142	137
Ear length	30	39
Body weight	9.10	5.95*
Cranial length	132.4	132.0†
Zygomatic breadth	93.1	86.7‡

- * - eviscerated
 1 - from specimen label
 2 - remeasured by ACK

3. It is at the same time strongly and, as far as the evidence goes, consistently different from *Macaca pagensis* (Table 3). The consistency of the colour differences is attested by field observations. The shortness of the tail, and the skull differences, need to be tested on larger samples. Recent behavioural studies also appear to support its distinction from *M. pagensis* (Abegg and Thierry 2002).

TABLE 3. - Diagnostic pelage characters of *Macaca pagensis* and *M. sibiru*.

Character	<i>Macaca pagensis</i>	<i>Macaca sibiru</i>
Dorsal coloration	chocolate brown	jet black
Ventral coloration	paler chocolate brown	white/silvery-white
Cheek patches	absent	white
Neck patches	ochraceous buff	absent

4. The ischial callosities and the glans penis are different from those of *M. nemestrina*, *M. leonina* and *M. silenus*, but these characters are not described for *M. pagensis*.

The Siberut macaque is diagnostically different from *Macaca pagensis*, in fact very strongly distinct. We propose to remove it from *M. pagensis*, and recognize it as a distinct species, *Macaca sibiru* Fuentes and Olson, 1995, for which we select the Edinburgh specimen (NMSZ 1999:24) as the lectotype. It should not be surprising that we have reached this conclusion, because the Mentawai Islands have been separated from mainland Sumatra for at least 500,000 years (Abegg and Thierry 2002), and it is apparent that there has also been a similar degree of separation between Siberut and the southern Mentawai Islands given the observed patterns of speciation and subspeciation in endemic primates. It is beyond the scope of this paper to speculate about the colonisation of the Mentawai islands by macaques (see Abegg and Thierry 2002). However, our morphological study and a recent molecular study (Evans *et al.* 1999) suggest that the Mentawai macaques are most closely related to *M. nemestrina* rather than being the descendant of a proto-*silenus* macaque, which colonised the Malay Archipelago prior to the evolution and colonisation of *M. nemestrina* as proposed by Abegg and Thierry (2002).

ACKNOWLEDGEMENTS

We thank Daphne Hills and Paula Jenkins for access to specimens at the Natural History Museum, London. ACK is most grateful to Dr Bryan Carroll and John Parridge of the Bristol, Clifton and West of England Zoological Society for donating the Bristol Siberut macaque to the National Museums of Scotland and to David Arncliffe for providing further details on its early history after importation.

BIBLIOGRAPHY

- ABEGG, C. and B. TIMERY. 2002. – Macaque evolution and dispersal in insular south-east Asia. *Biological Journal of the Linnean Society*, 75: 555-576.
- BRANDON-JONES, D. 1993. – The taxonomic affinities of the Mentawai Islands srewi, *Presbytis potenziani* (Bonaparte, 1856) (Mammalia: Primates: Cercopithecoidea). *Raffles Bulletin of Zoology*, 41: 331-357.
- CHASEN, F.N. 1940. – A handlist of Malaysian mammals. *Bulletin of the Raffles Museum, Singapore*, 15: 1-88, 1-209.
- CHASEN, F.N. and C.B. KLOSS. 1928. – Spolia Mentawensia: Mammals. *Proceedings of the Zoological Society of London*, 97: 797-840.
- DE BEACK, O. 1923. – Contributo allo studio dei macachi. *Atti della Società Linguistica di Scienze e Lettere II*, 1: 22-39.
- EVANS, B.J., J.C. MORALES, J. SUPRIATA, and D.J. MELNICK. 1999. – Origin of the Sulawesi macaques (Cercopithecoidea: *Macaca*) as suggested by mitochondrial DNA phylogeny. *Biological Journal of the Linnean Society*, 66: 539-560.
- FOODEN, J. 1975. – Taxonomy and evolution of honal and pigtail macaques (Primates: Cercopithecoidea). *Feldiana Zoology*, 67: 1-168.
- FUENTES, A. and M. OLSON. 1995. – Preliminary observations and status of the Pagai Macaque. *Asian Primates*, 4: 1-4.
- FUENTES, A. and E. RAY. 1996. – Humans, habitat loss and hunting: The status of the Mentawai primates on Sipora and the Pagai Islands. *Asian Primates*, 5 (3-4): 5-9.
- GOELTENBOTH, F. and K.H. TIMOTRIS. 1996. – Impact of rainforest destruction – the Siberut Island case, Sumatra, Indonesia. In: Edwards, D. S (ed.), *Tropical Rainforest Research – Current Issues*, pp. 425-433. Kluwer Academic Publishers.
- GROVES, C.P., 1996. – The nomenclature of the Tanzanian Mangabey and the Siberut Macaque. *Australian Primateology*, 10, 4-25.
- GROVES, C.P., 2001. – *Primate Taxonomy*. Smithsonian Institution Press, Washington.
- International Code of Zoological Nomenclature, Third Edition, adopted by the XX General Assembly of the International Union of Biological Sciences, 1985. *International Trust for Zoological Nomenclature in association with British Museum (Natural History)*, London.
- MILLER, G.S., 1903. – Seventy new Malaysian Mammals. *Smithsonian Miscellaneous Collections*, 45: 1-73.
- MITCHELL, A.H. and R.L. TILSON. 1986. – Restoring the balance: Traditional hunting and primate conservation in the Mentawai Islands, Indonesia. In: ELSE, J.G. and P.C. LEE (eds.), *Primate ecology and conservation*, vol 2, pp. 249-260. Cambridge University Press, Cambridge.
- ROWE, N., 1996. – *The pictorial guide to the living primates*. Pogonias Press, East Hampton.
- SCHWARZ, E., 1934. – Ueber einen Hybriden von Schweinsaffe (*Macaca nemestrina* Linnaeus) und Mohrenmakak (*Macaca nigra maura* F. Cuvier). *Zoologische Garten*, 7: 44-46.
- TENAZA, R. and R.L. TILSON. 1985. – Human predation and Kloss's gibbon (*Hyllobates klossii*) sleeping trees in Siberut Island, Indonesia. *American Journal of Primatology*, 8: 299-308.
- WHITTEK, A.J. and J.E.J. WHITTEK. 1982. – Preliminary observations of the Mentawai macaque on Siberut Island, Indonesia. *International Journal of Primatology*, 3: 445-459.
- WILSON, C.C. and W.L. WILSON. 1977. – Behavioral and morphological variation among primate populations in Sumatra. *Yearbook of Physical Anthropology*, 20: 207-233.