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A REVISION OF THE ASIAN PIED LEAF MONKEYS (MAMMALIA: CERCOPITHECIDAE: SUPERSPECIES *SEMNOPITHECUS AURATUS*), WITH A DESCRIPTION OF A NEW SUBSPECIES

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Abstract. - The nomenclature (where relevant), type specimens, type localities, geographic distribution and integumental characters of the leaf monkey species, *Semnopithecus auratus*, *S. francoisi*, *S. hatinhensis*, *S. laotum*, *S. delacouri* and *S. johnii* are reviewed. *Trachypithecus leucocephalus* is interpreted as an albinistic morph of *S. francoisi*. A new Indochinese subspecies is described for the Sundaic *S. auratus*. The nominal taxon, *S. poliocephalus*, known only from Cat Ba island, Vietnam, is recognized as a subspecies of the hooded black leaf monkey, *S. johnii*, otherwise endemic to southern India. Limited observations indicate an association between the Indochinese populations and a limestone habitat where trees are sometimes stunted or absent, and the monkeys take refuge in rock holes and caves. External characters clinally vary between taxa independently of each other and do not conform to a conventional geographic distribution. The close taxonomic affinity of these Javan, Indochinese and southern Indian taxa indicates that they are the remnants of a formerly continuous distribution, fragmented by the cool and dry climate accompanying the most recent glaciation. The pre-glacial population was perhaps classifiable as a single species with clinally intergrading subspecies. The anomalous geographic distribution of external characters in the surviving populations is interpreted as indicating that the climatic deterioration was sufficiently slow as apparently to avoid the extinction of any of these subspecies; but sufficiently rapid as to prevent them from interbreeding into a single population as their distribution contracted to its present extent. The eccentric ecology of the Indochinese pied leaf monkeys is perhaps symptomatic of the climatic traumas they endured.

INTRODUCTION

An Indochinese black leaf monkey with white sideburns was designated as *Semnopithecus francoisi* in 1898 and, at approximately 10 or 20 year intervals up to the present time, descriptions of six related nominal taxa with varying degrees of pale pelage colour on the head, rump, paws and tail, have followed. The description of *Semnopithecus delacouri* in 1932, brought the number of nominal Indochinese taxa to four, and presented Osgood with

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the opportunity to review the group. Osgood (1932: 206) drew attention to the "wholly black" leaf monkey specimen here adopted as the holotype of a new subspecies, and suggested that it and the others belonged to a "restricted group which in turn evidently are related to *P[ithecus] potenziani* of the West Sumatran Mentawi Islands, a very distinct species not heretofore closely associated with any other" (Osgood, 1932: 205). Pocock (1935: 955) pointed out that *Presbytis potenziani* was distinguished "by its entirely white cheeks and throat and the reddish-brown hue of the belly, as well as in its shorter tail and some skull-characters". Pocock (1935: 956) noted that the Indochinese forms "exhibit some curious cross resemblances, and evidently form a natural assemblage, but on the available evidence must be given specific rank. Nevertheless, as Osgood surmised, it seems likely enough that intergrading forms will be discovered, reducing them to subspecific rank". Ellerman & Morrison-Scott (1951: 210-211) reflected their equivocal taxonomic status by the insertion of a parenthesized question mark before the specific epithet, "*françoisi*", when in combination with a "subspecific" name other than that of the nominate subspecies.

Dao (1970: 61) claimed that the study of a series of black leaf monkeys (skins and skulls) collected in various localities in north Vietnam from 1956 to 1966, "nous a permis de confirmer que, tous les semnopithèques noirs du Vietnam appartiennent à la même espèce, *Presbytis francoisi*". Having received from him (*in litt.*, 2 Feb.1977) a list of the series deposited at the Zoology Laboratory, University of Hanoi, it is evident that the series is far from adequate to justify such a claim which appears to rest primarily on the resemblance of *Semnopithecus hatinhensis* to *S. francoisi* in lumbar, and to *S. delacouri* in cephalic, pelage colour. The intermediates between "*Presbytis francoisi leucocephalus*" and *S. francoisi* claimed by Li & Ma (1980) and Ma et al. (1989), are more reasonably interpreted as albinistic variation in the latter species (see below, p. 17).

Cranial similarities and an identical neonatal pelage colour demonstrate a close relationship between *S. obscurus* (reviewed by Pocock, 1935, and Chasen, 1935) and *S. francoisi*. What has escaped comment is that if the latter is represented by more than one subspecies, their variation is of a radically different nature. No subspecies of *S. obscurus* displays a blackish pelage of the pure glossy quality present in the pied* leaf monkeys, nor do colour fields on the body show such precise demarcation, and *S. obscurus* subspecies clinally intergrade in a manner usually so imperceptible as to encumber their geographic definition. No such difficulties beset the student of Indochinese pied leaf monkey zoogeography, despite the fact that their "subspecies" are probably geographically more closely aggregated. Only Osgood (1932) has attempted an investigation of their relationship with other species. In associating them with *Presbytis potenziani*, he was misled by convergence (Brandon-Jones, 1993), but his intimation (p. 206) of an affiliation with the Javan black leaf monkey is borne out by cranial resemblances. An overall review of the Asian Colobinae reveals that these cranial and pelage colour resemblances are also shared by the leaf monkeys of Sri Lanka and southern India.

In view of the compelling evidence presented by Pocock (1928, 1935), Washburn (1944), Hooijer (1962), Weitzel (1983) and Brandon-Jones (1993) for at least a bipartite division of the species commonly aggregated in the genus *Presbytis* Eschscholtz, 1821, and in the absence of a comprehensive review of generic status throughout the subfamily Colobinae, two of the three genera advocated by Pocock (1935), are here adopted. *Trachypithecus* Reichenbach, 1862, is treated as a subgenus of *Semnopithecus* Desmarest, 1822. The

* This epithet is adopted as a convenient collective term for the leaf monkeys reviewed in this paper.

subspecific relationship to be demonstrated in this paper, between the Indian and the Tonkin hooded black leaf monkey precludes recognition of the fourth genus, *Kasi* Reichenbach, 1862, added by W. C. O. Hill (1936). This genus-group name is therefore subsumed into the simultaneously published *Trachypithecus*. With the exception of the sinking of *Trachypithecus leucocephalus* Tan, 1957, into the synonymy of *Semnopithecus francoisi* Pousargues, 1898, the taxonomic arrangement follows that of Brandon-Jones (1984).

For the reasons discussed on p. 33-34, the Asian pied leaf monkeys are treated as species of the superspecies, *Semnopithecus auratus*. In accordance with Article 6(b) of the International Code of Zoological Nomenclature (1985), the superspecies name (*auratus*) is interpolated in parentheses between the genus-group name (*Semnopithecus*) and the specific name (e.g. *francoisi*). The synonymies presented in this paper are restricted to the earliest detected publication of all the genus-group and species-group combinations to which the taxa have been referred. The alternative locality names in square parentheses are not intended to represent the authoritative spelling for a locality, but only the spelling under which the locality was identified or, in the case of Pinyin Chinese names, the spelling by which the locality may be more familiar. Abbreviations employed for the institutions at which specimens are stored, are as follows: AMNH - American Museum of Natural History, New York; FMNH - Field Museum of Natural History, Chicago; LM - Nationaal Natuurhistorisch Museum, Leiden; MNHN - Muséum National d'Histoire Naturelle, Paris; MZB - Museum Zoologicum Bogoriense, Bogor; UH - Zoology Laboratory, University of Hanoi; USNM - National Museum of Natural History, Smithsonian Institution, Washington D.C.; ZD - Natural History Museum, London; ZRC - Zoological Reference Collection, Department of Zoology, National University of Singapore; and ZSI - Zoological Survey of India, Indian Museum, Calcutta.

Semnopithecus (Trachypithecus) (superspecies *auratus*) *auratus* (Geoffroy Saint-Hilaire, 1812)

Ebony leaf monkey

Nomenclature. - The earliest available species-group name that may pertain to the ebony leaf monkey is *Simia Maura* Schreber (1774: 107-108, pl. XXII B). Weitzel & Groves' (1985: 402) contention that it is indeterminable is open to question. Elliot (1913: 77) justifiably rejected Thomas and Wroughton's (1909: 372) opinion that its primary basis was the "Middle-sized Black Monkey" of Edwards (1764: 221, pl. 311). Elliot's statement that the "baby *yellowish brown* monkey" *his* which Schreber had to hand "was the type of his *S. maura*" constitutes a lectotype designation, and determines the application of the species-group name. For reasons not relevant to this paper, it is believed that the lectotype could well have been an infant *Semnopithecus obscurus*. In view of the uncertainty, and in the interests of stability of nomenclature, the species-group name *Simia Maura* Schreber, 1774, should be suppressed under the plenary powers of the International Commission for Zoological Nomenclature. Weitzel & Groves (1985) overlooked the "orange-cinnamon" pelage-coloured variants of *Semnopithecus cristatus* at Abai [5°41'N 118°23'E] in Borneo (Allen & Coolidge, 1940: 143-145) as yet another possible identity for *Cercopithecus auratus* Geoffroy Saint-Hilaire, 1812 (p. 93). The apparent absence of a crest, and perhaps even the black hairs on the kneecaps and parts of the tail of the holotype, tend to discredit this possibility. It is also improbable for political reasons. C. J. Temminck, a Dutchman, is more likely to have obtained it from one of the then Netherlands possessions, and this conclusion is strengthened by the report (Müller, 1839: 16) that the holotype was received from Samarang [= Semarang 6°58'S 110°25'E] in central Java.

A second species-group name to antedate *Semnopithecus Pyrrhus* Horsfield, 1823 is *Simia Mauritius* Griffith, 1821 (p. 58). Long-assumed to refer to the long-tailed or crab-eating macaque, the only primate inhabiting the island of Mauritius, an examination of the original description and plate shows that the holotype must have reached London by way of, rather than from Mauritius. The "uniform, black hair", the very short thumbs and the slender build leave little doubt that it is actually a Javan ebony leaf monkey. Although said to possess cheek pouches, these were often wrongly diagnosed as present in colobine species before the distinctions between the two cercopithecid subfamilies were fully appreciated. The present review indicates that *Pithecus pyrrhus sondaicus* Robinson & Kloss, 1919 (p. 374), the species-group name currently applied to the west Javan ebony leaf monkey, is intermediate with the nominate subspecies. The retention of such scientific names poses a perennial threat to nomenclatural stability. It is therefore here rejected as a junior subjective synonym of *Cercopithecus auratus* Geoffroy Saint-Hilaire, 1812, and substituted with *Simia Mauritius*.

Specimens examined. - In order to assess geographic variation in the melanic pelage colour morph, descriptions of 97 skins from 47 localities were compared. These localities fairly well represented the range of the species so far as it has been reported (Fig. 1). Skins in neonatal pelage or still substantially in transitional coat, were excluded from the survey, but the series included two infants (deciduous dentition only) and six juveniles (any stage between and including crown apex of first permanent dentition above level of alveolar margin, to one permanent tooth still below this level). Descriptions of MZB skins were wholly and of ZRC skins partly, derived from notes generously placed at the author's disposal by C. P. Groves. Many LM specimens have no accession numbers. Those denoted "LM (H)" are listed by Hooijer (1962: 26-27), and are allocated his specimen numbers. Those denoted "LM (S)" were collected by H. J. V. Sody, and are suffixed with his collector's number. A = adult; S = subadult; J = juvenile; I = infant; M = male; F = female. To facilitate ease of reference, localities have been designated numerically, and where more than one skin derives from a single locality, an alphabetical suffix is appended.

Mt. [= Gunung] Pantjar [6°35'S 106°54'E]: ZD 1907.6.18.1, J M (**1**). Buitenzorg [=Bogor 6°30'S 106°58'E]: MZB 1876, [A] M (**2**). Tjisalak [= Cisalak 6°23'S 106°51'E]: MZB 558, [A] F (**3**). Leuwiliang [6°34'S 106°37'E]: MZB 2344, [A] M (**4a**); MZB 2345, S F (**4b**). Djasinga [6°29'S 106°27'E]: MZB 2053, [A] M (**5a**); MZB 3188, [A] F (**5b**). Ujung Kulon [=Menandjung Udjung-kulon 6°45'S 105°20'E]: MZB 6694, S F (**6**). Wynkoops Bay [=Pelabuhanratu 6°59'S 106°33'E] (100 ft.): ZRC 4.380, [A] F (**7a**); ZRC 4.381, J M (**7b**). Tjikaso [=Tji Kaso 7°25'S 106°40'E]: MZB 8008, S M (**8**). Tji Wangie [=Tjiwangi 7°04'S 107°02'E] (4000 ft.): ZD 1909.1.5.[14], [A M] (**9a**); ZD 1909.1.5.15, A M (**9b**); ZD 1909.1.5.16, A F (**9c**); ZD 1909.1.5.17, A F (**9d**). Tjeringin, near Bandjar [c. 7°21'S 108°30'E], LM (S) 6f, A F (**10a**); LM (S) 10f, A F (**10b**); LM (S) 21f, A F (**10c**); LM (S) 14f, J F (**10d**). G[unung] Salak [6°42'S 106°44'E] (700 m.): LM (S) A214, A M (**11a**); LM (S) A233, [A] M (**11b**); LM (S) A127, J F (**11c**); LM (S) A128, J F (**11d**). Kosala [6°37'S 106°24'E] (2500 ft.): ZD 1882.2.6.1, A M (**12**). Oedjoengteboe [=Udjungtebu 6°15'S 106°00'E] (1000 ft.): ZRC 4.382, A F (**13**). G. Pangerango [=Gunung Pangrango 6°46'S 106°57'E]: LM 14607, A M (**14a**); LM 2067/1, [A] M (**14b**); LM 2067/2, [J] F (**14c**). Tjibodas [6°45'S 107°01'E] (5000 ft.): ZD 1949.423, A M (**15a**); ZD 1954.62, A M (**15b**); MZB no no., S F (**15c**). Tjikoedjang [?=Cikujang 6°41'S 107°03'E]: MZB 6693, S M (**16**). Pengalengan [7°10'S 107°34'E]: LM 5919 e, S M (**17a**); LM 5919 i, S F (**17b**). Tirtasari [7°10'S 107°36'E]: LM 5919 m, S F (**18**). Tjibeureum [7°11'S 107°36'E]: LM 5919 k, S M (**19a**); LM 5919 f, S F (**19b**); LM 5919 a, A F (**19c**); LM 5919 [d], A F (**19d**); LM 5919 l, A F (**19e**). [Tjibeureum]: LM 5919 [g/j], A F (**19f**). Kaligua [The first of 3 localities near Gunung Slamet 7°14'S 109°12'E]: MZB 6690, [A] F (**20a**); MZB 6691, [A] M (**20b**); MZB 6692, S M (**20c**). Kalikidang (700 m.): LM (S)125C, A F (**21a**); LM (S) 126C, A F (**21b**). Tjoeroegilang (1000 m.): LM (S) 15C, A M (**22**). Pagilaran [7°06'S 109°52'E] (1300-1500 m.): LM 14606, A F (**23**). Tjandiroto [7°10'S 110°03'E] (600 m.): LM (S) 72B, A F (**24a**); LM (S) 108B, A F (**24b**). Gedangan [7°11'S 110°41'E] (65 m.): MZB 6695, [A] M (**25a**); LM (S) 11, A M (**25b**); LM (S) 8, A F (**25c**). Pangonan, Goenoeng Moeria [=Gunung Murjo 6°36'S 110°53'E] (550 m.): LM (S) M38, A F (**26a**); LM (S) M39, I F (**26b**). G.

Lawoe [=Gunung Lawu 7°38'S 111°11'E] (1500-1600 m.): LM 14609, S M (**27**). Kawarassan [=Kawarasan 7°49'S 112°07'E]: LM 2067/4, [S] F (**28**). Wonokoio, Dampit, S. Malang [c. 8°13'S 112°45'E]: LM (S) I A, [A] ? (**29a**); LM (S) IV B, [A] ? (**29b**). Batoe [=Batu] district [c. 7°52'S 112°31'E]: LM (H) 15, [S] F (**30a**); LM (H) 16, [S] F (**30b**). Soerabaya [=Surabaja 7°15'S 112°45'E]: LM (H) 29, [A] M (**31a**), LM (H) 30, [A] M (**31b**). Pangandaran [7°41'S 108°39'E]: ZD 1909.1.5.4, A M (**32**). Kalipoetjang [=Kaliputjang 7°39'S 108°44'E]: ZD 1909.1.5.18, I F (**33**). Djoembleng [7°44'S 108°56'E]: MZB 2094, [A] F (**34**). Tjilatjap [7°44'S 109°00'E]: ZD 1909.1.5.8, A M (**35a**); ZD 1909.1.5.9, A F (**35b**); ZD 1909.1.5.11, A F (**35c**); ZD 1909.1.5.12, A F (**35d**). Karangbolang [=Karangbolong 7°45'S 109°28'E] (100 ft.): ZRC 4.377, A M (**36**). Ijang geb[ergte=Pegunungan Ijang, c. 7°58'S 113°38'E] (1400 m.): MZB 1927, A F (**37**). Ongop-ongop [8°05'S 114°14'E] (1700 m.): ZD 1954.56, A M (**38a**); ZRC 4.373, A M (**38b**); ZRC 4.372, [A] F (**38c**); MZB 704, [J] F (**38d**). Sudoeng jrok [c. 8°05'S 114°14'E] (3900 ft.): ZD 1954.57, A M (**39a**); ZD 1954.58, A M (**39b**); ZRC 4.375, A M (**39c**); ZRC 4.374, A F (**39d**); ZD 1954.59, A F (**39e**). Tamansari [=Tamansuruh 8°12'S 114°17'E] (1600 ft.): ZD 1954.60, A M (**40a**); ZRC 4.376, A F (**40b**). Badjoelmati [=Badjulmati 7°56'S 114°23'E] (100 ft.): ZD 1954.61, A M (**41**). Wonoredjo, Kosambikerap [c. 7°55'S 114°23'E]: MZB 6696, S M (**42a**); MZB 6697, S F (**42b**). Sendang [8°08'S 114°38'E]: LM (S) E9, S M (**43a**); LM (S) E77, A M (**43b**); LM (S) E27, A F (**43c**); LM (S) E35, A F (**43d**); LM (S) E38, A F (**43e**); LM (S) E39, A F (**43f**); LM (S) E42, A F (**43g**). [Danau Bratan 8°16'S 115°11'E]: ZD 1913.3.6.1, A M (**44**). Mangsit Hill [8°28'S 116°04'E]: ZD 1939.1143, A M (**45**). Sapit [8°27'S 116°32'E]: MZB 6689, J M (**46**). Sembaloen [=Sembalunlawang 8°23'S 116°32'E]: MZB 6688, J M (**47**).

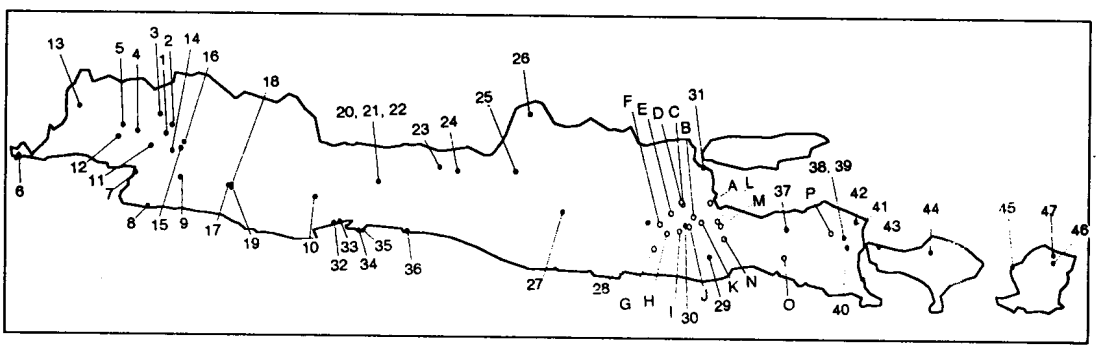

Fig. 1. Map of *Semnopithecus auratus* localities

- • Melanic morph
- o Erythristic morph

For localities 1 - 47, see text

A = Rembang	[7°38'S 112°48'E]	ZD
B = Ardjuno	[7°46'S 112°36'E]	MZB, ZRC
C = Modjokerto	[c. 7°38'S 112°30'E]	ZD
D = Pugeran	[c. 7°37'S 112°29'E]	MZB
E = Wonosalam	[7°43'S 112°22'E]	LM
F = Manggis	[7°50'S 112°14'E]	LM*
G = Blitar	[8°06'S 112°10'E]	MZB
H = Kelud	[7°56'S 112°19'E]	LM*
I = Kawi	[7°55'S 112°27'E]	LM*
J = Batu District	[c. 7°52'S 112°32'E]	LM
K = Lawang	[7°50'S 112°42'E]	Kohlbrugge, 1896
L = Puspo	[7°50'S 112°52'E]	Kohlbrugge, 1896
M = Tosari	[7°53'S 112°54'E]	LM
N = Smeroehoeve	[8°01'S 112°56'E]	Bemmel-Leineman and Bemmel, 1940
O = Between Djember and Puger	[c. 8°16'S 113°35'E]	LM
P = Kendeng III	[c. 8°01'S 114°07'E]	MZB

* Skulls only, the identification is inscribed (presumably in E. Dubois' handwriting) on each skull. Dubois evidently regarded the orange-haired morph as a separate species.

Description. - Of the six skins which did not obviously display the erect forward curled circumfacial hair characteristic of the species, four (**10d**, **11d**, **14c** and **26b**) were an infant and three juveniles. Its apparent absence in some of these and the two adult skins (**14a** and **25c**) may well be an artefact of their preparation and preservation. All personally examined skins had pinnal hair whitish with variable, mainly distal, tinges of yellowish, brownish or blackish. Female skins had a pale pubic hair patch, usually yellowish white. Infant and juvenile skins appeared imbued with more brownish in their pelage than adult skins from the same locality. Skin **1** was dorsally blackish with silvered axillae, ventral tail root and adjacent rear of the thigh. The underside of the trunk was blackish brown. In skin **10d** the venter (grey to blackish in adults from the same locality) and the underlying colour of the circumpinnal hair (blackish in the adults) were brownish. On the central chest where **10d** was pale brownish, and on the ventral shank, the adults were whitish. Their dorsal silvering was more intense, and was not largely restricted to the elbow, leg and tips of the circumpinnal hairs. **7b**, on the other hand, was more silvered than **7a** on the nape, back, brachium and especially leg. Juveniles **11c** and **11d** did not have the crural silvering present in adults **11a** and **11b**. All Gunung Salak skins were brown along the lateral chest, but in **11d** this colour extended throughout the venter. **14c** was similar to **11d**, but retained residual neonatal orange on the chin, anterior to the pinna, and on the distal dorsum of the tail. **26b** also had traces of orange on the forehead and distal tail. Its circumpinnal hair was yellowish brown with slight silvering. It showed considerable silvering on the dorsum of the legs, with a very reduced intensity on the brachium, occiput, nape, flanks, and amongst the dark grey hairs of the underside of the trunk, especially along the midline of the chest. In skin **33** the venter and circumpinnal hairs were brownish, grading to greyish towards the axillae. The yellowish pubic hairs extended onto the ventral tail root, and the rest of the pelage was brownish black.

Skins **2**, **4b**, **5a**, **5b** and **8** were described as almost jet black, without silvering. Their undersides were black, rather than grey. Skins **3** and **6** were similar with browner bellies. **20b** had minimal ventral pelage colour dilution. Skin **4a** was like **3** and **6**, with slightly browner legs and whiskers. **7a** was brownish black with blackish brown venter and circumfacial hair.

In **9a** the paws were brownish black while the rest of the pelage was deep blackish brown, marginally paler on the venter, circumpinna, sideburns, chin and rear edge of the thigh. It had the faintest traces of silvering on the back, slightly stronger on the shank and mid thigh. The ventral trunk in the other Tji Wangie skins which had not been on exhibition and subject to fading, was brownish black with a greyish tinge in **9c**. Otherwise the pelage was blackish with the ventral tail root very faintly silvered in **9b** or, in the females, sprinkled with yellowish white hairs which extend between the callosities.

All Tjeringin skins were predominantly blackish, paler on the throat, with silvering concentrated on the circumpinnal hair and at the elbow. Silvering was also conspicuous on the leg in **10a** and **10b**, but less so in **10c**. **10a** and **10c** had silvering on the ventral forearm (more distally extensive in **10a**) and faintly in the centre of the dorsal brachium and in a nuchal arc from shoulder to shoulder. In **10a** this extended onto the occiput and formed a fairly marked interpinnal tract. **10b** had the most silvering on the arm but, like **10a**, there was a concentrated patch immediately below the shoulder. The venter was grey in **10a**, blackish in **10b** and dark grey in **10c**.

In **11a** and **11b** some scrotal hairs were whitish. The circumpinnal, shoulder, sternal and posterior crural hairs were dark brown. The lateral part of the chest was brown, less markedly in **11a** whose tail was also distally brownish, but probably through superficial damage. The

rest of the pelage was basally brownish, but otherwise blackish with faint silvering on the shank and posterior of the thigh. **12** was dorsally blackish with silvering on the posterior shank, fainter on the thigh and anterior to the pinna, and still fainter on the hind flank. The venter was brown, more blackish on the thoracic midline and pectoral region. **13** was brownish black except on the whiskers, circumpinna, shank and venter, especially the postumbilical region and lateral chest which were more brownish. There was very faint silvering on the thigh.

14a resembled juvenile **11c**, but the sternal pelage and the posterior of the leg were paler brown. **14b** resembled **11b** but the silvering was more conspicuous and included the dorsal arm around the elbow. **14a**, **19d**, **20a**, **23** and to a greater extent **19e**, all had whitish hairs sprinkled on the tail tip. In **19f** this intermingling pervaded the tail, although less so on the proximal half. **15a** and **15b** were dorsally blackish with silvering on the posterior of the leg, especially in **15b** which also had faint silvering on the anterior of the back. The venter was blackish brown. **15c** was simply described as jet black. Skin **16** was described as almost jet black, tinged with silver on the rump and especially the legs, with the whiskers and underside brownish black. In **16** and **20c** (Boeadi, *in litt.*, 9.ix.1977), **15a**, **15b**, **19c**, **19e**, **19f**, **24a** and **25b** whitish or yellowish hairs were intermingled with the blackish ones of the paws.

17a and **17b** both resembled juvenile **11d**, but with the ventral trunk and posterior ventral thigh a paler brown, epecially in **17b**. Silvering on the ventral posterior of the leg was more discernible in **17a**, probably owing to the darker background colour. **17a** had an isolated patch of whitish hairs dorsal to the right shoulder. **18** also resembled **11d**, but the venter and thigh were more blackish. Whitish pubic hairs were more discernible than in **17b**. All the Tjibeureum skins except **19b**, had a sparser ventral pelage than those from G. Salak and G. Pangrango. **19e** also appeared to have a shorter and sparser dorsal pelage. All skins had faint silvering on the posterior of the leg. This was most apparent in **19d**, perhaps owing to its background colour being the darkest of the series, and least in **19a**. The flanks and posterior of the arms were suffused with brownish in **19c** and **19e**, and to a lesser extent in **19a**, which had most brownish on the shank. In **19f** whitish hairs fringed the abdomen and upper ventral thigh, were intermittently sprinkled on the dorsal trunk and the posterior of the arm, and yellowish hairs extended for about 100 mm along the ventral tail root. The venter was brown in **19a-c** and **19f**, but more blackish laterally in **19d** and **19e**. The lower lateral chest appeared somewhat paler in **19a** and **19e**.

20a had some brown on the whiskers and some pale hairs on the legs. **20c** resembled skin **4a**, but the legs were tinged with grey, as was the rump. **21b** was faintly silvered on the elbow, the anterior dorsum of the thigh, the ventral shank, in a nuchal arc between the pinnae and at the tips of the brownish circumpinnal hairs. The venter was brownish with a pale sternal patch. **21a** was similar with slightly more brownish and less silvering on the shank and nape. The venter was grey with a whitish sternal patch. Skin **22** was silvered only on the anterior dorsum of the thigh and the ventral shank. The circumpinnal hair was brownish and the venter blackish brown.

In **23** faint silvering congregated on the elbow, the ventral forearm and in a nuchal arc. It was stronger on the shank, dorsal edges and ventral thigh and, owing to the intensity of the blackish background colour, exceptionally conspicuous on the circumpinnal hair. Whitish hairs occurred on the dorsal tail root, and on the throat and thoracic midline. The rest of the venter was blackish brown. Of the above described skins only **10b** emulated **24a** and **24b** in the prominence of its crural silvering, especially on the posterior shank. Silvering of the

whiskers and nape was more evident, and intensified on the occiput. The circumpinnal silvering coalesced frontally to form a complete circle with that of the interpinnal tract. Silvering pervaded the arms, but showed no concentration at the elbow and on the brachium especially in **24b**, tended to be restricted to the posterior edge. As in **10b** there was a very faint silvery incursion onto the rump anterior to the tail root. The throat hairs were whitish grey. The venter and tail were not preserved in **24a**. In **24b** the venter was blackish with a whitish midline. The ventral tail root was whitish and very faint silvering extended along its proximal edges.

25a had considerable silvering on the cheek, crest, leg and rump, slight silvering on the tail and slighter still on the arm. The belly was brownish with grey hairs. Silvering on the occiput in **25b** was more uniformly the intensity of the interpinnal tract in **24a** and **24b**, and stronger still towards the vertex. The paler background colour and relative sparsity of the sideburns and chin reduced the conspicuousness of silvering in the circumfacial hair. This was also reduced on the shoulder, but more concentrated at the elbow, with a very faint incursion onto the metacarpal hairs. The blackish thoracic hair was tipped with whitish towards the ventral midline. **25c** which had less crural silvering than **25b**, differed from **10b** only in the increased silvering on the arms, circumpinna, occiput and crown, especially at the vertex. Circumfacial silvering was unexceptional, and the brownish grey venter was slightly more medially suffused with whitish. **26a** differed from **25b** only in the reduced silvering on the nape and arm, and the increase in whitish on the venter. **27** differed from **25b** only in an increase in silvering circumfacially, on the ventral thigh and on the thoracic midline, with less on the ventral flank.

In **28** crural silvering was very sparse except on the edges of the thigh and marginally onto the posterior edge of the shank. Silvering on the arm was restricted to the posterior edge of the brachium where it was concentrated at the elbow. Cephalic silvering was largely restricted to a faint nuchal and interpinnal semi-circle. The very faint silvering on the back was mainly on the hind-flank. The venter was blackish brown with some silvering, especially in the sternal region, throat and forearm. Skins **29a** and **29b** consisted solely of the head and anterior of the trunk. **29b** was predominantly blackish with a brown tinged circumpinna and the faintest trace of silvering on the nape. The lower chest was whitish brown. **29a** was similar, but the circumpinna was deeper brown with nuchal silvering strongest on the long suprapinnal hairs and faintly extending onto the occiput. The venter was grey with dissipated silvering on the throat.

Skin **30a** resembled **10b** but its circumfacial silvering was more conspicuously continuous frontally and, intermingled with some short completely whitish hairs, converged closer to the lateral facial margin. Like **10b** there was only the faintest trace of silvering on the nape and anterior of the back. Whitish hairs were abundant on the sides of the throat, and more generally distributed on the venter than in **10b**, but particularly concentrated in the sternal region and the abdominal midline. **30b** was dorsally blackish brown with brownish circumpinnal and ventral pelage. It was devoid of silvering except very faintly on the posterior edge of the leg. **31a** resembled **30b** with dorsal silvering faintly sprinkled on the brachium and leg, especially on the posterior edge of the knee and shank. **31b** resembled **25b**, but silvering was absent from the occiput and very faint, but more uniformly distributed on the nape and back, where it was more widespread than in **25b**. The more brownish venter had no whitish tinge.

32 was dorsally blackish but, apart from the paws and distal tail, faintly silvered throughout, more intensely on the leg, brachium and circumpinna. The blackish venter was silvered,

especially towards the throat, abdomen and tail root. Skin **34** had considerable silvering on the legs, rump, crest and cheeks, and slight silvering on the arms and tail.

The Cilacap skins were dorsally blackish with very faint silvering throughout the back in **35a** and **35c**, stronger on the shank and anterior to the pinna. In **35c** it extended onto the brachium and especially the thigh. In **35b** and **35d** there was silvering on the limbs and circumpinna, extending faintly throughout the back in **35b**, and faintly onto the nape and mid-shoulder in **35d**. The venter in **35a** and **35c** was blackish tinged towards the abdominal midline with brownish in **35a**, and with yellowish in **35c**. In **35b** and **35d** it was blackish grey with silvering towards the midline. The pubic hair was yellowish white in **35b** and **35d**, yellowish in **35c** and yellowish brown in **35a**.

Skin **36** was faintly silvered around the vertex, flank, anterior of the back and tail base; moderately so on the nape, rump, forearm, elbow and lateral chest; and conspicuously so on the sideburns, circumpinna, shoulder, brachium and leg. The throat was yellowish white, the sternal region yellowish brown and the central abdomen greyish yellow. The skin resembled, but was paler than skins **38b-c**, and much paler than skins **39c-d** and **40b**, silvering being absent only on the back. Skins **38d** and **42a-b** were blackish with silvering on the limbs above the paws, especially the inner surface, and on the head, especially the whiskers. The venter was dark grey. Skin **37** was similar with much silvering on the crown and whiskers, but less on the limbs. In a comparison of skins **35b**, **38a**, **39a-b**, **39e**, **40a**, **41**, **44** and **45**: **38a** had most silvering on the limbs, especially the forearm; **39b** compared with **38a** in the amount on the shank and had most silvering on the rump and scapular region; **38a** and **41** had most on the fringe above the temple; **41** had most on the nape; **45** and especially **38a** had considerable silvering on the proximal part of, and in **38a** throughout the tail. **39e** was only somewhat more silvered than **35b** on the limbs, head and throat, and the rest of the pelage was more brownish than in **35b**. **44** had a distinctly brownish dorsal hue, but **45** was not distinguishable from the rest in this respect.

In **43a-g** the pelage colour was exclusively blackish on the paws and tail. Silvering was prevalent on the elbow and anterior dorsum of the thigh, fairly conspicuous on the posterior edge of the brachium and leg, encroaching onto the dorsal shank, but very faint on the rest of the leg and the back, where it was most discernible postero-laterally. **43d-e** and **43g** had legs as silvered as those of **10b**. In **43e** this silvering encroached furthest onto the lateral parts of the rump, while in **43g** it encroached furthest anterior to the tail base. **43d** and **43g** had the most whitish on the ventral shank, **43a** and **43f** the least, with very restricted silvering on the arm. In the skin sequence **43c**, **43b**, **43e**, **43g** and **43d** the brachial silvering spread increasingly conspicuously from the elbow towards the shoulder. Cephalic silvering was very faint and diffuse in **43a**, restricted to the central occiput in **43f**, mainly restricted to a faint occipital semicircle with its axes at the pinnae in **43c**, diffused throughout the occiput and nape in **43b** (in which it was most conspicuous in a post-pinnal patch) and **43e**, and especially **43g**. Cephalic silvering in **43d** was similar to **43b**, but was more conspicuous and intensified in an interpinnal arc. The tips of the circumpinnal hairs in **43b**, **43d-e** and **43g** were paler brown than in the rest of the series. All the series had blackish brown circumfacial hairs, especially **43d** which had whitish hairs on the central throat. **43e** and **43g** were the only other skins with any hint of gular whitish. The venter was silvery brown in **43a**, tinged with black on the pectoral and sternal region; was blackish brown in **43b-c** and **43f**, with some silvering, especially on the lower sternal region; was laterally blackish brown with a 90 mm whitish medial band in **43d**, including some basally blackish hairs; or was blackish in **43e** and **43g** with silvering, especially along the midline. There was ventral silvering on the arms in **43d-e** and **43g**, and to some extent in **43b**.

The pelage colour in **44** was exclusively blackish on the paws and tail. Silvering was prevalent on the brownish black head, shoulders, brachium, thigh and shank, but less so on the knee and forearm, and virtually absent from the back. The venter was blackish brown, with a yellowish tinge on the throat and abdomen. Skin **45** was similar to **44**, but silvering was less prevalent on centre of the occiput and nape, less so on the brachium, but more so on the elbow, forearm and basal quarter of the tail. The throat was yellowish, the sternal region yellowish black and the lateral venter yellowish brown. Skins **46** and **47** were black with browner whiskers, flanks and limbs above the paws. The head and cheeks, and the brownish venter had blond tints.

Sody (1931) noted that skins from locality **11** were "*absolutely* black", while those from locality **15** were black with "only the back of the hind limbs with a few white-tipped hairs". The amount of white increased rather rapidly in an easterly direction, reaching a maximum in central Java (localities **24** and **26**). In the two specimens from locality **29**, the amount of white had diminished again. In isolation, this character assigned only specimens from localities **11** and **15** to *"sondaicus"* and the rest (from locality **10** eastwards) to *"pyrrhus"*. Cranial measurements indicated that the boundary should preferably be drawn between localities **20-22** and **24**, though once again the transition seemed gradual. Based on its smaller cranial size, he described a new subspecies from Bali. Pocock (1935) referred specimens from localities **1**, **7**, **9**, **12**, **15**, **32** and **33** to *"sondaicus"* but regarded skins from locality **35** as intermediate with the nominate subspecies, to which he referred specimens from localities **38-41**. He claimed that the cranial and body measurements failed to bear out Robinson & Kloss' (1919) statement that the nominate subspecies was larger than the western one. He also described a new subspecies fom Bali based on the noticeably shorter condylo-basal and basal cranial lengths. Hooijer (1960, 1962) concluded from a craniometric study of the subspecies of *Semnopithecus cristatus* and *S. auratus* that the female skull was smaller than the male, with a proportionally wider brain case, greater height, and the mandibular symphysis relatively lower than that of the male. The male skull of *"pyrrhus"* was larger than that of *"sondaicus"*, and the difference in size was statistically significant. There was no difference in size between the female skulls of the two Javan subspecies. His conclusion as to the relative size of skulls from Bali however, is unreliable, as the mandibular measurements for the sole male skull were actually obtained from the mandible belonging to calvarium **43e**.

The present study indicates that only specimens from localities **1-8** and possibly **9**, should be included in the blackish western subspecies. Of the three described skins from locality **15**, the type locality of *Pithecus pyrrhus sondaicus*, two (including the holotype) are intermediate. As noted by Chasen (1940: 82), skins from Cilacap are intermediate in pelage colour, while one from Karangbolong is of the nominate subspecies. The subspecific limit thus appears to run from the south coast at 109°E, northwestwards to the the vicinity of Jakarta. Some skins from localities **15**, **16**, **19**, **20**, **24** and **25** are endowed with pale hairs intermingled with the blackish ones of the paws. The silvering of the blackish pelage reaches its maximal expression in skins from localities **36-41**, with a reduction in its prominence in skins from localities both to the north and east of this part of south-east Java. A possible interpretation is that specimens from this area should be referred to the nominate subspecies, and that those from elsewhere excluding the distribution of the western subspecies, should be referred to a third subspecies for which the species-group name, *Pithecus pyrrhus sondaicus*, would be the senior available name. It is perhaps relevant that the dorsally black-tinged specimens of the orange-haired morph, derive from a cluster of the northern localities (Fig. 1, **A-D**) from whence this morph has been recorded. Until it is established whether there is a geographic connection between the central Javan, and the extreme eastern Javan

populations of the species, and whether this interpretation is substantiated by cranial characters, it would seem most reasonable to recognize only the nominate subspecies and *Semnopithecus auratus mauritius*.

***Semnopithecus (Trachypithecus) (auratus) auratus auratus* (Geoffroy Saint-Hilaire, 1812)**
Spangled ebony leaf monkey

Cercopithecus auratus Geoffroy Saint-Hilaire, 1812: 93.
Simia auratus: Cuvier, 1821: 34.
Semnopithecus Pyrrhus Horsfield, 1823.
Semnopithecus maurus: Horsfield, 1824.
Semno-Pithecus auratus: Desmoulins, 1825: 570.
Presbytes Pyrrhus: Gray, 1843: 3.
Presbytes cristata: Gray, 1843: 3.
S[emnopithecus (Trachypithecus)] pyrrhus: Reichenbach, 1862: 89.
Presbytis pyrrha: Thomas & Wroughton, 1909: 372.
Pygathrix [(Trachypithecus)] aurata: Elliot, 1913: 75.
Pithecus pyrrhus sondaicus Robinson & Kloss, 1919: 374.
P[ithecus] p[yrrhus] pyrrhus: Robinson & Kloss, 1919: 374.
Pithecus pyrrhus kohlbruggei Sody, 1931: 349.
[Trachypithecus pyrrhus] pyrrhus: Pocock, 1935: 929.
[Trachypithecus pyrrhus] stresemanni Pocock, 1935: 931.
T[rachypithecus] p[yrrhus] kohlbruggei: W. C. O. Hill, 1939: 288.
Presbytis cristatus kohlbruggei: Laurie & Hill, 1954: 83.
Presbytis cristatus pyrrhus: Khajuria, 1956: 205.
P[resbytis (Trachypithecus)] cristatus: Fiedler, 1956: 200.
Presbytis cristatus sondaicus: J. E. Hill, 1960: 34.
T[rachypithecus] c[ristatus] kohlbruggei: Hooijer, 1960: 580.
[Presbytis (Trachypithecus) cristata] kohlbruggei: Kuhn, 1967: 40.
Semnopithecus [(Trachypithecus)] auratus: Brandon-Jones, 1984: 407.
[Trachypithecus auratus] auratus: Weitzel & Groves, 1985: 407.

Type specimens. - The adult female holotype of *Cercopithecus auratus* was received in exchange from C. J. Temminck in 1812 by the Muséum National d'Histoire Naturelle, Paris, where it is preserved as a mounted skin with skull inside, No. 125 (111) (Rode, 1938: 209, no. 15). Three adult female syntypes of *Semnopithecus Pyrrhus* are preserved at the Natural History Museum, London (Napier, 1985: 57) as skulls and round skins, ZD 22a and ZD 1855.12.24.11, and at the Indian Museum, Calcutta as skull and damaged skin ZSI 12189 (Khajuria, 1956: 205). The holotype and paratype adult male skulls and round skins, ZD.1949.423 and ZD.1954.62, of *Pithecus pyrrhus sondaicus* are preserved at the Natural History Museum, London, as is the holotype adult male skull and round skin, ZD 1913.3.6.1, of *[Trachypithecus pyrrhus] stresemanni* and the two adult male and one adult female paratype skulls, ZD 1913.3.6.2-4 (Napier, 1985: 56). The holotype of *Pithecus pyrrhus kohlbruggei,* an adult female skull and round skin, LM (S) E42, and the six paratype skulls and round skins are preserved at the Nationaal Natuurhistorisch Museum, Leiden (Hooijer, 1962: 29).

Type localities. - Temminck informed G. Saint-Hilaire (1812) that *Cercopithecus auratus* inhabited "l'Inde; les Moluques", but this was amended to "Samarang, Java" by Müller (1839). Subsequent reports and collecting localities indicate that this was the place of acquisition, rather than collection, and that the orange-haired morph is apparently confined to the area between Blitar, Idjen and Pugeran (Fig. 1). No type locality other than "Java" was specified for *Semnopithecus Pyrrhus*, but Robinson and Kloss (1919: 375) "fix[ed] it as the province of Pasuruan" [7°30'S 113°05'E]. The type locality for both species-group names is here

more precisely restricted to the Batu district from whence W. H. de Vriese collected three orange-haired specimens in 1861, along with the two melanic specimens described above (Schlegel, 1876: 55-58; Hooijer, 1962: 26). The holotype and paratype of *Pithecus pyrrhus sondaicus* were collected at Tjibodas (5500 ft) [6°45'S 107°01'E], Java. The holotype and paratypes of *Pithecus pyrrhus kohlbruggei* were collected at [Tandjung] Sendang [8°08'S 114°38'E], Bali. The paratypes and possibly the holotype of *[Trachypithecus pyrrhus] stresemanni* were collected at Danau (incorrectly spelt "Dauan" by Pocock, 1935: 931) Bratan (2500 ft) [8°16'S 115°11'E], Bali. The holotype, however, has a second label which is inscribed, "Tjeloekanbawang" [= Celukanbawang, 8°12'S 114°50'E].

Distribution. - Lombok, Bali and eastern Java. Everett (1896: 593) opined that it was "certainly introduced by the Balinese Rajahs" to Lombok. Intergrades with the western subspecies along a boundary running from the south coast at 109°E, approximately northwestwards to the the vicinity of Jakarta.

Diagnosis. - The circumfacial hair is erect and forward curled. With the exception of the whitish pinnal hairs, the female pale pubic patch and the whitish hairs sometimes intermingled with the blackish ones of the paws, the pelage in the melanic morph is glossy black with a slight tinge of brownish, commonly more prevalent on the venter, sideburns and legs. This blackish pigment is variably absent from the tips of the hairs of the arms above the wrists, most often near the elbow; of the legs above the ankles, most often on the posterior edge of the thigh; of the head, most often near the pinna; and sometimes of the back, most often on the rump and shoulder; of the venter; of the flank; and rarely, of the tail. The venter may be blackish, grey or brown, or a combination of the three, sometimes with areas of white or yellowish. The pelage colour in the erythristic morph is deep orange, usually more yellowish on the limbs, especially the elbow and shank, on the circumpinnal hairs and in some cases, elsewhere on the head, intermittently on the proximal part of the tail, and throughout the venter other than the lateral chest. Some specimens are dorsally tinged with black, sometimes with scattered traces of black on the extremities. The skin of the face and paws in this morph is usually depigmented or freckled.

Semnopithecus (Trachypithecus) (auratus) auratus mauritius (Griffith, 1821)

West Javan ebony leaf monkey

Cercopithecus maurus: Geoffroy Saint-Hilaire, 1812: 93.
Simia maura: Cuvier, 1821: 33.
Simia Mauritius Griffith, 1821: 58.
[Semnopithecus] maurus: Desmarest, 1822: 533.
Presbytes maura: Gray, 1843: 3.
Pr[esbytis] maurus: Blyth, 1847: 735.
S[emnopithecus (Trachypithecus)] maurus: Reichenbach, 1862: 89.
Presbytis pyrrha: Thomas & Wroughton, 1909: 372.
Pygathrix [(Trachypithecus)] aurata: Elliot, 1913: 75.
[Pithecus pyrrhus] sondaicus: Sody, 1931: 349.
[Trachypithecus pyrrhus] sondaicus: Pocock, 1935: 929.
T[rachypithecus] c[ristatus] sondaicus: Hooijer, 1960: 580.
[Presbytis (Trachypithecus) cristata] sondaica: Kuhn, 1967: 202.
P[resbytis] c[ristatus] sondaicus: Napier & Napier, 1967: 353.
Semnopithecus [(Trachypithecus)] auratus: Brandon-Jones, 1984: 407.
[Trachypithecus auratus] sondaicus: Weitzel and Groves, 1985: 407.

Type specimen. - The holotype (Griffith, 1821, pl. opp. p. 58) of *Simia Mauritius* was a juvenile (judging by the supplied measurements) of unspecified sex, received dead (having died on the voyage) shortly before June 1821 by [E.] Cross, proprietor of the Exeter' Change menagerie, London. The specimen cannot be traced amongst the collection at the Natural History Museum, London, which received some of Cross' material, and is presumed destroyed.

Type locality. - "Mauritius", here provisionally amended to Djasinga [6°29'S 106°27'E], Java, [Indonesia].

Distribution. - West Java. Within this area the subspecies appears divided into a northern and southern population by a string of populations from Udjungtebu to Tjibodas which incipiently display the pelage coloration of the nominate subspecies.

Diagnosis. - The circumfacial hair is erect and forward curled. With the exception of the whitish pinnal hairs and the female pale pubic patch, the pelage is glossy black with a slight tinge of brownish, commonly more prevalent on the venter, sideburns and legs.

Semnopithecus (Trachypithecus) (auratus) auratus ebenus, new subspecies
Wulsin's ebony leaf monkey

Pithecus sp. ?: Osgood, 1932: 206.
Semnopithecus [(Trachypithecus)] auratus: Brandon-Jones, 1984: 407.
T[rachypithecus] f[rancoisi] ssp.: Ratajszczak, [1990]: 135.

Type specimen. - The holotype and sole recorded specimen, an adult female skull and flat skin, USNM 240489, collected by F. R. Wulsin in 1924 (Osgood, 1932: 197) in the course of the National Geographic Central China Expedition, is preserved at the National Museum of Natural History, Smithsonian Institution, Washington D.C.

Type locality. - The specimen is labelled simply "Fr[ench] Indo China", but according to Osgood (1932: 197), most of Wulsin's material was collected at Lai Chau in northwestern Vietnam or at Vientiane, the capital of Laos. The existence of only a single specimen renders improbable its provenance from near a capital city. It would therefore appear that the holotype came from the vicinity of Lai Chau or, perhaps even more probably, from the Fan Si Pan mountain chain (c. 22°30'N 103°50'E) which was visited by Wulsin from 28 April to 2 May, and again from 29 September to 1 October 1924 (Wulsin, 1925). Dao (*in litt.*, 20 Feb.1978) reported that "*Presbytis francoisi francoisi*" was present on the eastern slope of this chain. This report was apparently based on sightings, rather than collected specimens and, in view of the probable difficulty in distinguishing the present subspecies from *S. francoisi* in the field, particularly when the presence of the former was not anticipated, it might have been this subspecies that was actually sighted. Vu Van Dung, a zoologist from the Ministry of Forestry, was reported by Ratajszczak ([1990]: 135) as having seen a group of all black monkeys in northwest Vietnam in 1972. Ratajszczak (pers. comm., 6 Dec.1993) also heard reports in Bac Thai province of a leaf monkey completely black except for a grey chevron on the chest.

Distribution. - Quite possibly confined to the type locality.

Specimen examined. - The holotype. The author is deeply indebted to R. W. Thorington, Jr., C. O. Handley, Jr. and L. K. Gordon for facilitating the loan of this specimen for examination at the Natural History Museum, London.

Diagnosis. - A leaf monkey resembling *S. a. mauritius* in hair length and colour, but intermediate between it and *S. francoisi* in hair disposition. The holotype is unique amongst females of the subgenus in that the whitish yellow pubic hair patch is obscured by an intermingling of blackish hairs.

Description. - The brow hairs are without the forward curl characteristic of the Javan subspecies, but are more erect and less hindwardly directed than in any other Asian pied leaf monkey. Nevertheless, immediately anterior to the vertex, the caudal direction and the shortness of the hairs accentuates the length and erectness of the hairs of the vertex. This crest resembles that of the Indochinese pied leaf monkeys, tapering posteriorly to a ridge of hair which extends about 30 mm beyond the rear end of the pinna. The crest and ridge however, are less clearly demarcated than in *S. francoisi* and the other Indochinese pied leaf monkeys owing to the erectness of the hairs between the crest and the pinna. Probably for the same reason no nuchal hair whorls are discernible. The direction of the hairs surrounding the pinna is similar to that in *S. francoisi*.

The pelage colour falls within the range of variation displayed by *S. a. mauritius*, glossy black but, especially on the ventrum, tending towards brownish at the base of the hairs. The hair of the anterior of the chest around the nipples, and on the throat between the pinnae is blackish brown. This coloration extends to where the forward directed hairs antero-ventral to the pinna converge with the backward directed hairs fringing the lateral parts of the sparsely haired face. These fringing hairs are black with barely discernible yellowish terminal bands. Sparse yellowish hairs intermingled with blackish hairs and blackish hairs with yellow terminal bands, occur on the chin, along the upper lip, and between the nostrils. Between the nostrils and the upper lip is a patch of short, very fine whitish hairs. Whitish hairs also occur on the anterior part of the pinna. Unfortunately the pinnal surface integument is missing from the unique specimen and it is impossible to determine the extent to which these pale pinnal hairs are distributed. Of other Asian pied leaf monkeys its pelage colour most closely resembles that of *S. francoisi*, but the white sideburns of the latter species are represented only by yellowish terminal bands to the hairs of this tract, and *S. francoisi* is without any significant brownish tinge to the coat.

Some very sparsely distributed white hairs, and some similarly rare yellowish hairs occur amongst the peripheral dorsal hairs fringing the hairless palmar pads of the paws. The surface integument of the digits of all four paws is missing, but it is assumed that the glossy black of the hair of the rest of the paws, extends to that of the digits as well.

As in all female dark pigmented *Semnopithecus (Trachypithecus)* species, the holotype exhibits a patch of pale hair ventral to the callosities. In this specimen the patch extends ventrally from the anus to occupy the space between the callosities and then to expand into a laterally tapering transverse band about 140 mm long and, below the callosities, about 30 mm wide. The colour of the hairs of the patch decreases in intensity from orange at the vulva, through a circumjacent area of yellowish which extends between the callosities to the centre of the transverse band where it grades to whitish towards the apices of the band. The patch is unaccompanied by a conspicuous loss of skin pigment in the same area, and is unique in known *Semnopithecus (Trachypithecus)* females in that it is rendered indistinct by the intermingling of blackish hairs.

The skull is normal for a *Semnopithecus (Trachypithecus)* species, although the nasal aperture has the scutiform outline more characteristic of *Semnopithecus (Semnopithecus)*. The

nasal bones are broad and only marginally concave in profile midway along the nasal suture, and marginally convex in profile towards the nasal aperture. The frontal process of the maxilla is folded sharply forwards to articulate with the nasals almost perpendicularly. The zygomatic process of the maxilla is concave at, and immediately below, the more lateral of the two infra-orbital foramina, but the inferior margin of the orbit remains prominent. The ridge between the facial and zygomatic surfaces of the zygomatic process of the maxilla is slightly concave medio-laterally. The external biorbital width decreases as the fronto-sphenoidal processes of the zygomatic bones approach their junction with the temporal processes. The supraorbital torus, which is continuous but indistinct across glabella, has the "raised eyebrow" appearance characteristic of *Semnopithecus (Trachypithecus)*, although it abruptly flattens out shortly lateral to the midpoint of the supraorbital margin. There is a bregmatic ossicle and the distance between lambda and inion (12 mm) is greater than usual. The hindermost point of the skull is at lambda, rather than inion.

Etymology. - The subspecific name is a Latin feminine noun meaning ebony, alluding to the pelage colour.

Semnopithecus (Trachypithecus) (auratus) françoisi Pousargues, 1898
White-sideburned black leaf monkey

S[emnopithecus] Barbei: Billet, 1896: 61.
Semnopithecus Françoisi Pousargues, 1898: 319.
[Semnopithecus (Lophopithecus)] françoisi: Trouessart, 1904: 7.
Pygathrix [(Corypithecus)] françoisi: Elliot, 1913: 68.
Pithecus françoisi: Thomas, 1928: 142.
Trachypithecus françoisi: Pocock, 1935: 956.
Presbytis françoisi françoisi: Ellerman & Morrison-Scott, 1951: 210.
P[resbytis (Trachypithecus)] françoisi: Fiedler, 1956: 202.
Trachypithecus (Presbytis) leucocephalus Tan, 1957: 63.
Trachypithecus leucocephalus: Tan, 1964: 171-173.
[Presbytis (Trachypithecus) francoisi] leucocephala: Kuhn, 1967: 40.
Presbytis francoisi leucocephalus: Li & Ma, 1980: 440.
Semnopithecus [(Trachypithecus)] francoisi: Brandon-Jones, 1984: 407.
Semnopithecus [(Trachypithecus)] leucocephalus: Brandon-Jones, 1984: 407.
Presbytis leucocephalus: Tan, 1985: 64.
Trachypithecus francoisi leucocephalus: Eudey, 1987: 17.
Presbytis franeoisis: Mei, 1987: 33.
Presbytis froncisi: Tang, 1987: [178].
Presbytis fiancoisi: Yu et al., 1992: 96.
P[resbytis] francosis: Yu et al., 1992: 100.
[Semnopithecus francoisi] leucocephalus: Corbet & Hill, 1992: 176.

Taxonomic note. - Tan (1957: 63) employed a skin collected in 1953 (1952 apud Tan, 1985: 64), and a series of ten specimens subsequently collected from the same locality, as the basis for a putative new species, "*Trachypithecus (Presbytis) leucocephalus*". The "Paiyun" was described as having "a completely white head, the white hairs extending down to the neck and shoulders, while on the backs of its hands and feet there are some white hairs". Li and Ma (1980: 440) recorded that in some specimens whitish hairs extended onto the digits; and in most specimens, between just under one-half to four-fifths of the distal part of the tail was whitish. This latter distinctive character, although present in the lectotype, was omitted from the original description. G. B. Corbet (*in litt.*, 8.iii.1991) reported that there are eight "*S. f. leucocephalus*" skins at the Kunming Institute of Zoology, China (presumably including the seven listed by Li and Ma, 1980). He noted that the "extent of white on the

head is fairly constant; the crest ranges from pure white to tinged smoky; tail has distal 2/3-3/4 white in 6, is brown in one & dark grey-brown in one; feet are totally black in one but have a varying amount of white in the others (on fore & hind feet)". Ma et al. (1989: 235, table 2) added: "Rump, thighs: Grayish black with white patch".

Albino (with reddish eyes), yellowish-white, greyish-white, black and white, and black *S. francoisi* have been reported in a karst jungle hill area of Daxin [=Ta-hsin 22°48'N 107°23'E] county in the Guangxi Zhuang Autonomous Region (Anon, 1981; Tan, 1985: 65-66). From the Liupang region of Daxin county, monkeys with the "*P[resbytis] f[rancoisi] leucocephalus*" colour pattern have been reported (Li and Ma, 1980: 441). "Another report describes a population to the west of this area, near Jingxi county"[=Chinghsi 23°08'N 106°25'E] (Tan, 1985: 64). If accurate, these reports indicate either considerable sympatry between the two forms, or that "*Trachypithecus leucocephalus*" is merely an albinistic *S. francoisi* circumventing an area from which complete albinos are known. The latter interpretation accords with the variation in the extent of whitish hairs on the shoulders (see Tan, 1985, figs. 1 and 2) and on the tail (Li and Ma, 1980). Li and Ma (1980: 441) found a troop of four black-tailed white-headed leaf monkeys in the Renliang region of Chongzuo [c. 22°20'N 107°20'E]. Some troops along the banks of the Zuo river [=Tso Chiang] contained individuals with white hair on the head and a black tail, as well as individuals with black hair on the head, white cheek hair, and a white tail (Ma *et al.*, 1989: 237). This variation might also resolve the ambiguity as to whether the "kleinen schwarzhaarigen Affen mit weißen, langen Bärten und langen Schwänzen" observed by Dewall (1910: 81) a short distance up-river from Lung an [= Lung-an 23°11'N 107°41'E], had black or white tails.

Such albinism or partial albinism is not uncommon in the Colobinae (see Thomas, 1910; Robinson & Kloss, 1915: 112-113; Phillips, 1928; Hooijer, 1962: 29; Oates, 1982: 309-310), and although comparatively uniform in pelage colour south of the Zuo river, *T. leucocephalus* is here provisionally regarded as a junior subjective synonym of *S. francoisi*.

Type specimens. - The adult female holotype of *Semnopithecus Françoisi* was donated by the French Consul, Monsieur François in 1898 to the Muséum National d'Histoire Naturelle, Paris, where it is preserved as a skull and mounted skin, 1898-1394 (Rode, 1938: 210, no. 18). The subadult female mounted skin designated by Tan (1985: 65) as the lectotype of *Trachypithecus (Presbytis) leucocephalus*, was unfortunately lost during the chaos of the "Cultural Revolution". Li & Ma (1980: 440) designated a neotype from a series of specimens collected by them in 1976 and 1977. This designation is invalid because the authors did not publish their reasons for believing all the syntypes to be lost or destroyed, nor did they describe the steps that had been taken to trace them [International Code of Zoological Nomenclature, 1985, Article 75(d)(3)]; and they cannot demonstrate that the designated specimen came as near as practicable from the original type locality [Article 75(d)(5)], because the specimen was collected on Sangen mountain, Luobai [= Lo-pai 22°20'N 107°31'E] commune, in Chongzuo Xian, while the rest of the series included a specimen from Fusui, the original type locality. The unequivocal identity of the species-group name obviates the necessity for a neotype designation [Article 75(b)], and Tan's specimen, as represented in his published photographs (1964, fig. 5; 1985, fig. 2), must stand as the lectotype.

Type localities. - The holotype of *Semnopithecus Françoisi* was collected near Long-Tchéou [= Longzhou 22°24'N 106°50'E], on the large crags which flank the river Long-Kiang [= Lung Chiang 22°20'N 106°53'E], in Kouang-si [= Guangxi Zhuang Autonomous Region, People's Republic of China]. The lectotype of *Trachypithecus leucocephalus* was

obtained in a small district around Fusui [= Fushue 22°35'N 107°57'E] county, Kwangsi Province, China (Tan, 1957: 63; 1964: 173).

Distribution. - The subspecies has been recorded from the following localities in the Socialist Republic of Vietnam: Huu Lung [21°30'N 106°20'E] (UH - Dao, *in litt.*, 2 Feb.1977); Langson [= Lang Son 21°50'N 106°46'E] (ZD - Thomas, 1928: 142; Osgood, 1932: 204); Dinh hoa [21°54'N 105°40'E] (UH - Dao, *in litt.*, 2 Feb.1977; 1990, fig. 1); hills to the north of Ra Ban village [22°10'N 105°45'E] (Ratajszczak, et al., 1990: 19); Bac-kan [= Bach Thong 22°08'N 105°50'E] (MNHN* - Thomas, 1928: 142; Osgood, 1932: 204; UH - C. P. Groves, pers. comm.); Babê Lakes [22°23'N 105°38'E] (Lowe, 1947: 44; UH - Dao, *in litt.*, 2 Feb.1977; 1990, fig. 1; Ratajszczak, et al., 1990: 15-20, pl. 2); Cao Bang [22°39'N 106°16'E] (Billet, 1896: 61); and from the following localities in the People's Republic of China: in Guangxi Zhuang Autonomous Region - the type localities; Longgang Reserve, 22°28'N 106°56'E (Li, 1993); Longrui Reserve, Ningming, 22°15'N 107°02'E (Li and Ma, 1980; Li, 1993); Longlin village, 22°25'-28'N 107°48'-53'E (Lu and Huang, 1993); Bapen Reserve, 22°29'N 107°52'E (Li, 1993); Daming Hills [= Taming Shan c. 23°30'N 108°20'E] on the Tropic of Cancer (Tan, 1985: 66); and in Guizhou province [= Kuei-chou Sheng] - from Xingyi [c. 25°00'N 105°00'E], Ceheng [c. 25°00'N 105°50'E], Zheng-an [c. 28°30'N 107°50'E] and Yuanhe [= Yanhe, c. 28°30'N 108°30'E] counties (Tan, 1985: 66). According to Li & Ma (1980: 440), its distribution to the south-east, does not reach the Shiwanda mountains [= Shih-wan-ta Shan 21°43'N 107°35'E]. The geographic distribution of "*Presbytis leucocephalus*" was figured by Jiang et al. (1991).

Specimens examined. - Three adult skulls and round skins from Vietnam, collected by J. Delacour and W. P. Lowe and preserved at the Natural History Museum, London: one male, ZD 1927.12.1.16, collectors' no. 581, and one female, ZD 1927.12.1.17, collectors' no. 580, from Langson (500 ft.); and one female skin in poor condition, ZD 1928.7.1.8, collectors' no. 960, labelled simply "Tonkin", the associated skull having the central part of the basicranium missing. A colour plate of the mounted skin of the holotype of *Semnopithecus Françoisi* was published by Trouessart (1912, pl. 18) and through V. Weitzel, the author has received copies of two black and white photographs taken by C. P. Groves of this skin; a black and white photograph of a live captive pair was published by Gewalt (1968, pl. 29), and others of single captive specimens by Tan (1985: 66, fig.3), Eudey (1987: 17) and Tang (1987: [178]).

Black and white photographs of the lectotype of *Trachypithecus leucocephalus*, and of a female and infant were published by Tan (1964, fig. 5; 1985, figs. 1 and 2), and of two presumed syntypes in captivity at Peking Zoo, by Jarvis (1966a: 525; 1966b, pl. 3). The author has also very kindly been supplied with a copy of a colour transparency taken by M. R. Brambell in September, 1974, of a specimen also in captivity at Peking Zoo (possibly one of the individuals featured in Jarvis' photograph); and with three taken by C. P. Groves in 1984, one of two adults and an infant at Peking Zoo, and two others of an approximately 15-year-old male at Kunming Zoo. One of the latter photographs was published by Eudey (1987: 26). Two colour photographs, the former of two free-living specimens, were published by Tang (1987: 170, [191]).

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* This specimen is preserved as a skin and skull (J. Cuisin, *in litt.*, 18 Jun.1992); Delacour and Lowe (1927) listed its locality as Ngan-son [22°25'N 105°59'E].

Diagnosis. - A glossy blackish-pelaged leaf monkey with a narrow tract of white hair running from behind the upper part of the pinna along the side of the face to the corner of the mouth. The head is surmounted by a sharply pointed crest of hair at the vertex. Two narrow ridges of hair, each commencing at the temple, converge along the midline behind the vertex until, at the nape, the hair direction revolves around two very clearly defined whorls, one on each side of the midline. The hair along the lateral parts of the trunk is exceptionally long, and the female has a pubic patch of depigmented skin clothed with white to yellowish hairs. At least one of the three examined specimens, ZD 1927.12.1.17 has short pale terminal bands, discernible only in light from certain angles, to the hairs of the same area of the rump and thighs whose hairs have longer pale terminal bands in *S. johnii poliocephalus*. This character is indeterminate in ZD 1928.7.1.8 because of its poor condition, and there are very few or no such hairs in ZD 1927.12.1.16, although there is some indication that the hairs of this specimen are not in perfect condition. This latter specimen has a presumably aberrant patch of depigmented skin on the left side of the abdomen. The hairs of this patch are the normal blackish colour.

Semnopithecus (Trachypithecus) (auratus) hatinhensis (Dao, 1970)
Stripe-headed black leaf monkey

Pithecus françoisi: Bourret, 1942: 39.
Presbytis francoisi hatinhensis Dao, 1970: 61.
Trachypithecus francoisi hatinhensis: Eudey, 1987: 17.
[Semnopithecus francoisi] hatinhensis: Corbet & Hill, 1992: 176.

Type specimen. - The holotype is an adult female, no. 28, original no. MA 239, collected in December 1942, by Monsieur Chau, and preserved in the Zoology Laboratory at the University of Hanoi as a skin in poor condition with skull. A paratype male, original no. 601, consisting of a skin only, was mislaid during the Vietnam war (Dao *in litt.*, 6.x.1978).

Type locality. - The holotype was collected at Xom-cuc [= Xom Cuc 17°56'N 105°48'E], and the paratype at Tuyên-hoa [= Tuyen Hoa 17°51'N 106°08'E]. Both these localities are in Quang binh province, Vietnam (Dao, *in litt.*, 11.ii.1980), so the epithet, *hatinhensis*, named after Hatinh province, may be a misnomer.

Distribution. - Until recently, it was known only from the holotype and paratype localities, but it has now been identified in the vicinity of (but not within) Cuc Phuong National Park [c. 20°20'N 105°30'E], through the confiscation of occasional individuals being illegally offered for sale in markets (information from Manuela Kloeden, assistant director of the Rescue Centre where the animals are housed, personally communicated by C. P. Groves, 27 Sep.1994).

Specimen examined. - A captive adult male in a colour transparency taken in imperfect conditions by C. P. Groves.

Diagnosis. - A leaf monkey resembling *S. francoisi* in the disposition and colour of the pelage, except that, as in *S. delacouri*, the narrow tract of white hair is prolonged behind the pinna onto the lateral part of the nape. As in *S. delacouri*, this extended whitish area presumably terminates as the radiating hairs which form the nuchal whorl, although the presence of a nuchal whorl in *S. hatinhensis* was not specified in the original description. Groves (pers. comm.) reported that the tract sometimes almost linked up across the back of

the head, leaving merely a black midline band. He also noted that the young of both *S. hatinhensis* and *S. delacouri* retain a grey-white band across the forehead for quite a while. The hair length on the tail and along the lateral parts of the trunk is intermediate between that of *S. francoisi* and that of *S. delacouri* (Dao, *in litt.*, 6 Oct.1978). The female has a small triangular pubic patch of yellowish white hair.

Semnopithecus (Trachypithecus) (auratus) laotum (Thomas, 1921)
White-browed black leaf monkey

Pithecus laotum Thomas, 1921: 181.
Trachypithecus laotum: Pocock, 1935: 959.
Presbytis (?) *françoisi laotum:* Ellerman & Morrison-Scott, 1951: 211.
Presbytis françoisi laotum: Deuve & Deuve, 1963: 61.
[Presbytis (Trachypithecus) francoisi] laotum: Kuhn, 1967: 40.
Trachypithecus francoisi laotum: Eudey, 1987: 17.
[Semnopithecus francoisi] laotum: Corbet & Hill, 1992: 176.

Type specimen. - The adult male holotype was collected by a Federated Malay States Museum collector [J. Bangassar] and donated by H. C. Robinson and C. B. Kloss to the Natural History Museum, London where it is preserved as a skull and round skin, ZD 1920.12.10.1.

Type locality. - "S. W. French Laos, on the French side of the Mekong" (Thomas, 1921: 182), at Camp 42, Ban Na(i) Sao [c. 17°53'N 104°37'E].

Distribution. - Endemic to Laos at Phasom [= Pha Som 18°00'N 104°19'E] and [Ban] Phontiou [17°53'N 104°37'E] (Deuve & Deuve, 1963: 61; 1964: 52). The itinerary in Day (1920) indicates that the type locality is very close to Ban Phontiou.

Specimens examined. - The holotype and the two adult female skulls and round skins, ZRC 4.436 and 4.437, collected by the same collector at the type locality, and preserved at the ZRC. The latter specimens were cited but not examined by Thomas (1921: 182), and therefore are not paratypes. Mrs. Yang Chang Man, Scientific Officer at the ZRC (*in litt.*, 17 Jul.1980), has very kindly supplied data on, and three black and white photographs taken by Yip Hoi Kee, of each of the ZRC skins. Other than these photographs, this leaf monkey has not been figured.

Diagnosis. - A leaf monkey resembling *S. francoisi* in the length, disposition and colour of the pelage, but the tract of white hair spreads to form a band across the forehead, leaving only a line of black hairs along the superior facial margin. Pale hairs are also scattered around the mouth and on the chin, and the throat hair is more yellowish grey. Behind the pinna, the area of white pelage is even more extensive than in *S. hatinhensis* and *S. delacouri*. In one of the females, ZRC 4.437, the white area almost completely encircles the blackish hairs of the vertex which are linked with those of the back by a barely discernible isthmus of blackish hairs along the midline of the nape. The hair length at the median lower thoracic part of the back is only just over half that in *S. francoisi*. The female has a bilaterally symmetrical, blunt-angled trapeziform pubic patch of orange yellow hairs associated with an area of dappled skin pigmentation, and sprinkled with some medial blackish hairs. The shorter of the two approximately parallel sides of the trapezium abuts onto the ventral margin of the ischial callosities, and yellowish hairs extend between the callosities (Yang, *in litt.*, 17 Jul.1980).

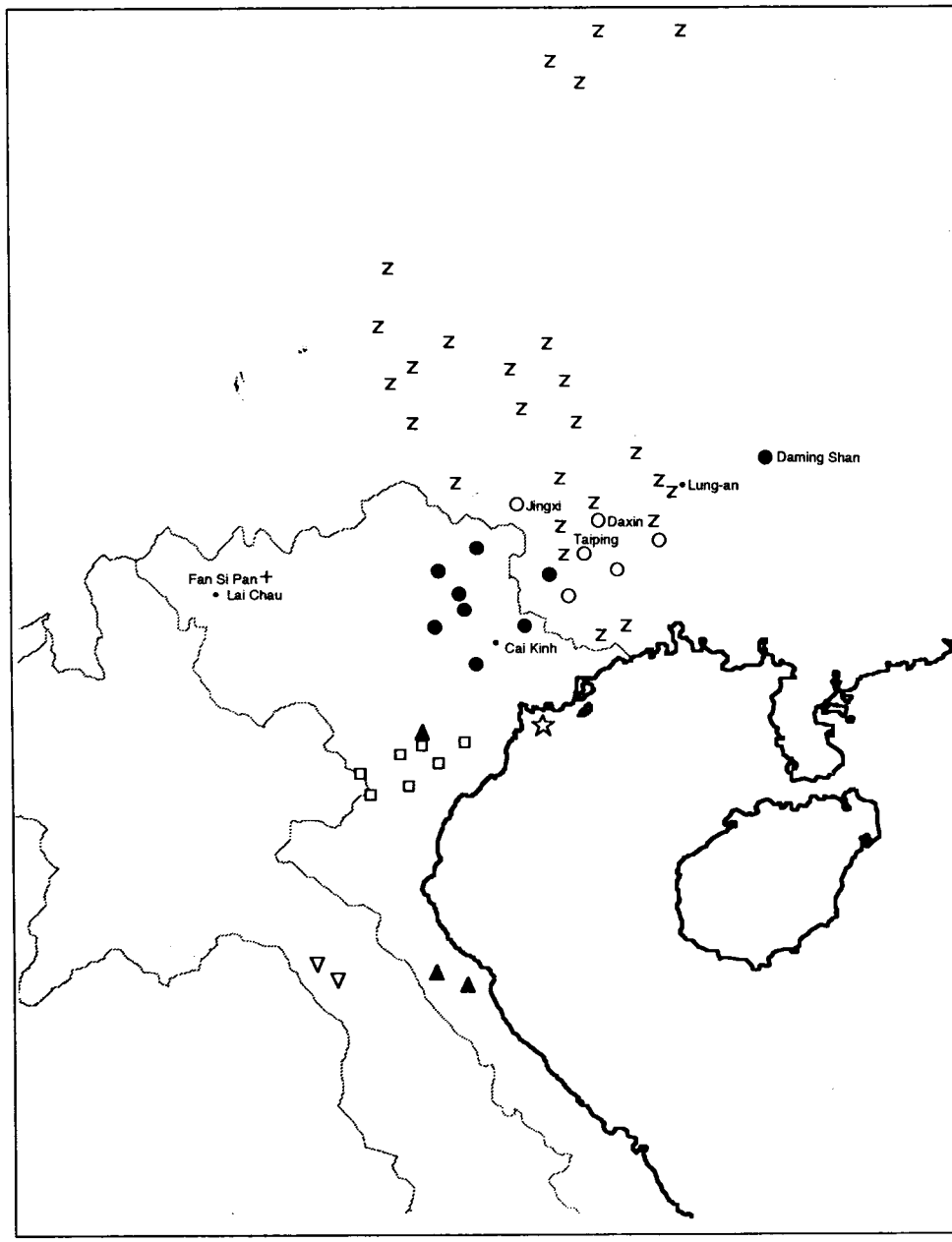

Fig. 2. The geographic distribution of the Indochinese pied leaf monkeys

- ● *S. francoisi*
- ○ Albinotic *S. francoisi*
- ▲ *S. hatinhensis*
- ▽ *S. laotum*
- □ *S. delacouri*
- ☆ *S. j. poliocephalus*

Z Distribution of *S. francoisi* from Zhang et al., 1992

The female, ZRC 4.437, with the greater extent of whitish hairs on the nape, and the greater tendency for the whitish hairs of the chin to extend onto the throat, also has a number of yellowish hairs at the tail tip and a larger pubic hair patch with blackish hairs restricted to the anterior third and its orange tinge most intense adjacent to the callosities.

Semnopithecus (Trachypithecus) (auratus) delacouri (Osgood, 1932)
White-rumped black leaf monkey

Pithecus delacouri Osgood, 1932: 205.
P. delacouri: Pocock, 1935: 956 (*lapsus calami* for *T[rachypithecus] delacouri*).
Presbytis (?) *françoisi delacouri:* Ellerman & Morrison-Scott, 1951: 211.
P[resbytis] f[rancoisi] delacouri: Napier & Napier, 1967: 353.
[Presbytis (Trachypithecus) francoisi] delacouri: Kuhn, 1967: 40.
Semnopithecus [(Trachypithecus)] delacouri: Brandon-Jones, 1984: 407.
Trachypithecus francoisi delacouri: Eudey, 1987: 17.
[Semnopithecus francoisi] delacouri: Corbet & Hill, 1992: 176.

Type specimen. - The holotype is an adult male collected by J. Delacour and W. P. Lowe and preserved at the Natural History Museum, London as a skull and round skin, ZD 1932.4.19.2. The collectors' measurements furnished by Osgood (1932: 205) of an adult female, derive from a round skin, ZD 1933.4.1.13a, collected at the type locality by the same collectors and preserved at the same institution. This specimen therefore qualifies as a paratype. Its skull, FMNH 39159, is preserved at the Field Museum of Natural History, Chicago.

Type locality. - Hoi Xuan [= Quan Hoa 20°22'N 105°07'E, Socialist Republic of Vietnam].

Distribution. - Endemic to Vietnam. In addition to the type locality, specimens have been collected at Lang Chanh [20°05'N 105°14'E], Cuc Phuong [20°20'N 105°30'E] and Chi Ne [20°29'N 105°47'E] (UH - Ratajszczak et al., 1990: 5). It was reported in the hills northwest of Cuc Phuong National Park [c. 20°25'N 105°20'E] and in Thuong Xuan district near the Laotian border [c. 20°00'N 105°00'E], and a specimen was captured in Quan Hoa district [c. 20°10'N 104°50'E] (Ratajszczak et al., 1990: 8, pl. 1).

Specimens examined. - The holotype and paratype. A black and white photograph of the holotype round skin was published by Osgood (1932, pl. 10).

Diagnosis. - A leaf monkey resembling *S. hatinhensis* in the disposition and colour of the pelage, with the striking exception, unique in the Anthropoidea, that the dorsal pelage is white throughout a sharply demarcated area between a transverse line just above the knee and a line running from the midpoint of the upper part of the small of the back to reach the lateral part of the back somewhat posteriorly to its point of origin. In dorsal aspect this area has the appearance of a pair of long shorts held by an invisible brace in the middle of the back, with an opening to emit the blackish tail whose long hair, especially midway along its length, renders it almost equally distinctive. In contrast, the hairs of the lateral part of the trunk are amongst the shortest of the Asian pied leaf monkeys, being intermediate between those of *S. a. ebenus* and *S. j. johnii*. The dark grey cheek hairs are wispy, but longer than in all the other Asian pied leaf monkeys, except *S. a. mauritius* and *S. j. johnii*. The female has a pubic patch of whitish hairs associated with an area of depigmented skin ventral to the callosities. This patch is discontinuous with the area of white dorsal pelage.

Semnopithecus (Trachypithecus) (auratus) johnii poliocephalus Trouessart, 1911
Tonkin hooded black leaf monkey

Semnopithecus (Lophopithecus) poliocephalus Trouessart, 1911: 271.
Pithecus poliocephalus: Thomas, 1928: 141.
T[rachypithecus] poliocephalus: Pocock, 1935: 956.
Pygathrix poliocephalus: Rode, 1938: 211.
Presbytis (?) *françoisi poliocephalus:* Ellerman & Morrison-Scott, 1951: 210.
P[resbytis] f[rancoisi] poliocephalus: Napier & Napier, 1967: 353.
[Presbytis (Trachypithecus) francoisi] poliocephala: Kuhn, 1967: 40.
Presbytis poliocephalus: Vu, 1977: 132.
Semnopithecus [(Trachypithecus)] johnii: Brandon-Jones, 1984: 407.
Trachypithecus francoisi poliocephalus: Eudey, 1987: 17.
[Semnopithecus francoisi] poliocephalus: Corbet & Hill, 1992: 176.

Type specimen. - The adult female holotype was donated by Marcel Léger to the Muséum National d'Histoire Naturelle, Paris, where it is preserved as a mounted skin, 1911-481 (Rode, 1938: 211, no. 22) without skull (Trouessart, 1912: 278).

Type locality. - None specified, but the monkey was said to be "not rare in the province of Caï-Khin*, to the north-east of Tonkin" (Léger, in Trouessart, 1911: 272). Fooden (1976: 112) tentatively identified this locality as Cai Kien, 21°19'N 107°44'E, a village on the island of Dao Chateau Renaud in north-east Vietnam. However, "province" is an improbable term to apply to a small island, and it is more likely that Léger was referring to the Cai Kinh limestone massif [c. 21°45'N 106°30'E] (Stielers, 1925, pl. 72, inset; Vu, 1977: 160). This locality lies almost directly between Huu Lung and Lang Son, the two most southerly localities recorded for *S. francoisi* (see p. 17). Unless the geographic ranges of the two species overlap or interlock, Léger's report must have been a case of mistaken identity of *S. francoisi*. The type locality of *S. j. poliocephalus* is therefore here restricted to its only confirmed locality, Dao Cat Ba, 20°48'N 107°00'E, Vung Ha Long (= Along Bay), Vietnam.

Distribution. - Possibly confined to the restricted type locality.

Specimens examined. - Three adult skulls and round skins, one male, ZD 1933.4.1.9 and two females, ZD 1933.4.1.10 and ZD 1933.4.1.11 from Cac-Ba Island [=Dao Cat Ba]; and one male, presumed adult, round skin in poor condition without skull, ZD 1927.12.1.12 (collectors' no. 558) from the Hanoi Zoological Gardens with locality, "Tonkin". All four specimens were collected by J. Delacour and W. P. Lowe, and are preserved at the Natural History Museum, London. J. Fooden (*in litt.*, 7 Jul. 1982) has very kindly supplied the author with brief descriptions of the three skins, adult male 39155, juvenile female 39154 and adult female 39156 collected by the same collectors on Cac-Ba Island and preserved in the Field Museum of Natural History, Chicago. The mounted skin of the holotype was figured in black and white by Trouessart (1911, pl. 7) and in colour by Trouessart (1912, pl. 19) and through V. Weitzel, the author has received copies of four black and white photographs of the holotype taken by C. P. Groves.

Diagnosis. - A leaf monkey resembling *S. francoisi* in the disposition and length of the hair, except that the hair at the median lower thoracic part of the back is one and a half times as long. The pelage colour resembles that of *S. j. johnii*. The head and neck are yellowish, paling to whitish in the tract of hair where *S. delacouri* is white. In all but one of the eight

* Spelt "Kaï-Khin" by Trouessart (1912: 278).

skins whose descriptions are available, the yellowish hairs extend for about 40mm posterior to the nuchal whorls; and brownish hairs with yellowish bases form a patch on the metatarsals and form a collar about 40mm in width separating the yellowish nuchal hairs from the blackish hairs of the back. In the exceptional specimen, 1933.4.1.1, the caudally directed hairs of the nuchal whorls represent the furthest extension of the yellowish hairs onto the shoulder, and only the bases of the otherwise blackish metatarsal hairs are brownish. In this specimen the area on the vertex and nape where the hairs have blackish terminal bands is similar in shape and almost as extensive as it is in the paler variant of *S. laotum*. In the remaining specimens blackish-tipped hairs are restricted to a sparse distribution on the crest. In all specimens there is a line of black hairs along the superior facial margin. Further evidence of variation comes from a troop of at least 18 observed by Ratajszczak et al. (1990: 23). Five (or six) adult females had head and shoulders darker than the very pale, almost white head and shoulders of the adult male. Seven (or eight) sub-adults had a head coloration ranging from creamy white to grey. *S. j. poliocephalus* and *S. j. johnii* are the only Asian pied leaf monkeys with grey terminal bands to the black hairs of the rump and outside of the thighs (usually virtually absent from the thighs, and sometimes wholly absent in *S. j. johnii)*; and known to have brown bases to the black hairs of the back, and pale pubic hairs in both sexes. (It would be instructive to learn if these characters were shared with "*T. leucocephalus*".) In the male there is a very small patch of yellowish orange hairs surrounding the penis. Ventral to the callosities in the female a tract of hair grades from orange to yellowish white, as it tapers laterally. The rest of the pelage is glossy black.

Semnopithecus (Trachypithecus) (auratus) johnii johnii (Fischer, 1829)
Indian hooded black leaf monkey

[?] *Simia Leonina* Shaw, 1800: 34.
S[imia] Johnii Fischer, 1829: 25.
S[emnopithecus] cucullatus I. Geoffroy Saint-Hilaire, 1830: 318.
S[emnopithecus] Johnii: Martin, 1838: 439.
Semnopithecus jubatus Wagner, 1839: 305.
Presbytes Johnii: Gray, 1843: 3.
S[emnopithecus] cephalopterus: Blyth, 1844: 468.
Pr[esbytis] Johnii: Blyth, 1847: 734.
Presbytis cucullatus: Blyth, 1859: 283.
S[emnopithecus (Kasi)] cucullatus: Reichenbach, 1862: 101.
Presbytis jubatus: Jerdon, 1867: 8.
S[emnopithecus (Presbypithecus)] Johnii: Trouessart, 1879: 56.
Semnopithecus vel *Presbytes jubatus:* Sterndale, 1884: 18.
Pygathrix [(Presbypithecus)] johni: Elliot, 1913: 72.
P[ithecus] johni: Wroughton, 1918: 560.
[Pithecus senex] johnii: Pocock, 1928: 503.
Pithecus [(Pithecus)] vetulus johni: W. C. O. Hill, 1934: 79.
Kasi johni: W. C. O. Hill, 1936: 124.
Presbytis [(Kasi)] johni: Khajuria, 1956: 211.
Presbytis (Trachypithecus) johnii: Oates, 1979: 485.
T[rachypithecus] johnii: Phillips, 1981: 129.
Semnopithecus [(Trachypithecus)] johnii: Brandon-Jones, 1984: 407.
T[rachypithecus] johni: Groves, 1989: 151.

Nomenclature. - The sole basis for the valid and available species-group name, *Simia Leonina* Shaw, 1800 (pp. 34-35, fig.17) was an abridged version of the description, and a redrawing of the plate, published by Buffon (1789: 81-82, pl. XXII) under the title "la guenon à crinière". Apart from the tail length of twenty-seven inches, Buffon's description accords

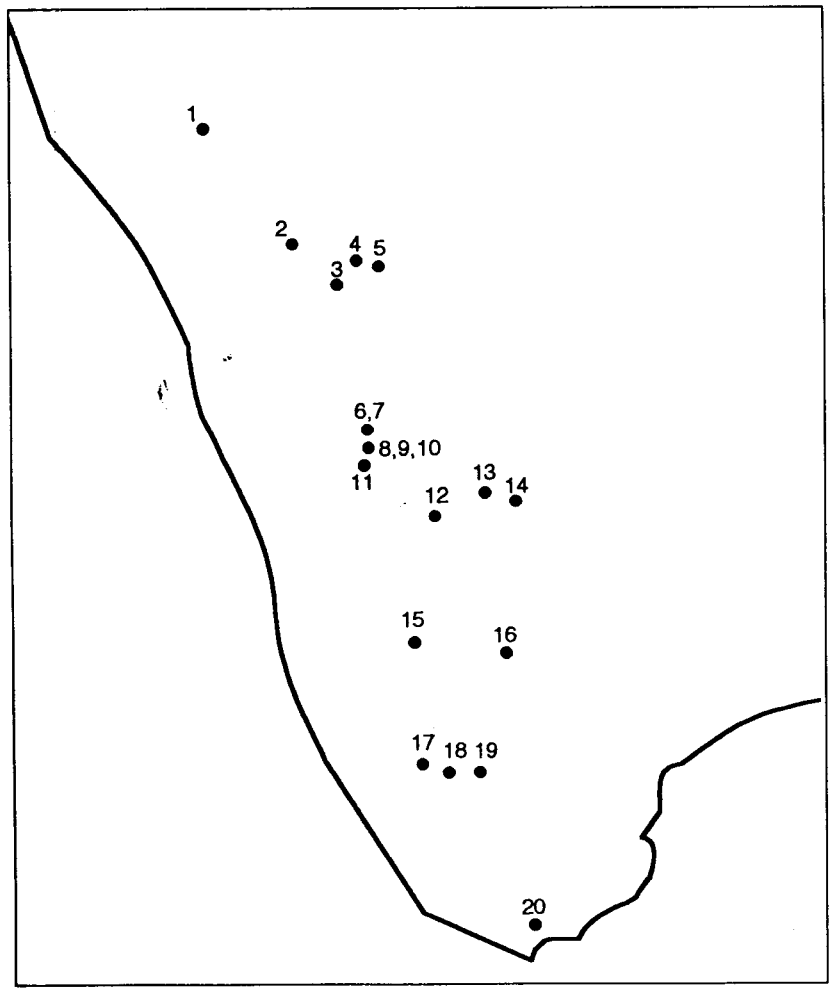

Fig. 3. Map of Southern India showing *Semnopithecus j. johnii* localities

1.	Srimangala	12°01'N 75°58'E
2.	Wynaad Plateau	c. 11°29'N 76°24'E
3.	Avalanche	11°18'N 76°36'E
4.	Nilgiri [=Ootacamund]	11°24'N 76°42'E
5.	Coonor [=Coonoor]	11°21'N 76°49'E
6.	Palagapandy [Estate]	c. 10°35'N 76°45'E
7.	Seetagundy Estate	c. 10°35'N 76°45'E
8.	Kumblacodie	c. 10°30'N 76°45'E
9.	Cotengady Estate	c. 10°30'N 76°45'E
10.	Nelliampathy Hills	c. 10°30'N 76°45'E
11.	Nr. Kuriarkutti	10°25'N 76°43'E
12.	Anamudi [?=Anamaad]	10°10'N 77°04'E
13.	Kukkal	10°18'N 77°20'E
14.	Kodaikanal	10°14'N 77°29'E
15.	Peermade [=Pirmed]	9°34'N 76°59'E
16.	High Wavy Mountains	9°32'N 77°25'E
17.	Nr. Punalor [=Punalur]	c. 9°00'N 77°00'E
18.	Tenmalai	8°58'N 77°07'E
19.	Tenkasi	8°58'N 77°18'E
20.	Aramboli Pass	8°16'N 77°33'E

with the liontail macaque, *Macaca silenus*. His plate, however, strongly resembles the Indian hooded black leaf monkey except in the physiognomy of the nose, the considerable length of the throat hairs and the presence of a tuft on the tail tip. These trivial differences could threaten the stability of *S[imia] Johnii* Fischer, 1829 as the senior scientific name for the hooded leaf monkey should the plate be designated as the lectotype. It is therefore recommended that *Simia Leonina* Shaw, 1800 should be suppressed under the plenary powers of the International Commission for Zoological Nomenclature.

Type specimens. - The holotype of *Simia Leonina* Shaw, 1800 was the adult male owned by the Duc de Bouillon and living in the Royal Menagerie at Versailles in 1775 (Buffon, 1789: 81). The holotype of *S. Johnii* Fischer, 1829 was the, evidently live, specimen obtained and described by John (1795: 215-216). Both holotypes are presumed destroyed. The holotype of *Semnopithecus cucullatus* I. Geoffroy Saint-Hilaire, 1830 is an adult female mounted skin without skull, donated to the Muséum National d'Histoire Naturelle, Paris in July 1822 by Leschenault de la Tour (Rode, 1938: 211, no. 21a), and figured by I. G. Saint-Hilaire (1831, pl. 1). The "allotype" listed by Rode (1938: 211, no. 21b) does not qualify as a paratype, because it was received while I. G. Saint-Hilaire (1831) was in press (I. G. Saint-Hilaire, 1831: 74). The syntypes of *Semnopithecus jubatus* Wagner, 1839 were two specimens collected by Baron [C. A. A.] von Hügel and mounted in the Viennese Museum (Wagner, 1839: 305). Their large canines (Wagner, 1839: 306) indicate that both syntypes were adult males.

Type localities. - The type locality of *Simia Leonina* Shaw, 1800 is unknown. Tellicherie [= Tellicherry 11°45'N 75°32'E], the purported type locality of *S. Johnii* Fischer, 1829 is, according to Jerdon (1867: 8-9), who resided there, outside the natural range of the species. Bélanger (in I. G. Saint-Hilaire, 1831: 74) saw several captive specimens on the Malabar coast, and it was probably one such specimen that was remitted to John. The type locality of *Semnopithecus cucullatus* I. G. Saint-Hilaire, 1830 is the Ghat mountains. This can presumably be restricted to the "Nellygerry" [= Nilgiri] Hills, which were visited by the donor of the holotype in May 1819, and appear to be the only part of the species' range visited during his expedition to southern India in 1818-1819 (Leschenault de la Tour, 1823). The type locality of *S. jubatus* Wagner, 1839 is the southern part of India. Once again, the only part of the species' range reportedly visited by the collector of the syntypes, are the "Neelgherry" Hills, where he spent a few weeks in March 1832 (Baikie, 1834: 40).

Distribution. - Confined to the southern part of the Western Ghats of southern India. It has been reported as far south as within about two miles of the Aramboli Pass [8°16'N 77°33'E] (W. C. O. Hill, 1937: 208), and as far north as Srimangala [12°01'N 75°58'E](ZD - Ryley, 1913: 492). The specimens brought from Bombay by Dussumier (in I. G. Saint-Hilaire, 1831: 74) were presumably trade or captive specimens. Contrary to the statement by Poirier (1970: 257), there is no historical evidence for its existence on the Shevaroy Hills [11°50'N 78°16'E] (Blanford, 1888: 34; Oates, 1979: 487-488). It is not mentioned in the field notes of the mammal section of the Vernay scientific survey of the area in 1929 (Baptista, 1929). The most easterly recorded localities are Machur [= Machchur 10°16'N 77°35'E] (Lindsay, 1926: 592) and Mudaliar Ootu, near Srivilliputhur [c. 9°35'N 77°35'E] (Johnsingh, 1974: 376).

Specimens examined. - Those at the Nationaal Natuurhistorisch Museum, Leiden catalogued by Jentink (1892: 13), and those at the Natural History Museum, London catalogued by Napier (1985: 71-72). ZD 1879.11.21.591 was collected by A. T. Christie, probably in the Nilgiris, which he had frequented (see Baikie, 1834: 33, 37, 38, 89). The collector's number of ZD 1979.981 indicates that it was collected on the Cotengady Estate.

Diagnosis. - The hairs of the head are recumbent and posteriorly directed. The nuchal hairs are longer than those of the shoulder. The hair length at the flanks and at the medium lower thoracic part of the back resembles that of *S. delacouri*, but the hair length on the tail is the shortest of the Asian pied leaf monkeys. The pelage colour resembles that of *S. johnii poliocephalus*. The yellowish of the nape varies individually in its extent, which sometimes includes the brow. The rest of the head and neck is pale brown. Like that of *S. j. poliocephalus*, the glossy black dorsal pelage is basally brown, but in a low altitude locality (c. 8°41'N 77°22'E) in the most southerly part of its range, some wholly brown individuals with silvery-gold head hair, and some partially brown individuals have been reported (Oates, 1982: 308). The holotype of *S. cucullatus* I. G. Saint-Hilaire, 1830, is possibly one such specimen, but it is more likely that the brown colour of the "flanks, loins and buttocks" (I. G. Saint-Hilaire, 1831: 72, pl. 1) has been exposed by superficial damage to the pelage. The presence and extent of the area of blackish dorsal hairs with grey distal bands is subject to individual, and apparently geographic, variation. Of the specimens from Coorg and the Nilgiris, silvering of the rump is conspicuous only in ZD 1879.11.21.591 and ZD 1913.8.22.1. In ZD 1845.8.12.2 it is conspicuous only at the most proximal part of the thigh, and in ZD 1891.10.7.7 and Jentink (1892: 13) specimen *d*, only at the tail base. In all five specimens, faint silvering spreads at least as far as the basal third of the tail, and is just discernible throughout most of the dorsum except the paws in 1879.11.21.591 and 1891.10.7.7. The remaining examined localized specimens all originate from between 10° and 10°35'N. In all specimens silvering is discernible to a variable extent on the tail and the dorsum except the paws, but is conspicuous in only three specimens, and then only between the tail root and the callosities (ZD1921.11.5.6) or dorso-lateral to the callosities (ZD 1921.11.5.4 and 1921.11.5.5). W. C. O. Hill (1937: 206), referring to specimens from between 8°58' and 9°34'N, reported that in "none of the living specimens I saw, nor in any of the skins, was there a pale sacral patch. The old male in Trivandrum Zoo had a few white-tipped hairs on either side of the root of the tail". It was possibly because of his familiarity with black-rumped individuals from the High Wavy Mountains and the higher parts of the Varushnaad valley [9°32'N 77°25'E] (Hutton, 1949: 689-690), that Hutton (1953) was so struck by the "greyish white buttocks and thighs" of specimens from the southwest slope of the Wynaad Plateau [c. 11°29'N 76°24'E]. The pubic hairs are readily examinable in only two adult male specimens. In both there is a pale area about 20mm by 20mm immediately behind the penis. In ZD 1913.8.22.1 it is whitish brown; in ZD 1879.11.21.591 it is yellowish white circumscribed by brownish. In adult female ZD 1845.8.12.2 yellowish white hairs occur between and ventral to the callosities, tapering about 80mm along the thigh and for about 40mm along the ventral tail root.

THE ECOLOGY OF THE INDOCHINESE PIED LEAF MONKEYS

Limited information is available on the ecology of the Indochinese pied leaf monkeys, but what there is presents a curious picture, atypical for the genus, and distinct even from that of *S. auratus mauritius* and *S. j. johnii*. Delacour & Lowe (1927), in a note referring to a specimen of *S. francoisi* collected at Ngan-Son, reported: "Seen at Lacs Ba Bé. Always on Marble forested Mts & difficult to obtain". This association with limestone formations has been widely substantiated (Billet, 1896: 61; Lowe, in Osgood, 1932: 204; Lowe, 1947: 44, 69; Deuve & Deuve, 1963: 61; 1964: 52; Li & Ma, 1980: 441; Tan, 1985: 64, 66; Dao, 1990: 502, 505; Ratajszczak et al., 1990: 8, 11, 15, 19, 23).

Semnopithecus laotum was "... said to be wholly terrestrial in its habits, being found on a more or less treeless plateau" (Thomas, 1921: 182). Day (1920: 34) described the topography

of Ban Na Sao as "High mountains; no jungle but rocks and high grass. Very big caves". Dao (1990: 503) described *S. laotum* habitat as: "Rocks with many holes and scattered shrubs". Populations of other taxa have been found on rocky crags (Pousargues, 1898: 321; Dewall, 1910: 81; Lowe, 1947: 44) and precipitous hills (Tan, 1985: 64, 66), and some regularly took refuge in holes in such limestone formations (Billet, 1896: 61; Lowe, in Osgood, 1932: 204; Lowe, 1947: 64-65; Tan, 1985: 64, 66; Dao, 1990: 504). These caves varied in depth from a few metres to 30 metres (Huang et al., 1983, cited in Tan, 1985: 66). Those selected by *S. francoisi* usually faced southeast, apparently to avoid the strong prevailing northwest wind. In warmer weather the monkeys slept outside their caves, but when nights were cold (sometimes below 5°C) they would enter to keep warm by mutual embrace. Each cave was occupied by a family group, usually from 3 to 10 individuals but occasionally as many as 20, and consisting of an adult male, 4-6 adult females and associated young (Tan, 1985: 66). Lu & Huang (1993) investigated troop size and age composition in the population at Longlin. The seasonal utilization of plant species and plant parts by "*Presbytis leucocephalus*" was listed by Jiang et al. (1991).

Local Muong hunters reported that *S. delacouri* was normally seen in groups of 5 to 10 animals and was almost always encountered at dusk in the vicinity of limestone cliffs and outcrops. These were occupied at night to lessen the likelihood of surprise attacks from predators. Almost all feeding activity took place in structurally well-developed areas of karst slope and valley/earth hills forest. The latter forest type was not on pure karst and generally occupied the lower parts of the landscape (Ratajszczak et al., 1990: 11).

Lowe's account of the collection of a series of specimens of *S. j. poliocephalus* indicates further peculiarities. He described it as a "curious weak and feeble sort of monkey, feeding on leaves of small bushes ... It is very tame, lives in small lots of eight to fifteen, and is very sociable. They are often seen all huddled together on the rocks" (Lowe, in Osgood, 1932: 204). "No sooner had we set foot on shore than six monkeys were seen and one shot. Immediately the gun was fired the rest disappeared in holes beneath the rocks - a curious habitat for a monkey, and one I had never encountered before ... Later in the day I found more of these little-known monkeys ... my boy suddenly called my attention to a large group of them sitting in the stunted trees and on the rocks. I selected a fine old male and fired. In an instant the remainder went to ground in the holes just like rabbits. However, I was determined to have some more, so lighted my pipe and sat on a rock below their holes. Presently one appeared which, when shot, fell into a deep cavity amongst the rocks; then another came in exactly the same way, and this was repeated until I had secured four ... I might have obtained many more, for as each one disappeared below another came from sheer curiosity to see what was happening" (Lowe, 1947: 64-65).

Hunters and members of the Cat Ba National Park Management team informed Ratajszczak et al. (1990: 26) that *S. j. poliocephalus* occured both in forest over limestone and valley earth hills forest. Troops numbered as many as 30 individuals, and had overlapping home ranges, but tended to avoid contact. The size of the home range was determined by the availability of water, and the seasonal variation in its availability resulted in irregular troop movement into unfamiliar terrain. Troops slept at night on crags and sometimes moved towards resting sites quite early in the afternoon. The role of the adult male(s) in troops included initiating and maintaining troop movements. Males sometimes stationed themselves at vantage points while the rest of the troop were feeding. The diet included a wide variety of forest seeds, flowers, dry and green leaves, young leaves of *Ficus* sp. and *Dracaena lourecei*, pods and shoots. It was also reported to eat some plants, including the leaves of *Pterocarya tonkinensis*, which are toxic to humans.

TAXONOMIC VARIATION IN EXTERNAL CHARACTERS

Semnopithecus johnii johnii is the only Asian pied leaf monkey sporting nuchal hairs longer than those of the shoulder, but in other respects its head hair disposition is the simplest. The hair disposition in *S. auratus mauritius* is elaborated only by the forward curling of the distal part of the brow hairs. The Indochinese pied leaf monkeys are characterised by a small area of long erected hairs on the vertex forming a fairly well defined crest which deflects the alignment of the brow hairs to either side. The lateral and even somewhat rostral direction of the hairs below the pinna conflicts with that of the posteriorly directed cheek hairs causing the throat hairs to be deflected around the anterior end of the pinna to form a ridge which runs towards the vertex. This elaboration in hair disposition culminates in *S. j. poliocephalus* and *S. francoisi* where the ridge converges with its opposite behind the crest and completes a full circle so that the ventral hairs are again rostrally directed, producing a well defined whorl lateral to the midline of the nape. The sequence of increasing complexity in head hair disposition is as follows: *S. j. johnii*, *S. a. mauritius*, *S. a. ebenus*, *S. delacouri*, *S. laotum*, *S. j. poliocephalus*, *S. francoisi*. Insufficient information is available to include *S. hatinhensis* in this series.

Variation in hair length is represented in Table I. Although all taxa conform in having flank hairs longer than back hairs, and back hairs longer than tail hairs, there is no taxonomic consistency in the variation in hair length in the different parts of the body.

The following field notes are available concerning skin and iris pigmentation. *S. francoisi*: "All bare skin black. Iris brown" (MNHN 1929-439). Those attached to the holotype of *S. delacouri* read: "Face black. Chin paler. Tip of penis white. Rest of skin, hands & feet jet black"; and to the paratype: "Face black & all skin except pure white in fork". For *S. j. poliocephalus* they read: "Face & feet black. Iris pale brown" (ZD 1933.4.1.9); "Face & ears blue black. Bare skin of belly dirty flesh. Hands etc. black" (FMNH 39155); "Bare skin in fork white spotted with black. Face & hands black. Ears greyish black" (FMNH 39156); "Face black. Ears dark grey. Hands & feet black. Fork spotted white & black" (ZD 1933.4.1.10).

Although not an accurate reflection of its colour in life, variation in colour in the dried skins, indicates that there is taxonomic variation in skin pigmentation. Arranged from darkest to palest, according to the colour of the skin in its dried condition, the taxa sort approximately

Table 1: Variation in hair length (millimetres)

Feature	*P. p.*	*S. a. m.*	*S. a. e.*	*S. f.*	*S. h.*	*S. l.*	*S. d.*	*S. j. p.*	*S. j. j.*
Lateral fringe	50	85	75	150	106	140	70	140	65
1/3 dist. shoulder to tail base	35	45	40	60	60	35	50	90	50
Tail (200mm from base)	15	20	20	30	38	20	45	35	15

Key

P. p.	*Presbytis potenziani*	*S. l.*	*Semnopithecus laotum*
S. a. m.	*Semnopithecus auratus mauritius*	*S. d.*	*Semnopithecus delacouri*
S. a. e.	*Semnopithecus auratus ebenus*	*S. j. p.*	*Semnopithecus johnii poliocephalus*
S. f.	*Semnopithecus francoisi*	*S. j. j.*	*Semnopithecus johnii johnii*
S. h.	*Semnopithecus hatinhensis*		

as follows: *S. laotum* (dark grey); *S. francoisi* (ZD 1927.12.1.16 buff grey, ZD 1927.12.1.17 tawny grey); *S. delacouri* (buff to buff grey); *S. j. johnii* (tawny; tawny grey in ZD 1921.11.5.4); *S. a. ebenus* (tawny brown); *S. j. poliocephalus* (yellowish to greyish buff); *S. a. mauritius* (yellowish to tawny brown). Comparison with the above field notes shows that the skin appears paler in the dried state than when freshly killed.

The female pubic hair is white in *S. delacouri*, but white to yellowish in all other taxa. In *S. a. ebenus*, *S. laotum* and *S. j. poliocephalus* the yellowish grades to orange. *S. a. ebenus* is unique in that the patch is obscured by an intermingling of blackish hairs. *S. auratus* and *S. j. johnii* are the only Asian pied leaf monkeys in which the pale pubic hair extends onto the tail base. The skin pigmentation of the female pubic patch is dappled in *S. j. poliocephalus* (see field notes above), *S. laotum* and *S. francoisi*, and somewhat so in some specimens of *S. a. mauritius*.

In *S. j. poliocephalus* pale paw hairs are restricted to the centre of the metatarsals where the hairs are usually basally yellowish and distally brownish or in an exceptional specimen basally brownish and distally blackish. A sprinkling of whitish hairs on the blackish paws occurs in *S. a. ebenus* and is common in *S. a. auratus* from certain localities.

The sharply delineated pure white rump and thigh dorsal pelage colour which sets *S. delacouri* apart, can be seen as the culmination of a process which shows an incipient development in at least one *S. francoisi* specimen, and progresses by way of the grey distal bands which embellish the blackish hairs of this body region in *S. j. johnii* and *S. j. poliocephalus*.

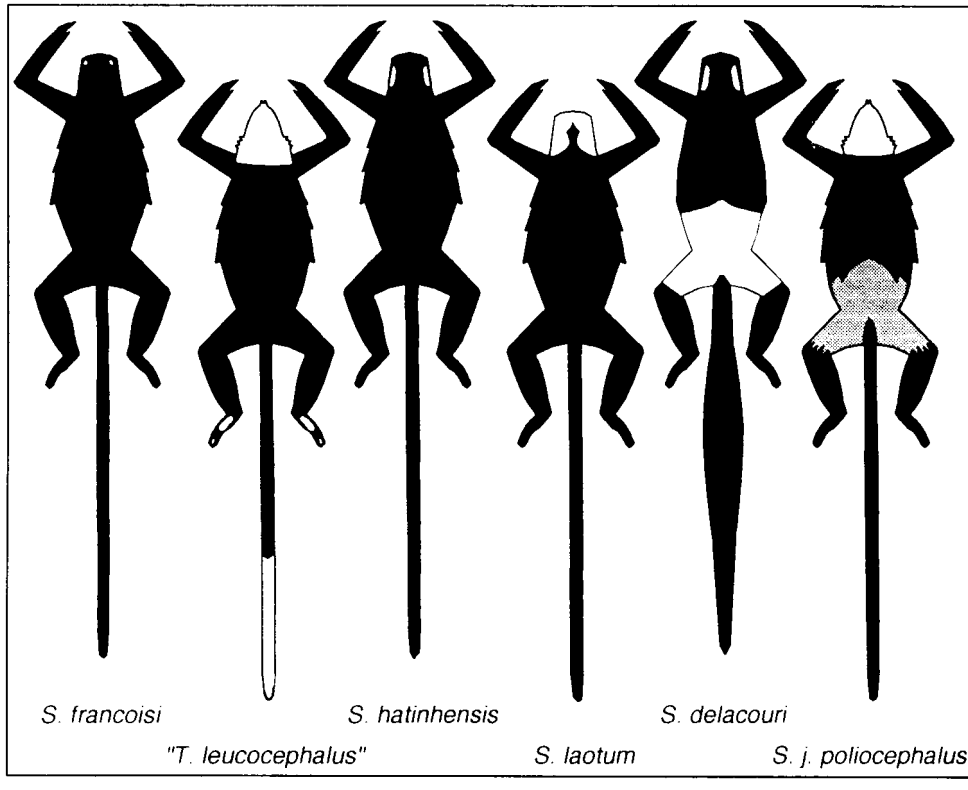

Fig. 4.

The increase in whiteness of the head hair commences with *S. a. mauritius* and *S. a. ebenus* where there are whitish hairs on the pinna and a faint indication of silvery grey or yellowish at the tips of the cheek whiskers. *S. francoisi* also has white hairs on the rim of the pinna, but in addition there is a narrow tract of white hair from above and behind the pinna to the corner of the mouth. The area of whiteness on the head in *S. hatinhensis* and *S. delacouri* is similar to *S. francoisi*, but more extensive and prolonged behind the pinna. In *S. laotum* the white areas are broader and more posteriorly prolonged behind the pinnae, and coalesce to form a white tract across the forehead. There are also white hairs around the mouth. In *S. j. johnii* there is individual variation in the intensity of the yellowish of the nape, while the rest of the head and neck is pale brown. In *S. j. poliocephalus* the head and neck are yellowish, paling to whitish in the areas where *S. hatinhensis* and *S. delacouri* are white. The shoulder hairs are usually brown with yellowish bases, and black persists on the head only in a line of hairs along the superior facial margin and in the tips of the crest hairs.

TAXONOMIC CONCLUSIONS

The relatively large series of *S. auratus* and *S. j. johnii* skulls available for examination demonstrates that cranial characters show considerable individual variation. Beyond confirming that all the Asian pied leaf monkeys, are referable to the subgenus, *Trachypithecus*, they are of little use in further analysing their inter-relationships. Even were there indications that this was possible, the small sample size for the Indochinese taxa, would make conclusions unreliable.

Taxonomic variation in external characters is summarised in Table 2 where they are arranged in numerical order of their clinal expression. The table illustrates that there is no taxonomic consistency in this clinal variation and that the taxa cannot be arranged into a self-evident morphological series. Conclusions as to their inter-relationships can therefore only be drawn by differential weighting of external characters according to their presumed susceptibility to variation.

Table 2: Taxonomic variation in external characters arranged in numerical order of their clinal expression

Feature	*S. a. m.*	*S. a. e.*	*S. f.*	*S. h.*	*S. l.*	*S. d.*	*S. j. p.*	*S. j. j.*
Head colour *	1	2	3	4	6	4	8	7
Rump colour *	1	1	4	?	1	8	7	6
Paw colour *	7	6	1	1	1	1	8	_
Penile Tuft *	1	?	1	1	1	1	7	7
Skin pigment *	1	3	6	?6	8	5	2	4
Head hair disposition †	2	3	8	5	5	4	7	1
Hair length (Flank) §	4	3	8	5	6	2	6	1
Hair length (Back) §	3	2	6	6	1	4	8	4
Hair length (Tail) §	2	2	5	7	2	8	6	1

* 1= darkest, 8 = palest
† 1= simplest, 8= most complex
§ 1= shortest, 8= longest
For Key, see Table 1

There would probably be a consensus of opinion that pelage colour is a more conservative external character than skin pigmentation, hair length or hair disposition. The relative priority of the latter characters is difficult, if not impossible, to determine, although hair length is perhaps the least conservative (see Tan, 1985: 66, for evidence of hair length variation in *S. francoisi*). Even if pelage colour is attributed the greatest taxonomic significance, the relative significance of pelage colour variation in different parts of the body (the head, the rump, the paws and the tail), can only be assessed arbitrarily.

Because there is head pelage colour variation between most of the taxa involved, this character is the most practical, if not the most significant, in drawing taxonomic conclusions. On this character, *S. hatinhensis* and *S. delacouri* are indistinguishable, but they fall with the other taxa into a clinal series which commences with *S. auratus* and culminates in *S. j. poliocephalus* and albinotic *S. francoisi*. It might be inferred that all of the taxa should be treated as subspecies of *S. auratus*. This conclusion is instantly undermined when their geographic distribution is taken into account. The clinal series more or less holds together from *S. a. ebenus*, through *S. francoisi* to *S. delacouri*, *S. hatinhensis* and *S. laotum* but, in addition to the geographical discontinuities affecting *S. auratus* and *S. johnii*, the cline is disrupted by the geographic position of *S. delacouri* and *S. hatinhensis* between that of *S. laotum* and *S. j. poliocephalus*.

That the degree of head pelage colour difference between *S. j. johnii* and *S. j. poliocephalus* can be accommodated within a leaf monkey species, is demonstrated by an aberrant example of *S. vetulus* (which was regarded as being conspecific with *S. johnii* by Blyth, 1844: 469; Pocock, 1928: 499; Hill, 1934: 79; and tentatively, by Groves, 1970: 571; 1993: 274). In ZD 1950.7, a specimen of *Semnopithecus vetulus nestor* from Kala Oya [80°02'N 80°30'E] in Sri Lanka, the normally pale buffy brown of the crown and nape is almost entirely replaced by whitish yellow. The contrast in head pelage colour between ZD 1950.7 and an unusually dark specimen, ZD 1911.9.9.1, of *Semnopithecus vetulus monticola* from Adam's Peak [6°48'N 80°30'E] is comparable to that between the two *S. johnii* subspecies.

The other features which are unique to *S. johnii* amongst the Asian pied leaf monkeys, are the small patch of pale hair surrounding the penis; the brown basal colour to the black hairs of the anterior of the back; and the grey terminal bands on the black rump hairs (in both subspecies these grizzled hairs are shorter than those on the rest of the back). Again, the increasing whiteness of the rump from *S. francoisi*, through *S. johnii* to *S. delacouri* does not follow a conventional geographic pattern.

PHYLOGENETIC CONCLUSIONS

Brandon-Jones (1978; in prep.) concluded that the Asian pied leaf monkeys are relics of a leaf monkey whose geographic distribution, formerly continuous from Java to southern India, was fragmented by the cool and dry climate accompanying the most recent glaciation. The pre-glacial Asian pied leaf monkey was perhaps classifiable as a single species with clinally intergrading subspecies ranging from an an ebony leaf monkey *(S. auratus)* at one extreme of its geographic range, to a hooded black leaf monkey *(S. johnii)* at the other extreme. The anomalous geographic distribution of external characters in the Indochinese pied leaf monkeys can be explained by surmising that the climatic deterioration was sufficiently slow as apparently to avoid the extinction of any of these subspecies; but sufficiently rapid as to prevent them from intergrading into a single population as their distribution contracted to

its present extent. The imbalance in geographic distribution between *S. francoisi* and the rest of the Indochinese pied leaf monkeys, indicates that *S. (auratus) francoisi* was the resident pre-glacial subspecies. Siting the remaining four Asian pied leaf monkeys in their former distribution can only be a matter for conjecture.

Subsequent to the glaciation, *S. auratus* gave rise to the *Semnopithecus cristatus* species group *(S. cristatus, S. obscurus, S. pileatus, S. barbei* and *S. geei)*, and *S. johnii* to *S. (Semnopithecus)* by way of *S. vetulus*. The genetic relationship between *S. auratus* and *S. johnii* and their descendant species is therefore equivalent to their genetic relationship with *S. francoisi*. This genetic relationship might therefore be expressed by treating *Semnopithecus* as a monotypic genus, but this would involve the recognition of a number of sympatric subspecies.

It is impossible to reconcile this phylogenetic analysis of the morphology and geographic distribution of the Asian pied leaf monkeys with a conventional classification and, at best, only a compromise taxonomy can be advocated. Three of the leaf monkeys, *S. auratus*, *S. johnii* and *S. delacouri* are sufficiently distinct from each other to warrant specific status by most conventional criteria. The specific distinction of *S. delacouri* from *S. hatinhensis* has recently been confirmed by the discovery (R. Wirth, in litt., 14 Oct.1993) that an isolated limestone hill a few miles from Cuc Phuong N. P. is inhabited by a single troop of each species with so far as is known, no interbreeding or even interaction between the two. Differences "in vocalisation, how the tail is carried during locomotion and various other things" have been observed. C. P. Groves (pers. comm.) has reported that compared with *S. hatinhensis*, *S. delacouri* seems more heavily built, "its crest is thinner, more coconut-like, and points forward; the ears stand out more from the head, seeming to be placed on prominent fleshy bases; the tail loops backward instead of being held above the back, in somewhat of an S-curve as in *Trachypithecus francoisi hatinhensis*. It has the same elongated handlebar-moustache-like hairs from mouth corners towards ears. The hair is thicker, especially on the tail; particularly the base of the tail is thick-haired and bushy. From the back it looks like a Ruffed Lemur. Adult males of the two taxa were caged together, being surplus to the breeding groups. The *hatinhensis* was dominant, constantly displacing the *delacouri*, dancing around it with much more agility". *S. laotum* and *S. hatinhensis* have been considered subspecies of *S. francoisi* but could no less rationally be treated as subspecies of *S. auratus*, as could *S. francoisi*. It is therefore advocated that all recognized taxa are regarded as distinct species within the superspecies *Semnopithecus (Trachypithecus) auratus*.

This analysis also raises the question of why only the southern subspecies of *S. auratus* and *S. johnii* have engendered descendant species, while their Indochinese relatives have ceased geographic dispersal, let alone evolutionary development. It is perhaps an unanswerable question, but is possibly connected with the geographic latitude of these populations and the "climatic buffetting" they have experienced. Brandon-Jones (1993; in prep.) provided evidence that there were at least two cool and dry periods which fragmented Asian colobine distribution. The climatic deterioration is likely to have affected the Indochinese pied leaf monkeys more severely than it did their southern relatives, and perhaps their eccentric ecology is symptomatic of the traumas they endured. Fresh habitats almost certainly became available to the southern subspecies before becoming available to the Indochinese pied leaf monkeys. It is also possible that populations at the extremes of a species' range have a greater evolutionary potential than those at its centre.

Table 3: Collector's measurements (in millimetres) - male specimens

Code	Locality	Acc. no/Source	Coll.No.	Coll. Date	Age	H&B	Tail	HF.	Ear	Weight
S. a.	Sendang	LM (Sody)	E77	21 Jul 1930	A	600	750	165	35	
S. a.	Wonoredjo	MZB 6696		nd nm1936		[590]	815	171	38	
S. a.	Badjoelmati	ZD.1954.61	8659	27 Jan 192	A	505	785	176	24	
S. a.	Tamansari	ZD.1954.60	8632	17 Jan 1960	A	600	750	166	32	
S. a.	Sudoeng jrok	ZRC 4.375	1035	09 Apr 1916	A	641	721	165	38	
S. a.	Sudoeng jrok	ZD.1954.58	1037	10 Apr 1916	A	574	757	174	45	
S. a.	Sudoeng jrok	ZD.1954.57	1029	08 Apr 1916	A	583	714	169	42	
S. a.	Ongop-ongop	ZD.1954.56	94	05 Apr 1916	A	570	700	170		
S. a.	[Ongop-ongop]	ZRC 4.373	102	06 Apr 1916	A	575	610	165	40	
S. a.	Kendeng III	MZB 705		15 Jun 1924		[570]	760	175	32	
S. a.	Karang Bolang	ZRC 4.377	8615	17 Feb 1920	A	530	865	179	34	
S. a.	Tjilatjap	ZD.1989.1.5.8	614	19 Oct 1907	A	590	810	165	40	
S. a.	Pangandaran	ZD.1909.1.5.4	1793	15 Apr 1908	A	650	780	180	38	
S. a.	G. Lawoe	LM 14609	1934	20 Jun 1936	A	440	612	143	32.5	
S. a.	Gedangan	LM (Sody)	11	05 Aug 1931	A	557	770	168	39	
S. a.	Gedangan	MZB 6695		01 Mar 1940	[S]	[534]	753	153	31	
S. a.	G.Slamet	LM (Sody)	15c	29 Sep 1929	A	560	660	173	33	
S. a.	Tjikoedjang	MZB 6693		30 Jul 1932	S	570	730	130	30	
S. a.	Tjibodas	USNM 156304	504	13 Aug 1909		545	713	175	20	
S. a.	Tjibodas	USNM 156305	511	24 Aug 1909		490	710			
S. a.	Tjibodas	ZD.1949.423	7181	12 Feb 1916	A	540	711	163	30	
S. a.	Tjibodas	ZD.1954.62	7286	24 Feb 1916	A	465	730	165	35	
S. a.	G. Pangerango	LM 14607	1163	13 Aug 1934	A	533	740	177.5	35	
S. a.	G. Salak	LM (Sody)	A214	nd Sep 1931	A	462	737	155	37	
S. a.	G. Salak	LM (Sody)	233A	nd May 1932	A	525	670	175	35	
S. a.	Tji Wangie	ZD.1909.1.5.15	493	04 Oct 1907	A	610	680	165	37	
S. a.	Tjikaso	MZB 8008		11 Apr 1956	S	530	782	172	32	
S. a.	Pelabuanratu	USNM 156309	920	04 Oct 1909		510	823	175	19	
S. a.	[Pelabuanratu]	ZRC 4.381	8814	23 Feb 1920	J	480	765	174	32	
S. a.	Djasinga	MZB 2053		10 Apr 1929	[A]	[487]	744	167	34	
S. a.	Leuwiliang	MZB 2344		20 Nov 1929	[A]	[524]	706	165	35	
S. a.	Bogor	MZB 1876		nd Aug 1928	[A]	530	690	168	30	
S. f.	Fusui	(Li and Ma, 1980)	77209	13 Aug 1977	A	510	820	163	27	
S. f.	Chongzhou	(Li and Ma, 1980)	76101	11 Apr 1976	A	590	890	170	29	7.70 kg
S. f.	Chongzhou	(Li and Ma, 1980)	76105	15 Apr 1976	A	614	860	182	26	8.80 kg
S. f.	Chongzhou	(Li and Ma, 1980)	77205	16 Jul 1977	A	615	830	183	34	9.45 kg
S. f.	Ba Bê	UH Ps 26			A	510	890	175	32	
S. f.	Ba Bê	UH Ps 16			A	600	900	175	45	
S. f.	Bac - Kan	MNHN 1929-439	543	20 Jan 1927	A	470	740	152	30	
S. f.	Dinh hoa	UH Ps 47			A	515	805	160	35	5.70 kg
S. f.	Langson	ZD.1927.12.1.16	581		A	635	858	165	30	
S. l.	Ban Na Sao	ZD.1920.12.10.1	7213	24 Feb 1920	A	485	845	162	45	
S. h.	Tuyên - hoa		601	01 Nov 1964		665	810	155	35	8.00 kg
S. d.	Hoi-Xuan	ZD.1932.4.19.2	1878	15 Feb 1930	A	580	820	183	40	
S. d.	Chi Ne	UH Ps 14			A	580	855	184	44	
S. d.	Chi Ne	UH Ps 15			S	475	725	150	44	
S. j. p.	Cac-Ba Isld	UH Ps 33			A	590	820	153	35	
S. j. p.	Cac-Ba Isld	ZD.1933.4.1.9	1814	07 Jan 1930	A	492	872	171	40	
S. j. p.	Cac-Ba Isld	FMNH 39155	1817	12 Jan 1930	A	530	870	166	33	
S. j. j.	Srimangala	ZD.1913.8.22.1	2509	11 Feb 1913	A	645	765	173	36	9.76 kg
S. j. j.	Seetagundy	ZD.1921.11.5.6	90	08 May 1921	S	[508]	[755]	[171]	[38]	
S. j. j.	Kumblacodie	ZD.1921.11.5.4	3	29 Mar 1921	A	[581]	[876]	[190]	[35]	
S. j. j.	Cotengady Estate	ZD.1921.11.5.3	80	27 Apr 1921	S	[543]	[965]	[190]	[45]	
S. j. j.	Anamaad	ZD.1921.11.5.5	76	25 Apr 1921	A	[571]	[940]	[197]	[38]	
S. j. j.	Kodaikanal	AMNH 54760		nd Jun 1924	[A]	[711]	[813]			
S. j. j.	Kodaikanal	(Leigh, 1926)			[A]	[610]	[813]			11.80 kg
S. j. j.	Kodaikanal	(Leigh, 1926)			[A]	[660]	[711]			13.17 kg
S. j. j.	Kodaikanal	(Leigh, 1926)			[A]	[635]	[686]			12.26 kg
S. j. j.	Tinnevelly Hills	(Leigh, 1926)			[A]	[660]	[915]			13.62 kg

Key

P. p. *Presbytis potenziani*
S. a. *Semnopithecus auratus*
S. f. *Semnopithecus francoisi*
S. h. *Semnopithecus hatinhensis*
S. l. *Semnopithecus laotum*
S. d. *Semnopithecus delacouri*
S. j. p. *Semnopithecus johnii poliocephalus*
S. j. j. *Semnopithecus johnii johnii*

Table 4: Collector's Measurements (in millimetres) - female specimens For Key, see Table 3

Code	Locality	Acc. no/Source	Coll.No.	Coll. Date	Age	H&B	Tail	HF.	Ear	Weight
S. a.	Sendang	LM (Sody)	E27	11 Jul 1930	A	552	733	167	33	
S. a.	Sendang	LM (Sody)	E35	13 Jul 1930	A	524	756	155	35	
S. a.	Sendang	LM (Sody)	E38	14 Jul 1930	A	540	790	170	35	
S. a.	Sendang	LM (Sody)	E39	14 Jul 1930	A	510	740	150	35	
S. a.	Sendang	LM (Sody)	E42	15 Jul 1930	A	525	700	153	35	
S. a.	Wonoredjo	MZB 6697		nd nm 1936	[A]	[566]	782	169	34	
S. a.	Tamansari	ZRC 4.376	8633	17 Jan 1920	A	515	735	164	32	
S. a.	Sudoeng jrok	ZD.1954.59	1036	09 Apr 1916	A	545	665	158	35	
S. a.	Sudoeng jrok	ZRC 4.374	1025	07 Apr 1916	A	557	679	159	32	
S. a.	Ongop Ongop	ZRC 4.372	82	03 Apr 1916	[A]	545	675	175	40	
S. a.	Tjilatjap	ZD.1909.1.5.9	615	19 Oct 1907	A	630	770	163	44	
S. a.	Tjilatjap	ZD.1909.1.5.11	749	07 Nov 1907	A	550	710	153	36	
S. a.	Tjilatjap	ZD.1909.1.5.12	787	17 Nov 1907	[A]	610	690	170	35	
S. a.	Pangonan	LM (Sody)	M38	19 Dec 1928	A	540	660	158	31	
S. a.	Gedangan	LM (Sody)	8	27 Jul 1931	A	485	750	171	35	
S. a.	Tjandiroto	LM (Sody)	72B	14 Jun 1929	A	540	640	150	34	
S. a.	Tjandiroto	LM (Sody)	108B	20 Jun 1929	A	560	780	174	33	
S. a.	Kalikidang	LM (Sody)	125c	17 Oct 1929	A	530	690	157	30	
S. a.	Kalikidang	LM (Sody)	126c	17 Oct 1929	A	550	660	158	32	
S. a.	Tjibodas	FMNH 48939		12 Sep 1909		505	663	165	20	
S. a.	Tjibodas	USNM 154725	216	14 Apr 1909	A	530	695	158	18	
S. a.	Udjungtebu	ZRC 4.382	8824	03 Apr 1920	A	500	770	167	31	
S. a.	Tjeringin	LM (Sody)	6f	28 Jan 1931	A	615	760	162	30	
S. a.	Tjeringin	LM (Sody)	10f	30 Jan 1931	A	505	690	140	30	
S. a.	Tjeringin	LM (Sody)	21f	01 Feb 1931	A	528	740	153	32	
S. a.	Tji Wangie	ZD.1909.1.5.16	479	28 Sep 1907	A	600	730			
S. a.	[Palabuanratu]	ZRC 4.380	8776	11 Feb 1920	[A]	535	775	165	32	
S. a.	Udjung Kulon	MZB 6694		03 Dec 1933	S	[500]	800	150	35	
S. a.	Djasinga	MZB 3188		02 Sep 1931	[A]	[505]	760	175	33	
S. a.	Leuwiliang	MZB 2345		27 Nov 1929	S	[462]	768	153	30	
S. a.	Tjisalak	MZB 0558		20 Oct 1923	[A]	500	750		31	
S. f.	Fusui	(Tan, 1985)			S	535	792			
S. f.	Chongzhou	(Li and Ma, 1980)	76102	11 Apr 1976	A	610	815	165	23	8.70 kg
S. f.	Ningming	(Li and Ma, 1980)	77206	09 Aug 1977	A	470	765	165	26	
S. f.	Ba Bê	UH Ps 11			A	610	900	170	42	7.20 kg
S. f.	Langson	ZD.1927.12.1.17	580	23 Jan 1927	A	590	830	160	36	
S. f.	Huu lung	UH Ps 34			A	670	900	153		
S. h.	Xom - cuc	No. 28	MA 239	nd Dec 1942	A	500	870	140	28	
S. l.	Ban Na Sao	ZRC 4.436	7212	24 Feb 1920	A	535	895	163	45	
S. l.	Ban Na Sao	ZRC 4.437	7219	25 Feb 1920	A	460	810	155	45	
S. d.	Hoi-Xuan	ZD.1933.4.2.13a	1837	25 Jan 1930	A	570	840	167	43	
S. j. p.	Cac-Ba Isld	ZD.1933.4.1.11	1818	12 Jan 1930	A	550	887	158	34	
S. j. p.	Cac-Ba Isld	ZD.1933.4.1.10	1820	12 Jan 1930	A	495	820	150	39	
S. j. p.	Cac-Ba Isld	FMNH 39154	1815	07 Jan 1930	J	410	613	130	38	
S. j. p.	Cac-Ba Isld	FMNH 3915	1819	12 Jan 1930	A	545	853	158	33	
S. j. j.	Kukkal	ZSI 12099	138	04 Jun 1922	[A]	600	800	171	37	11.35 kg
S. j. j.	Kodaikanal	(Leigh, 1926)		08 May 1919	A	[584]	[813]			10.90 kg

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