The Kalakad–Mundanthurai Tiger Reserve: A global heritage of biological diversity

A. J. T. Johnsingh
Wildlife Institute of India, P.B. 18, Chandrabani, Dehra Dun 248 001, India

Kalakad–Mundanthurai Tiger Reserve (KMTR), once largely a reserve forest, became a Tiger Reserve in 1988. This Reserve at the southern end of the Western Ghats, a global biodiversity hotspot, is a veritable home of ecological and biological diversity. It has about 150 localized plant endemics, and 33 fish, 37 amphibian, 81 reptile, 273 bird and 77 mammal species. KMTR also protects the catchment of numerous rivers, which supports the agricultural economy of three adjacent districts. This fascinating Reserve, and the unparalleled encouragement from the Tamil Nadu Forest Department, has over the decades attracted numerous biologists, who have studied in detail various species of the Reserve. The Reserve has enormous potential for future research and conservation of biodiversity and endangered species such as the tiger. Tiger conservation in the southern Western Ghats should have landscape-level planning and the suggested Megamalai–Kalakad Tiger Conservation Unit offers an ideal framework to turn this suggestion into a reality. KMTR is an excellent illustration of how research and management need to go hand in hand to achieve conservation objectives.

KMTR is an important area for research on and conservation of the nocturnal slender lorises. (Photo: A. J. T. Johnsingh)

A herd of Nilgiri tahr: Conservation of this endangered mountain goat in KMTR requires research inputs, planned management, and monitoring. (Photo: A. J. T. Johnsingh)
realty\textsuperscript{2} in April 1988. Now with the inclusion of Upper Kodayar and Boothupandi Reserve Forests of Kanyakumari district, the Tiger Reserve is about 900 km\textsuperscript{2}.

KMTR, sprawling across a diverse terrain, is ecologically rich. It has vegetation types ranging from thorn scrub to montane (wet) evergreen forests, all within an altitudinal range from sea level to 1866 m above sea level. The exemplary ecological richness and the unparalleled encouragement from the Tamil Nadu Forest Department, have over the decades attracted numerous biologists both from abroad and within India. Their findings have enhanced our understanding and appreciation of the biological values of this area.

**Biodiversity hotspot**

The Western Ghats, one of the 25 mega biodiversity hotspots of the world\textsuperscript{3}, covers 5\% of India’s land area, yet contains more than 4000 or 27\% of the country’s total plant species. Of these, 1500 species are endemic\textsuperscript{4}. Nearly 63\% of India’s arboreal evergreen taxa are endemic to the Western Ghats\textsuperscript{5}. In the Agasthyamalai region, the pattern of high endemism and diversity is well illustrated by plant taxa. This region has about 150 localized plant endemics and a rich reservoir for a large number of wild relatives of cultivated plants such as cardamom, mango, banana, rice, jackfruit and turmeric\textsuperscript{6}.

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**Figure 1.** Map of Kalakad–Mundanthurai Tiger Reserve.
Orchids like *Brachycorythis splendida* and *Disperis neilgherrensis* show the affinities of this Reserve to Africa. Recently a new edible fruit species (*Saururus* sp. nov.) has been recorded from these hills (Sathish Kumar, pers. comm.). Tree species such as *Bischofia javanica*, *Canarium strictum* and *Mesua ferrea* indicate the floral affinity of KMR with north-east India. Occurrence of tree species such as *Oberonia forcipata*, *Memecylon angustifolium*, *Mesua ferrea*, *Elaeocarpus serratus* and *Calamus thwaitesii* in Agasthyamalai and Sri Lanka explains the past geological linkage between south India and Sri Lanka. Diversity of tree species in Kakachi, an undisturbed mid-elevation evergreen forest in KMR, appears to be greater than at other sites in the Western Ghats such as Anamalai and Nelliampathy.

Yet we were callous about this area of great biological significance. Consequently, between 1960 and 1990 this area lost 85.6 km² to plantations, 42.0 km² to encroachments and 36.4 km² to reservoirs. In spite of these ravages, the region still protects the catchment of numerous rivers, which support the agricultural economy of Tirunelveli, Tuticorin and Kanyakumari districts.

**Early research**

The first published observations on the mammals of this area come from Webb-Peploe, a Christian missionary working with Dohnavur Fellowship. He recorded the occurrence of rusty-spotted cat in the scrub forests on the way to Narikadu. He also reports of the occurrence of brown palm civet, striped hyena (*Hyaena hyaena*) and the possible occurrence of Malabar civet (*Viverra megasplia*). Barking deer (*Muntiacus muntjak*) was not recorded.

Primatologists from abroad as well as from India have been attracted to KMTR by the occurrence of five primate species, all of which could be seen in a day’s trek. Green and Minkowski worked out the annual home range of a 15-member lion-tailed macaque group to be around 5 km² in Kakachi. They estimated that a large contiguous block of at least 160 km² of rainforest rich in *Cullenia excelsa* and *Artocarpus hirsuta* is needed to maintain a viable breeding population of about 500 animals. Ramesh et al. report that there is c. 440 km² of contiguous mid-elevation rainforest in KMTR and adjacent hills. Such contiguous rainforest is rare in Western Ghats today.

Soon after the lion-tailed macaque study, John Oates studied Nilgiri langur in Kakachi. The study resulted in a paper on the leaf chemistry of langur food plants. The langur study was followed by research on bonnet macaque on the Mundanthurai Plateau and in evergreen forests near Sengaltheri. On the Plateau, 68 plant species were recorded as food plants. Fruits, particularly figs, and insects constituted the bulk of the diet.

**Recent research**

One of the ideal places in KMTR for wildlife research is the Mundanthurai Plateau which has an area of about 50 km² and is at an altitude of 180 m above sea level. It has facilities to stay, two perennial rivers and varied habitats such as riverine forests, plantations, dry deciduous forests and Deer Valley where *kumri* cultivation was once practised.

The early 1980s saw a spate of research by the wildlife biology students of A.V.C. College, Mylapurthurai for their M Sc dissertation under the guidance of the author. Most of the research was done on the Plateau and led to several useful publications. The first paper recommended that to improve forage availability for ungulates, fire should be used sparingly, and where fire-intolerant plant species are to be protected, fire should be banned. Much later in the same grassland (Deer Valley), Sankaran...
and McNaughton demonstrated and explained how low-diversity plant communities can show greater compositional stability when subjected to experimental perturbations characteristic of their native environments. Johnsingh and Joshua highlighted the biological values of the threatened gallery forest of river Tambiraparani; Dasia halauanus, an arboreal skink, reported earlier only from Sri Lanka, was discovered by them in this gallery forest.

Later, Johnsingh and Joshua analysed the patterns of bird species diversity within the riverine, dry deciduous and secondary vegetation. They found that seasonal variation in bird abundance was more pronounced in the riverine and dry deciduous forest than in the secondary vegetation which was avoided by most of the winter migrants. The paper emphasized the need for assessing and monitoring the conservation status of avifauna in managed forests in India.

The study also enabled Joshua and Johnsingh to compile a bird list of 159 species for the Plateau. Sunderraj continued his M.Sc. dissertation work for his Ph.D. quantifying the group size, composition, ranging and food plants of Nilgiri langur in the gallery forests of Tambiraparani and Servalar on the Plateau. The study quantified the biotic disturbances of pilgrimage to Srimuthyvanar Koil and came up with valid recommendations (Sunderraj and Johnsingh, this issue). Sunderraj and Johnsingh also quantified the impact of the flash flood along the Servalar river in October 1992, which decimated the gallery forest and its arboreal mammals (Nilgiri langur, bonnet macaque and Indian giant squirrel). The conclusion was that revival of the gallery forest was necessary and it could be aided by planting of Alphonsea scleroarpa, Syzygium cumint, Mangifera indica, Derris indica, Albizia amara and A. lebbek.

Johnsingh and Sankar identified 162 food plants of chital, 139 of sambar and 90 of cattle on the Plateau. They concluded that elimination of cattle from the Plateau and creation of more meadows would lead to an increase in chital population that was then estimated to be 150–200 animals. Sankar did cafeteria experiments with a tame chital, which added 25 species to the list of chital food plants identified by him. Johnsingh and Vickram came up with a useful photo-documented paper on fishes of Mundanthurai Wildlife Sanctuary describing 33 species. They came up with five recommendations that could significantly improve the fish resources of the sanctuary.

Ravi Chellam did a four-month study on common langur and was successful in taking a unique photograph of male Nilgiri langur copulating with a female common langur. The foothills were surveyed and it was discovered that the langur occurred in three distinct isolated sub-populations: on the Plateau, in the Madura Coats factory campus at the foothills just outside the forest boundary, and the Nambikovil river in Thirukkurungudi range. This discontinuous distribution suggests the past continuous

distribution along the forest boundary. It appears that common langurs occasionally wander off from their ranges as one was seen in Nannikudai in Thirukkurungudi range, and two in Thalayanai in Kalakad range (D. Mudappa, pers. commun.). It may be worth helping the common langur to recolonize all the riverine tracts along the foothills through reintroduction, which will significantly improve the prey base for the leopard.

Sathyakumar analysed leopard scats collected from the Plateau and found that sambar, blacknaped hare, chital, mouse deer and cattle contributed to the diet. There was no mention of barking deer in the diet. However, Ramakrishnan et al. found barking deer remains in nearly 8% of 111 leopard scats and recorded no mouse deer remains. These findings are questionable. Katti and Katti and Price studied the leaf warblers of the genus Phylloscopus. In his delightful article, Katti highlights the ecological role of warblers and emphasizes that a study of warblers is as important as that of large mammals.

Some recent research in KMTR has focused more on the smaller little-known animals such as amphibians and reptiles. India has 215 amphibian species. The Western Ghats have 120, of which 90 are restricted to rainforests. Thirty-two species have been recorded from the rainforests of KMTR of which 25 are endemic to Western Ghats (Vasudevan et al., this issue). Melanophryniscus indicus, the black narrow-mouthed frog was rediscovered after 100 years in Kakachi.

The total number of reptilian species in India is 480, of which the Western Ghats have 197, so far, around 55 species have been reported from the rainforests of KMTR. N. M. Ishwar (pers. commun.) reports that the number of reptilian species from KMTR is around 81, which is quite high for any single protected area. Some species of biological and ecological importance are Calotes andamanensis, Geocaphalus silicatius (Cochin forest cane-
turtle), Hemidactylus anamallensis (Anaimalai gecko),
and Otocryptis beddomei (Indian kangaroo lizard).

Katti et al. (unpubl.) have compiled a list of 273 spe-
cies of birds found in and around KMTR (Appendix 1).
Of the 16 species of birds endemic to the Western Ghat,
14 are found in KMTR. The Oriental Bay Owl, a very
rare species, has been recorded from Sengaltheri. There
may be a good population of Broad-tailed Grassbird near
Kodayar. The White-bellied Shortwing, another rare West-
ern Ghats endemic, is found in high elevation rainforests
like Neterikal. The mammal list assembled by D. Mudappa
and J. Ronald (pers. commun.) contains at least 77 spe-
cies. Special mention must be made of the rodent the
Malabar spiny dormouse, the only species of this genus,
which seems to have a wide distribution in KMTR
(Mudappa et al., this issue). Appendix 1 gives the list of
vertebrates identified in the Reserve. Species and sub-
species that are endemic to Western Ghats are marked
with an asterisk.

Opportunities for research and conservation

KMTR is an invaluable amphitheatre for future research.
Biological research here is of great management and con-
servation significance. Archival research could be done to
know the history of KMTR and the land use changes the
area has undergone over the decades. It will be vital to
inventory and quantify the distribution and abundance of
endangered and endemic species and assess the factors
that govern their abundance. KMTR will be an excellent
place to do a radio-telemetry study on mouse deer, a spe-
cies on which very little information is available in India.
The rainforest tract in KMTR, supposed to be the most
extensive in the Western Ghats, offers an unparalleled
opportunity to investigate and monitor various parameters
related to rainforest ecology. Only if studies in rainforest
ecology are on a long-term basis, can information valu-
able for rainforest conservation be collected.

KMTR offers excellent opportunities for practicing
restoration ecology. There are 28 enclaves within KMTR56,
many of which may be acquired by the Forest Department
in course of time. As and when these enclaves are
acquired to add them to the wildlife habitat, native vegeta-
tion should be grown in them. Research related to restora-
tion ecology such as identification of suitable plant species,
raising and transplantation of their saplings should be
actively encouraged. The knowledge acquired through
such programmes will come in handy, for example, when
the lease of enclave Bombay Murrin Muraung Trading
Corporation, which has a total area of about 34 km², expires
in 2028 and if the Government decides to integrate the
enclave into KMTR. Increase in pilgrimage and tourism
and its impact on wildlife needs to be quantified and
Sunderraj and Johnsingh (this issue) have already set a
model for such studies.

In addition, research and management efforts need to be
directed towards endangered species such as the
Nilgiri tahr and tiger. In extreme southern Western Ghats,
which includes the southern portions of KMTR and the
adjoining Neyyar Wildlife Sanctuary, we have an ex-
cellent opportunity to bring back a population of about 1000
tahr. The tahr habitat here is extensive from the southern
slopes of Agasthyamalai in the west to Thiruvananthapuram
hills in the south east and Kottanghatthi and Kannunni
in the north. Several decades ago, tahr occurred throughout
these areas, but were eliminated in the course of time
from most places due to poaching77 and cattle grazing.
The latter leads to competition for water in summer and
the cattle camps become the abodes for poachers. Perhaps
around 100 tahr are found today in Thiruvananthapuram
and Upper Kadayar hills in KMTR and in Vazhimmattumudi
Neyyar Wildlife Sanctuary. If this population is well pro-
tected and the grasslands in the tahr habitats are managed
by the judicious use of fire, then it is possible for this
small population to build up and spread rapidly. We
should endeavour to make this happen within the next two
decades.

KMTR is reserved for the tiger2 but it can support a
maximum of 15 adult tigers. The reason for this low num-
ber of tigers is the low abundance of wild ungulate prey as
the Reserve is not ecologically suitable to support a
higher density of ungulates. Sambar and wild boar,
the two ungulates available to the tiger throughout the
Reserve, occur in very low densities. The foothill forests
are not extensive (the available forests are heavily dis-
turbed), the terrain is rocky and steep in many places,
mid-elevation forests are dry in most places and together
with rainforests are unproductive for ungulates.

Tiger conservation in the southern Western Ghats,
therefore, should be planned on a landscape level cover-
ing a much larger area encompassing the forests of Kerala
and Tamil Nadu. Ideas for such an area, the Periyar-
Kalakad Tiger Conservation Unit, an area of about 5000 km² of productive habitat, are already available. This tract, in fact, should be called as Megamalai–Kalakad Tiger Conservation Unit and include the wildlife rich areas, north of the Periyar Tiger Reserve. This unit has about 50 tigers but has the potential to support at least 100 tigers. Major conservation problems in this unit are poaching of prey species and elephant, plantations (Eucalyptus, coffee and cardamom), illegal cultivation of ganja (Cannabis sativa), growing pilgrimage to Sabarimalai temple and other shrines (accompanied by increasing biotic disturbances and garbage) and habitat fragmentation along the Ariankavu pass. It is possible to control poaching, acquire the coffee and cardamom plantations which the owners want to sell, reduce the problems caused by the pilgrimage and create a corridor across Ariankavu pass if the Forest Departments of Tamil Nadu and Kerala work together, activated and supported by conservationists.

Appendix I. List of vertebrates found in Kalakad–Mundanthurai Tiger Reserve. Endemic species are marked with an asterisk for herpetofauna, birds and mammals. Bird species marked with @ are found around KMTR (mainly waterbirds). Sources for the herpetofauna, bird and mammal lists are given at the end of the Appendix.

(a) Fishes recorded from the Reserve (during the early 1980s). Family names are changed according to Talwar and Jhingran.

I. Family: Gobiidae
   1. Glossogobius giuris

II. Family: Mastacembelidae
   2. Mastacembelus armatus

III. Family: Channidae
   3. Channa striatus
   4. Channa orientalis (C. gachua)

IV. Family: Cichlidae
   5. Euploplus maculatus
   6. Euploplus suratensis
   7. Oreoichthys mossambica (Tilapia mossambica)

V. Family: Siluridae
   8. Macrones vitatus (Macrones vitatus)
   9. Ompak bimaculatus (Callichthys bimaculatus)
   10. Heteropterus fossilis (Saccobranchus fossilis)

VI. Family: Belonidae
   11. Xenentodon cancila (Belone cancila)

VII. Family: Aplocheilidae
   12. Aplocheilus lineatus (Haplocheilus rubrostigma)
   13. H. lineatus synonym of Aplocheilus lineatus

VIII. Family: Cyprinidae
   14. Brachyplatystoma fasciatum (Homalogaster brachytarsus)
   15. Gara lissorynchus (Discogobius modestus)
   16. Cyprinus carpio communis
   17. Labeo jambalensis
   18. L. caesus
   19. Cirrhina mitrula
   20. Ctenopharyngodon idella
   21. Puntius sarana sarana (Barbus sarana)

IX. Family: Anguillidae
   33. Anguilla bengalensis

(b) Amphibians recorded from the Reserve (includes unidentified species).

I. Family: Ichthyophiidae
   1. Ichthyophis species 1
   2. Ichthyophis species 2

II. Family: Uraeotyphlidae
   3. Uraeotyphlus malabaricus

III. Family: Bufonidae
   4. Bufo melanostictus
   5. B. beddomei
   6. B. microtympanum
   7. B. species
   8. B. fergusoni

IV. Family: Microhyliidae
   9. Rhacophorus indicus
   10. Rana muscosa
   11. Microhyla ornata
   12. M. rubra

V. Family: Rhacophoridae
   13. Phylletis variabilis
   14. P. pulcherrimus
   15. P. charus
   16. P. glandulosus
   17. P. species
   18. Polypedates maculatus
   19. Rhacophorus calcudensis

VI. Family: Ranidae
   20. Euphylyctis cyanophlyctis
   21. Indirana beddomei
   22. I. brachytarsus
   23. I. leptodactyla
   24. I. diplotisnica
   25. Limnonectes keralensis
   26. L. timnocharis
   27. Micrixalus fascus
   28. M. saxicola
   29. M. species
   30. Nyctibatrachus allicae
   31. N. major
   32. N. vasanthi
   33. N. beddomei
   34. Rana aurantiaca
   35. R. curtipes
   36. R. temporalis
   37. Tomopterna rolanda

(c) Reptiles recorded from the Reserve (during 1996–1998).

I. Family: Bataguridae
   1. Melanochelys trijuga
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II. Family: Gekkonidae
4. Cnemaspis indica*
5. C. ornatus*
6. C. beddomei*
7. Cnemaspis spp. 1
8. Cnemaspis spp. 2 (yellow throat)
9. Cnemaspis spp. 3 (red eyed gecko)
10. Hemidactylus anamalensis (= Dravidogecko anamalianis)*
11. Hemidactylus leschenaultii
12. H. maculatus
13. H. triedrius
14. H. brookii
15. H. frenatus

III. Family: Agamidae
16. Calotes andamanensis*
17. C. calotes
18. C. elliotii*
19. C. rouxi*
20. C. nemoricola*
21. C. grandisquamis*
22. Draco dussumieri*
23. Otoctropsis beddomei*
24. Psammodipus blanfordanus
25. P. dorsalis
26. Calotes versicolor
27. Sitana ponticeriana

IV. Family: Chamaleonidae
28. Chamæleo zeylanicus

V. Family: Scincidae
29. Mabuya macularius
30. M. carinata
31. M. beddomeii
32. Scincella travancoricum (= Liolopisma travancoricum)*
33. Ristella spp.
34. Dasia haliatus
35. Lygosoma punctatus
36. Mabuya gangeticus*
37. Sphenomorphus dussumieri

VI. Family: Varanidae
38. Varamus bengalensis

VII. Family: Tymphlopidae
39. Ramphotyphlops braminus

VIII. Family: Uropeltidae
40. Brachypholidium rhodogaster*
41. Melanopholidium punctatum*
42. Uropeltis arcticeps*
43. U. elli*ti*
44. U. ocellata*
45. Uropeltis spp.
46. Teretrurus sanguineus*
47. Uropeltis liura*

IX. Family: Boidae
48. Python molurus

X. Family: Colubridae
49. Haemus dispar*
50. A. nasutus
51. A. perrotetti*
52. A. pulverulenta
53. Amphiasma beddomei*
54. Boiga ceylonensis
55. B. forsteni
56. Dendrelaphis grandoculis*
57. D. tristis
58. Lycodon aulicus
59. L. travanccoricus*
60. Lycodon spp.
61. Macropisthodon plumbeicolor
62. Oligodon arnensis
63. O. brevicaudus*
64. Coluber submissus
65. Xenochrophis piscator
66. Amphiasma stolata
67. Boiga trigonatus
68. Chrysopsela ornata
69. Elaphe helena
70. Liopeltis calmartia
71. Oligodon taeniatala

XI. Family: Elapidae
72. Ophidionous hannah
73. Callopis melanoarginus nigrescens*
74. Bungarus caeruleus
75. Naja naja

XII. Family: Viperidae
76. Hynale hypnale
77. Trimeresurus gramineus
78. T. malabaricus*
79. T. macrolepis*
80. T. strigatus*
81. Vipera russelli

(d) Birds recorded in and around KMTR (1991–1999).
1. Francolinus pondicerianus Grey Francolin
2. Coturnix comornandelica Rain Quail®
3. Perdicula asiatica Jungle Bush Quail
4. Turnix sylvatica Small Buttonquail
5. Turnix tanki Yellow-legged Buttonquail
6. Turnix suscitator Barred Buttonquail
7. Galloperdix spadicea Red Spurfowl
8. Galloperdix lawlata Painted Spurfowl
9. Gallus sonnerati Grey Junglefowl
10. Pavo cristatus Indian Peafowl
11. Anser indicus Bar-headed Goose
12. Dendrocyna javanica Lesser Whistling-duck®
13. Netapus coromandelianus Cotton Pygmy-geese®
14. Anas poecilorhyncha Spot-billed Duck®
15. Anas acuta Northern Pintail®
16. Jynx torquilla Eurasian Wryneck
17. Picumnus innominatus Speckled Piculet
18. Celeus brachyurus Rufous Woodpecker
19. Dryocopus javensis White-bellied Woodpecker
20. Dendrocopos nasus Brown-capped Pygmy Woodpecker
21. Picus chlorolophus Lesser Yellownape
22. Picus xanthopygaeus Streak-throated Woodpecker
23. Dinopium javanense Common Flameback
24. Dinopium benghalense Black-rumped Flameback
25. Chrysocolaptes lucidus Greater Flameback
26. Megalaima zeylanica Brown-headed Barbet
27. Megalaima viridis White-cheeked Barbet
28. Megalaima rubricapilla Crimson-fronted Barbet
29. Megalaima haemacephala Coppersmith Barbet
30. Oxyerus griseus Malabar Grey Hornbill®

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31. Buceros bicornis - Great Hornbill
32. Upupa epops - Common Hoopoe
33. Harpactes fasciatus - Malabar Trogan
34. Coracias benghalensis - Indian Roller
35. Alcedo atthis - Common Kingfisher
36. Ceyx erithacus - Oriental Dwarf Kingfisher
37. Halcyon capensis - Stork-billed Kingfisher
38. Halcyon smyrnensis - White-throated Kingfisher
39. Halcyon pileata - Black-capped Kingfisher
40. Ceryle rudis - Pied Kingfisher
41. Merops orientalis - Green Bee-eater
42. Merops philippinus - Blue-tailed Bee-eater
43. Merops leschenaulti - Chestnut-headed Bee-eater
44. Clamator jacobinus - Pied Cuckoo
45. Clamator coronandus - Chestnut-winged Cuckoo
46. Hierococcyx sparverioides - Large Hawk Cuckoo
47. Hierococcyx varius - Common Hawk Cuckoo
48. Caculus micropterus - Indian Cuckoo
49. Caculus poliocephalus - Lesser Cuckoo
50. Cacomantis passerinus - Grey-bellied Cuckoo
51. Surniculus lugubris - Drongo Cuckoo
52. Eudyptanys scolopaceus - Asian Koel
53. Phaenicophaeus viridirostris - Blue-faced Malkoha
54. Phaenicophaeus leschenaulti - Srieker Malkoha
55. Ceyx rutila - Great Crested Cuckoo
56. Loriuslorus - Vernal Hanging Parrot
57. Psittacula krameri - Rose-ringed Parakeet
58. Psittacula cyanocephala - Plum-headed Parakeet
59. Psittacula columboides - Malabar Parakeet
60. Collocalia unicolor - Indian Swiftlet
61. Zoonavena sylvatica - White-rumped Needle-tail
62. Cypsiurus balasiensis - Asian Palm Swift
63. Carpodacus unicolor - House Swift
64. Apus pacificus - Fork-tailed Swift
65. Tachymarptis melba - Alpine Swift
66. Hemiprocne coronata - Crested Treeswift
67. Phodilus badius - Oriental Bay Owl
68. Otus sancta - Oriental Scops Owl
69. Otus bakkana - Collared Scops Owl
70. Bubo bubo - Eurasian Eagle Owl
71. Bubo nipalensis - Spot-bellied Eagle Owl
72. Ketupa zeylonensis - Brown Fish Owl
73. Strix leptogrammica - Brown Wood Owl
74. Glaucopteryx olivacea - Jungle Owlet
75. Athene brama - Spotted Owlet
76. Ninox scutulata - Brown Hawk Owl
77. Batrachostomus moniliger - Sri Lanka Frogmouth
78. Caprimulgus indicus - Grey Nightjar
79. Caprimulgus macrurus - Large-tailed Nightjar
80. Caprimulgus asiaticus - Indian Nightjar
81. Columba livia - Rock Pigeon
82. Columba elphinstonii - Nilgiri Wood Pigeon
83. Ducula badia - Mountain Imperial Pigeon
84. Streptopelia senegalensis - Laughing Dove
85. Streptopelia chilensis - Spotted Dove
86. Streptopelia decaocto - Eurasian Collared Dove
87. Chalcophaps indica - Emerald Dove
88. Terron pampadorum - Pompadour Green Pigeon
89. Rallina eurizonoides - Slaty-legged Crane
90. Amaurornis phoenicurus - White-breasted Waterhen
91. Porphyrio poliocephalus - Purple Swamphen
92. Gallinula chloropus - Common Moorhen
93. Fulica atra - Common Coot
94. Gallinago sp. - ? Snipe
95. Tringa ochropus - Green Sandpiper
96. Actitis hypoleucos - Common Sandpiper
97. Burhinus oedicnemus - Eurasian Thick-Knee
98. Himantopus himantopus - Black-winged Stilt
99. Charadrius dubius - Little Ringed Plover
100. Vanellus malabaricus - Yellow-wattled Lapwing
101. Vanellus indicus - Red-wattled Lapwing
102. Sterna aurantia - River Tern
103. Chlidonias hybridus - Whiskered Tern
104. Pandion haliaetus - Osprey
105. Aviceda jerdoni - Jerdon’s Baza
106. Aviceda lepela - Black Baza
107. Elanus caeruleus - Black-shinned Kite
108. Milvus migrans - Black Kite
109. Haliaeetus indus - Brahminy Kite
110. Ichthyophaga ichthyaetus - Grey-headed Fish Eagle
111. Neophron percnopterus - Egyptian Vulture
112. Sarcogyps calvus - Red-headed Vulture
113. Spilornis cheela - Crested Serpent Eagle
114. Circus pygargus - Pallid Harrier
115. Accipiter virgatus - Crested Goshawk
116. Accipiter badius - Shikra
117. Accipiter virgatus - Besra
118. Accipiter nisus - Eurasian Sparrowhawk
119. Pernis ptilorhynchus - Oriental Honey-buzzard
120. Buto buteo japonicus - Common Buzzard
121. Buto rufinus - Long-legged Buzzard
122. Aquila rapax - Tawny Eagle
123. Hieraetus pennatus - Booted Eagle
124. Hieraetus kiaeri - Rufous-bellied Eagle
125. Spizaetus cirrhatus cirrhatus - Changeable Hawk Eagle
126. Falco tinnunculus - Kestrel
127. Falco subbuteo - Eurasian Hobby
128. Falco jugger - Laggar Falcon
129. Tachybaptus ruficollis - Little Grebe
130. Anhinga melanogaster - Darter
131. Phalacrocorax niger - Little Cormorant
132. Phalacrocorax carbo - Great Cormorant
133. Egeretta garzetta - Little Egret
134. Casmerodius albus - Great Egret
135. Mesophasus intermedius - Intermediate Egret
136. Babulcus ibis - Cattle Egret
137. Ardea grayii - Indian Pond Heron
138. Ardea cinerea - Grey Heron
139. Butorides striatus - Little Heron
140. Nycticorax nycticorax - Black-crowned Night Heron
141. Gorsachius melanolophus - Malayan Night Heron
142. Dupetor flavicollis - Black Bittern
143. Plegadis falcinellus - Glossy Ibis
144. Threskiornis melanophractus - Black-headed Ibis
145. Pseudibis papillosa - Black Ibis
146. Platalea leucorodia - Eurasian Spoonbill
147. Pelecanus philippensis - Spot-billed Pelican
148. Mycteria leucocephala - Painted Stork
149. Anastomus oscitans - Asian Openbill
150. Pitta brachyura - Indian Pitta
151. Irena puella - Asian Fairy Bluebird
152. Chloropsis cochinchenensis - Blue-winged Leafbird
153. Chloropsis aurifrons - Golden-fronted Leafbird
154. Lanius cristatus - Brown Shrike
155. Lanius vittatus - Bay-backed Shrike
156. Lanius meridionalis - Southern Grey Shrike
157. Dendrocitta vagabunda - Rufous Treepie
158. Dendrocitta leucogastra - White-bellied Treepie
159. Corvus splendens - House Crow
160. Corvus macrorhynchos - Large-billed Crow
161. Artamus fuscus - Ashy Woodswallow
162. Oriolus oriolus - Eurasian Golden Oriole
163. Oriolus xanthornus - Black-hooded Oriole
164. Coracina macei - Large Cuckoo-shrike

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165. *Coracina melanopetra* Black-headed Cuckoo-shrike
166. *Pericrocotus cinnamonus* Small Minivet
167. *Pericrocotus flammeus* Scarlet Minivet
168. *Hemipus picatus* Bar-winged Flycatcher-shrike
169. *Dicrurus macrocercus* Black Drongo
170. *Dicrurus leucophaeus* Ashy Drongo
171. *Dicrurus caerulescens* White-bellied Drongo
172. *Dicrurus aeneus* Bronzed Drongo
173. *Dicrurus paradiseus* Greater Racket-tailed Drongo
174. *Hypothymis azurea* Black-naped Monarch
175. *Tersiphone paradisi* Asian Paradise-Flycatcher
176. *Aegithina tiphia* Common Iora
177. *Tephrodornis gularis* Large Woodshrike
178. *Tephrodornis ponderianus* Common Woodshrike
179. *Monticola solitarius* Blue Rock Thrush
180. *Myophonus horsfieldii* Malabar Whistling Thrush
181. *Zoothera wardii* Pied Thrush
182. *Zoothera citrina* Orange-headed Thrush
183. *Zoothera dauma* Scaly Thrush
184. *Turdus merula* Eurasian Blackbird
185. *Brachypteryx major* White-bellied Shortwing*
186. *Muscicapa daurica* Asian Brown Flycatcher
187. *Muscicapa ruficauda* Rusty-tailed Flycatcher
188. *Muscicapa flaviventris* Brown-breasted Flycatcher
189. *Ficedula parva* Red-throated Flycatcher
190. *Ficedula nigrografa* Black-and-orange Flycatcher*
191. *Eumyias thalassinus* Verditer Flycatcher
192. *Eumyias albicaudata* Nilgiri Flycatcher*
193. *Cyornis pallipes* White-bellied Blue Flycatcher*
194. *Cyornis rubeculoides* Blue-throated Flycatcher
195. *Cyornis tickelliae* Tickell's Blue Flycatcher
196. *Calcicola ceylonensis* Grey-headed Canary Flycatcher
197. *Luscinia brunnea* Indian Blue Robin
198. *Copsychus saularis* Oriental Magpie Robin
199. *Saxicola fulicata* Indian Robin
200. *Phoenicurus ochrourus* Pied Bushchat
201. *Saxicola caprata* Chestnut-tailed Starling
202. *Sturnus malabaricus* Brahminy Starling
203. *Sturnus pagodarum* Common Myna
204. *Acridotheres cristatellus* Jungle Myna
205. *Gracula religiosa* Hill Myna
206. *Sitta frontalis* Velvet-fronted Nuthatch
207. *Eurystomus rubicundus* Black-lored Tit
208. *Hirundo rupestris* Eurasian Crag Martin?
209. *Hirundo concolor* Dusky Crag Martin
210. *Hirundo rustica* Barn Swallow
211. *Hirundo tahitica* Pacific Swallow
212. *Hirundo smithii* Wire-tailed Swallow
213. *Hirundo daurica* Red-rumped Swallow
214. *Delichon urbica* Northern House Martin
215. *Pycnonotus sinensis* Grey-headed Bulbul*
216. *Pycnonotus sinensis* Black-crested Bulbul
217. *Pycnonotus sinensis* Red-whiskered Bulbul
218. *Pycnonotus sinensis* Red-vented Bulbul
219. *Pycnonotus montiffi* Yellow-browed Bulbul
220. *Iole indica* Black Bulbul
221. *Hypsipetes leucocephalus* Grey-browed Prinia
222. *Prinia hofossonii* Jungle Prinia
223. *Prinia socialis* Ashy Prinia
224. *Zosterops palpebrosus* Oriental White-eye
225. *Louristenna semigularis* Grassembler Warbler
226. *Acrocephalus dumetorum* Blyth's Reed Warbler
227. *Acrocephalus aerdon* Thick-billed Warbler
228. *Schoenicola platyura* Broad-tailed Grassbird*
229. *Sylvia hortensis* Orphean Warbler
230. *Orthotomus sutorius* Common Tailorbird
231. *Phylloscopus trochiloides* Greenshank Warbler
232. *Phylloscopus magnirostris* Large-billed Leaf Warbler
233. *Phylloscopus occipitalis* Western Crowned Warbler
234. *Garrulax deselletii* Wynaad Laughingthrush*
235. *Garrulax jerdoni* Grey-breasted Laughingthrush*
236. *Pellorneum ruficeps* Puff-throated Babbler
237. *Pomatorhynchus ruficollis* Indian Scimitar Babbler
238. *Dumetia hyperythra* Twnny-bellied Babbler
239. *Rhopsophaea atriceps* Dark-fronted Babbler
240. *Chrysosoma sinense* Yellow-eyed Babbler
241. *Turdoides subrubra* Rufous Babbler*
242. *Turdoides striata* Jungle Babbler
243. *Turdoides affinis* Yellow-billed Babbler
244. *Alcippe poliocephala* Brown-cheeked Fulvetta
245. *Miraflia cantillans* Singing Bushlark
246. *Miraflia erythroptera* Indian Bushlark
247. *Eremopterix grisea* Ashy-crowned Sparrow Lark
248. *Alauda arvensis* Eurasian Skylark
249. *Dicaeum agile* Thick-billed Flowerpecker
250. *Dicaeum eurysyrhynchos* Pale-billed Flowerpecker
251. *Dicaeum concolor* Plain Flowerpecker
252. *Nectarinia zeylonica* Purple-rumped Sunbird
253. *Nectarinia minima* Crimson-backed Sunbird*
254. *Nectarinia asiatica* Purple Sunbird
255. *Nectarinia lotenii* Loten's Sunbird
256. *Arachnothera longirostra* Little Greenbul
257. *Passer domesticus* House Sparrow
258. *Dendronanthus indicus* Forest Wagtial
259. *Motacilla alba* White Wagtial
260. *Motacilla madraspatensis* White-browed Wagtial
261. *Motacilla flava* Yellow Wagtial
262. *Motacilla cinerea* Grey Wagtial
263. *Anthus nigrosinensis* Nilgiri Pipit*
264. *Anthus rufalus* Paddyfield Pipit
265. *Plouerus philippinus* Baya Weaver
266. *Lonchura malabarica* Indian Silverbill
267. *Lonchura striata* White-rumped Munia
268. *Lonchura kelaarti* Black-throated Munia
269. *Lonchura punctulata* Scaly-breasted Munia
270. *Lonchura malacca* Black-headed Munia
271. *Carpodacus erythrinus* Common Rosefinch

Order: Insectivora
1. Family: Erinaceidae
   1a. Hemiechinus nudiventris Madras hedgehog
2. Family: Soricidae
   2a. Suncus dayi Day's shrew
   2b. Suncus murinus Grey musk shrew
   2c. Suncus montanus Hill (mountain) shrew
   2d. Suncus etruscus Pygmy shrew
Order: Chiroptera
3. Family: Pteropodidae
   3a. Rousettus leschenaulti Fruits bat
   3b. Pteropus giganteus Indian flying fox
   3c. Cyopterus brachyotis Lesser dog-faced fruit bat
   3d. Cyopterus sphinx Short-nosed fruit bat
Order: Rhinomastidae
4. Family: Rhinomastidae
   4a. Rhinomastus hardwickii Lesser mouse-tailed bat
### SPECIAL SECTION: KALAKAD–MUNDANTHURAI TIGER RESERVE

| V. | Family: Emballonuridae | 11. Taphozous melanopogon | Black-bearded tomb bat |
|    |                        | 12. Taphozous saccalumius | Pouch-bearing bat |
| VI. | Family: Megadermatidae | 13. Megaderma lyra | Greater false vampire |
|     |                        | 14. Megaderma spasma | Lesser false vampire |
| VII. | Family: Rhinolophidae | 15. Rhinolophus rouxi | Rufous horseshoe bat |
|      |                         | 16. Rhinolophus leptus | Blyth's horseshoe bat |
|      |                         | 17. Rhinolophus beddomei | Lesser woolly horseshoe bat |
| VIII. | Family: Hipposideridae | 18. Hipposideros ater | Dusky leaf-nosed bat |
|      |                        | 19. Hipposideros fulvus | Fulvous leaf-nosed bat |
|      |                        | 20. Hipposideros speoris | Schneider's leaf-nosed bat |
| IX.  | Family: Vespertilionidae | 21. Pipistrellus minus | Evening bat |
|      |                         | 22. Kerivoula picta (?) | Painted bat (?) |
|      | Order: Primates        |                        |                      |
| X.   | Family: Lorisidae      | 23. Loris tardigradus | Slender loris |
| XI.  | Family: Cercopithecidae | 24. Macaca radiata | Bonnet macaque |
|      |                         | 25. Macaca silenus* | Lion-tailed macaque |
|      |                         | 26. Semnopithecus entellus | Common langur |
|      |                         | 27. Trachypithecus johnii* | Nilgiri langur |
| Order: Carnivora |                        |                      |                      |
| XII. | Family: Canidae        | 28. Canis aureus | Indian jackal |
|      |                         | 29. Vulpes bengalensis | Bengal fox (from outside PA) |
|      |                         | 30. Cuon alpinus | Dhole or Asiatic wild dog |
| XIII. | Family: Ursidae        | 31. Melursus ursinus | Sloth bear |
| XIV. | Family: Mustelidae     | 32. Martes gwatkini* | Nilgiri marten |
|      |                         | 33. Lutra lutra | Common otter |
|      |                         | 34. Lutrogale perspicillata | Smooth coated otter |
|      |                         | 35. Amblonyx cinerea | Oriental small clawed otter |
| XV.  | Family: Viverridae      | 36. Viverricula indica | Small Indian civet |
|      |                         | 37. Paradoxurus hermaphroditus | Common palm civet |
|      |                         | 38. Paradoxurus jerdoni* | Jerdon's (brown) palm civet |
| XVI. | Family: Herpestidae    | 39. Herpestes edwardsi | Common Indian mongoose |
|      |                         | 40. Herpestes fuscus | Brown mongoose |
|      |                         | 41. Herpestes smithii | Ruddy mongoose |
|      |                         | 42. Herpestes viitticus (?) | Stripe-necked mongoose (?) |
| Order: Proboscidea |                        |                      |                      |
| XVII. | Family: Felidae        | 43. Prionailurus bengalensis | Leopard cat |
|       |                         | 44. Felis chaus | Jungle cat |
|       |                         | 45. Prionailurus rubiginosus | Rusty-spotted cat |
|       |                         | 46. Panthera pardus | Leopard |
|       |                         | 47. Panthera tigris | Tiger |
| Order: Proboscidea |                        |                      |                      |
| XVIII. | Family: Elephantidae   | 48. Elephas maximus | Asian elephant |
|       | Order: Artiodactyla    | 49. Sus scrofa | Wild boar |
|     | Order: Tragulidae      | 50. Moschus moschiferus | Indian spotted chevrotain or mouse deer |
|     | Order: Cervidae        | 51. Muntiacus muntjak | Barking deer |
|     |                         | 52. Axis axis | Chital |
|     |                         | 53. Cervus unicolor | Sambar |
| XXII. | Family: Bovidae        | 54. Bos gaurus | Gaur |
|      |                         | 55. Hemitragus jemlahensis* | Nilgiri tahr |
|      | Order: Pholidota       |                        |                      |
| XXIII. | Family: Manidae        | 56. Mantis crassicaudata | Indian pangolin |
|      | Order: Rodentia        | 57. Funambulus palmarum | Common palm squirrel |
|      |                         | 58. Funambulus sublineatus | Dusky striped squirrel |
|      |                         | 59. Funambulus tristriatus* | Jungle striped squirrel |
|      |                         | 60. Ratufa indica | Indian giant squirrel |
| XXIV. | Family: Sciuridae      | 61. Phascogale attenuata | Indian giant flying squirrel |
|      | SubFamily: Pteromysidae | 62. Pteromyscus ecaudatus | Travancore flying squirrel (?) |
|      | Order: Muridae         | 63. Platacanthus lasiurus* | Malabar spiny dormouse |
|      |                         | 64. Tatera indica | Indian gerbil |
|      |                         | 65. Gobius irwini | Indian bush rat |
|      |                         | 66. Millardia melacantha | Soft-furred field rat or metal |
|      |                         | 67. Rattus rattus reticulatus | White-bellied wood rat |
|      |                         | 68. Cremnomyx blanfordi | White-tailed wood rat |
|      |                         | 69. Mus booduga | Indian field mouse |
|      |                         | 70. Mus musculus | Bonhote’s mouse |
|      |                         | 71. Mus musculus | House mouse |
|      |                         | 72. Mus platyurus | Spiny field mouse |
|      |                         | 73. Vandelevia oleracea | Indian long-tailed tree mouse |
|      |                         | 74. Bandicota bengalensis | Lesser bandicoot rat |
|      |                         | 75. Bandicota indica | Large bandicoot rat |
|      | Order: Lagomorpha      | 76. Hystrix indica | Indian porcupine |
|      |                         | 77. Lepus nigricollis nigricollis | Blacknaped hare |

Sources: Amphibians (K. Vasudevan, unpubl.); reptiles (N. M. Ishwar, unpubl.); birds (M. Katti et al., unpubl.); mammals (A. Kumar, D. Mudappa and J. Ronald, pers. commun.). Nomenclature for birds follows Grimmett et al. 1998.

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