A conservation review of three wet zone forests in south-west Sri Lanka

Julia P. G. Jones, Claire D. Ferry, Catherine E. Isherwood, Christopher G. Knight, Chandra L. Kumara and Kanchana Weerakoon

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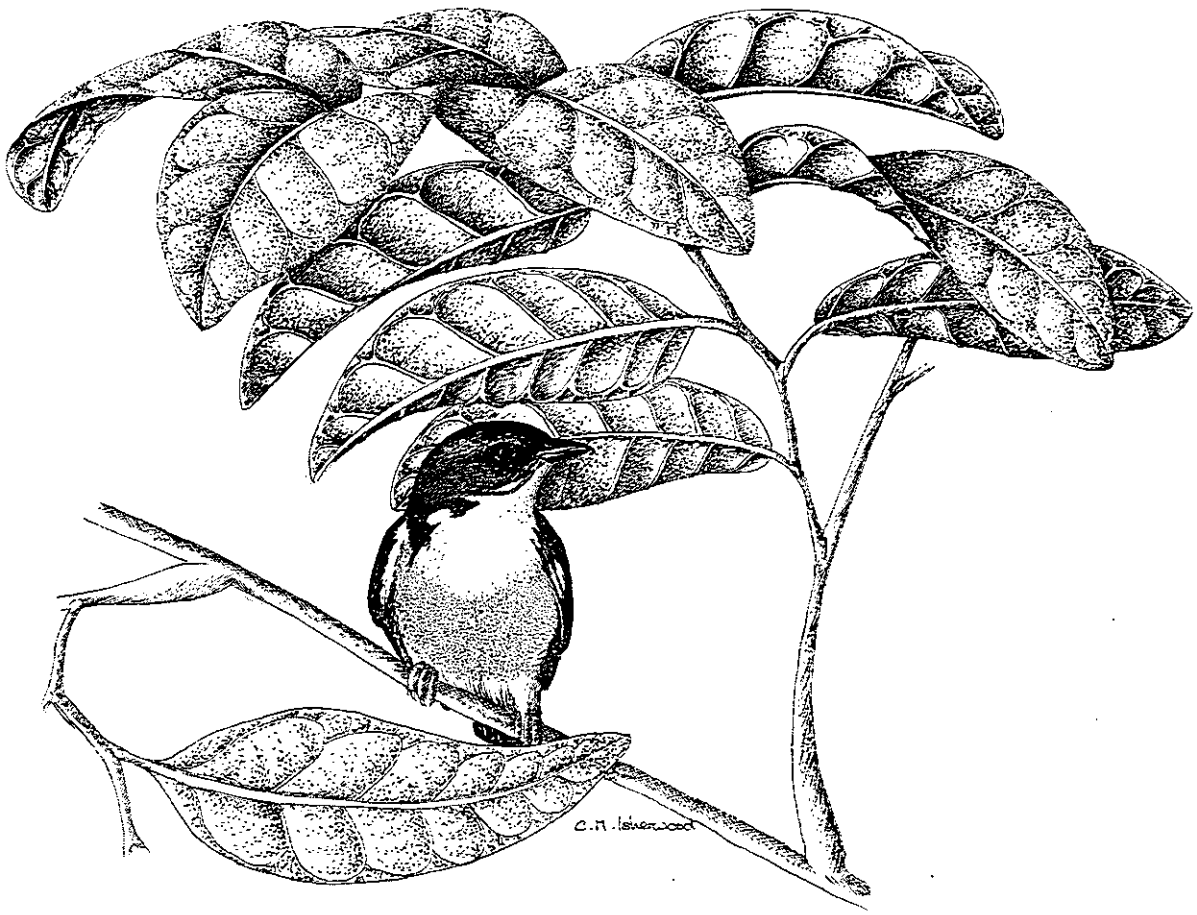
Final report of Project Sinharaja '97



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Cover illustrations:

Front	Green-billed Coucal *Centropus chlororhynchus*
Frontispiece	Legge's Flowerpecker *Dicaeum vincens*

The work described in this report was undertaken by Project Sinharaja '97, a biological survey expedition organised through the University of Cambridge and the Field Ornithology Group of Sri Lanka. Three months (June to September 1997) were spent in three wet zone forest sites: Delwala Proposed Reserve, Walankanda Forest Reserve and Kudumiriya Proposed Reserve. Surveys focused on birds but preliminary inventories for other vertebrate groups and plants were also made for each site visited.

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Field Ornithology Group of Sri Lanka

BirdLife International

Fauna and Flora International

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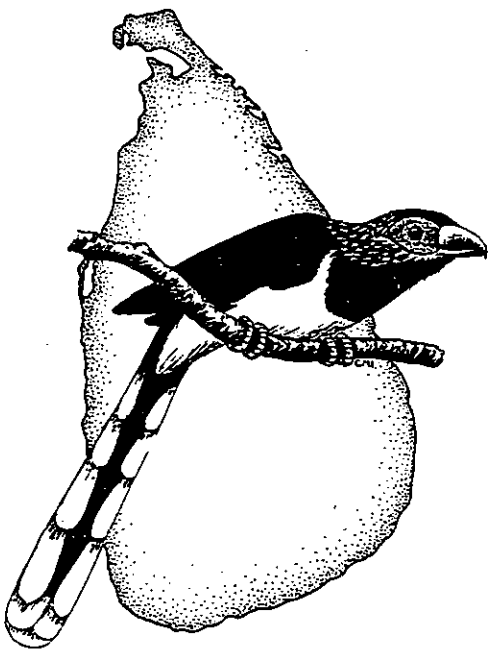

Sinharaja '97

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Executive Summary

Sri Lanka has one of the highest levels of species richness per unit area of any country in Asia, but also the continent's second highest human population density (Jansen & de Zoysa 1992). This poses a serious challenge to politicians, economists and conservationists: economic development for the 18 million inhabitants without loss of the nation's unique natural heritage. This challenge is exacerbated by the concentration of the human population in the "wet zone", the region of highest biological diversity and endemism.

The main threats facing Sri Lanka's wet zone biodiversity are habitat loss and fragmentation. Natural closed-canopy forest is estimated to have declined in extent from 44% of the island's land area in 1956 to 18.5% in 1983, of which only 1,440 km^2 is rainforest (Collins *et al.* 1991). The few forested areas that remain are isolated by large areas of agricultural land, a barrier to dispersal for many forest species.

In 1992, a moratorium on wet zone logging was passed for all state owned forests. This has successfully prevented most logging, particularly large-scale operations. However, small-scale illegal logging continues to damage some remaining forests.

From 1991 to 1996, all forest patches larger than 200 ha were surveyed by the National Conservation Review (NCR) team (IUCN/WCMC/FAO 1997). The surveys carried out by NCR were preliminary, and further work was recommended for sites identified as being particularly important for watershed protection and biodiversity conservation.

The forests visited in this study had all been identified by NCR as 'of highest importance': Delwala Proposed Reserve (PR); Walankanda Forest Reserve (FR); and Kudumiriya Proposed Reserve. Each site holds remnants of primary Dipterocarp-dominated forest, a vegetation type of which little remains in Sri Lanka.

As remnants of a unique and vanishing habitat type, all wet zone forest patches deserve conservation management. However, large patches are more valuable than small ones as they are more likely to contain viable populations of species which exist at low densities and are generally better buffered from outside pressures (Soulé 1983).

All over the world, conservation resources are limited and priorities must be determined. We suggest that Delwala PR and Walankanda FR are particularly valuable as they form a contiguous tract of forest of more than 2,500 ha. This is a significant size as few patches of rainforest larger than 10,000 ha remain (Legg & Jewell 1995). The forests together hold five threatened bird species and at least seven species of threatened mammal. A small group of Asian Elephants *Elephas maximus* use the area, moving between the two (contiguous) forests. This supports our suggestion that these two forests should be managed as a single unit.

Kudumiriya PR also contains important populations of a number of species of conservation concern. These include Green-billed Coucal *Centropus chlororhynchus*, endemic to Sri Lanka, globally threatened and a potentially important 'flagship species' for conservation.

All forests visited play an important role in the lives of local people. Protecting such forests will therefore require not only the investment of financial resources, the dedication of Government Departments and Non-Governmental Organisations, but also the involvement of these local people who rely on the forests for their daily needs.

සම්පිණ්ඩනය

ආසියාවේ රටවල් අතුරින් ඒකක වර්ගඵලයක් තුළ වැඩිම ජෛව විවිධත්වයක් ඇති රට ලෙස ශ්‍රී ලංකාව මුල් තැනක සිටියි. තවද ජනගහනය අතින් බලන කල ආසියාවේ දෙවැනි ඉහළම ජනගහන ඝනත්වය සහිත රට ද ශ්‍රී ලංකාවයි. (ජැන්ෂන් සහ ද සොයිසා 1992) මෙම තත්වය ශ්‍රී ලංකාවේ දේශපාලනඥයන්ට, ආර්ථික විශ්ලේෂඥයන්ට, සහ සංරක්ෂකයන්ට විශාල අභියෝගයක් වන්නේ, රටේ ඇති මෙම අද්විතීය ස්වභාවික උරුමයන්ට හානි නොවන සේ මිලියන 17 ක ජනතාවගේ ආර්ථික දියුණුව සලසා දිය යුතු වීමයි. මෙම අභියෝගය වඩාත් උග්‍ර වන්නේ ආවේනිකත්වය හා ජෛව විවිධත්වය බහුල තෙත් කලාපය තුළ ජනගහනය ඒකරාශී වීමත් සමගය.

ශ්‍රී ලංකාවේ තෙත් කලාපය තුළ පවතින මෙම වටිනා ජීව සම්පත් මුහුණපාන තර්ජන අතර ඉඩම් කැබැලි වීම හා වාසස්ථාන අහිමිවීම ප්‍රධාන තැනක් ගනී. පසුගිය වසර 40 තුළ රටේ සෙසු ප්‍රදේශ හා සසඳන කළ 40%ක වනාන්තර අහිමිවීමක් පෙන්නුම් කරයි (ලෙග් සහ ජ්වෙල් 1995) එම නිසා දිවයිනේ මුළු වර්ගඵලයෙන් 20% ප්‍රමාණයක් දැනට ස්වභාවික වනාන්තර ලෙස ඉතිරිවී පවතී. මෙසේ ඉතිරිවී ඇති ප්‍රදේශ විශාල ප්‍රමාණයේ කෘෂිකාර්මික බිම් වලින් වටවී ඇති නිසා ඒවායේ ඇති සත්ත්ව හා ශාක විශේෂවල ව්‍යාප්තිය සීමාවී ඇත.

1992 වර්ෂයේදී රජය මඟින් ක්‍රියාත්මක කරන ලද පනත නිසා එතෙක් තෙත් කලාපය තුළ සිදු කෙරුණු මහා පරිමාණයේ දව සංහාරය සාර්ථක ලෙස අඩපන වූ නමුත් කුඩා පරිමාණයේ අනවසර දව කැපීම් තව දුරටත් සිදුවෙමින් පවතී. 1991 සහ 1996 කාලය අතරතුර ශ්‍රී ලංකාවේ හෙක්ටයාර 200 කට වැඩි විශාලත්වයක් ඇති සියලුම කුඩා වනාන්තර ජාතික සංරක්ෂණ සමාලෝචන කම්ටුව (IUCN/WCMC/FAO 1997) විසින් ගවේෂණය කරන ලදි. මෙමඟින් ජීව විද්‍යාත්මක පර්යේෂණ මූලික මට්ටමින් සිදු කෙරුණු අතර වටිනා කමින් වැඩි ප්‍රදේශ හඳුනා ගැනීම ද එම ප්‍රදේශවල තවදුරටත් පර්යේෂණ සිදු කිරීම සුදුසු ලෙස නිර්දේශ කිරීම ද සිදුවිය.

අපගේ අධ්‍යයනය සිදුකෙරුණු දෙල්වල යෝජිත රක්ෂිතය, වලන්කන්ද රක්ෂිතය සහ කුඩුමේරිය යෝජිත රක්ෂිතය මෙසේ පුළුල් පර්යේෂණ සඳහා නිර්දේශිත වනාන්තර තුනකි. ශ්‍රී ලංකාවේ තෙත් කලාපය තුළ පිහිටා ඇති මෙම වනාන්තර තුළ ලංකාවේ දුර්ලභ ශාක ගණයක් වන ඩිප්ටෙරාකාපුස් පවුලේ ශාක ද දකින්නට ඇත.

විනාශවී යන ප්‍රදේශ අතරින් තවමත් ඉතිරිවී පවතින අද්විතීය හා ඉතා වැදගත්කමින් යුත් පරිසර පද්ධති ලෙස තෙත් කලාපයේ සියලුම වනාන්තර පාහේ සංරක්ෂණ සැලසුමක දැඩි අවධානයට ලක්විය යුතුය. කෙසේ නමුත් විශාල ප්‍රදේශ ලෙස ඉතිරිවී ඇති දැඩි වනාන්තර වැඩි අවධානයකට ලක්විය යුත්තේ ඒවායේ අඩු ඝනත්වයෙන් යුත් ජීව විශේෂ වැඩි සංඛ්‍යාවක් සිටින නිසාත් මනා පාලනයක් සහිත ප්‍රේරක ප්‍රදේශවලින් වටවී ඇති නිසාත්ය. (සෝල් 1983) ලෝකයේ සෑම තැනකම පාහේ සම්පත් සීමාවී ඇති අතර ඒවා පිළිබඳ අවධානය යොමුකළ යුතු බවට දැනටමත් වැටහී ඇත. වලන්කන්ද රක්ෂිතය හා දෙල්වල යෝජිත රක්ෂිතය එකම කඳුවැටියක දෙපස තිබෙන හෙක්ටයාර් 2500 කට අධික භූමි ප්‍රමාණයකින් යුතු අඛණ්ඩ පරිසර පද්ධතියක් ලෙස පිහිටන නිසා එම වනාන්තර වෙත වැඩි අවධානයක් යොමුවිය යුතු බව අපගේ අදහසයි. හෙක්ටයාර 10,000 ඉක්මවන වැසි වනාන්තර තිබෙන බැවින් මෙය සැලකිය යුතු විශාලත්වයකි. (ලෙග් සහ ජ්වෙල් 1995)

ශ්‍රී ලංකාවේ තෙත් කළාප

ශ්‍රී ලංකාවේ තෙත් කලාපය ඉතා වැදගත් ජීව විවිධත්වයක් සහිත සංරක්ෂණ කළාපයකි. (සේනානායක, (et. al 1997) මෙතෙක් ලංකාව තුළ සිදුකර ඇති බොහෝ පර්යේෂණ තෙත් කලාපයේ පිහිටා ඇති සිංහරාජ ජාතික වනය තුළට සීමාවී ඇත. මෙම වාර්තාව සිංහරාජ වනාන්තරය හැරුණු කොට තෙත් කලාපය තුළ පිහිටා ඇති වෙනත් වනාන්තර තුනක එනම් දෙල්වල යෝජිත රක්ෂිතය, වලන්කන්ද රක්ෂිතය සහ කුඩුමේරිය යෝජිත රක්ෂිතය තුළ සිදුකෙරුණු ප්‍රථම සවිස්තරාත්මක වාර්තාව වනු ඇත. පහත රට වර්ෂා වනාන්තර වල අඩංගු අද්විතීය ලක්ෂණ සහිත එම කුඩා වනාන්තර තුන ආවේනික ශාක හා සත්ව විශාල ප්‍රමාණයකින් සමන්විතය

ප්‍රතිඵල

පක්ෂීන්

ආසියාවේ අන් කවර රටකටත් වඩා ආවේනික පක්ෂීන් ප්‍රමාණයක් (23) සිටින ශ්‍රී ලංකාවේ (ස්ටැටර්සිල්ඩ් et. al 1998) පහත රට තෙත් කලාපීය හා කඳුකර කලාපීය වනාන්තරවල ඉන් විශේෂ 14 ක් වාසය කරති. සති 10 ක් තුළ සිදුකෙරුණු අධ්‍යයනයේදී පක්ෂි විශේෂ 110 ක් වාර්තා විය. මේ අතර අන්තරාදය ශ්‍රී ලංකා බට ඇටිකුකුළා *(Centropus chlororhyncus)* අවදනම් අවස්ථාවක සිටින බවට නම් කර ඇති පක්ෂි විශේෂ වන ශ්‍රී ලංකා මයිල ගොයා *(Columba torringtoni)* වත රතු මල් කොහා *(Phaenicophaeus pyrrhocephalus)* ශ්‍රී ලංකා

කැහිබෙල්ලා *(Urocissa ornata)* සහ අළු දෙමලිච්චා *(Garrulax ciner eifrons)* ඇතුලත්ය. (කොලර් et. al.1994)

තර්ජනයට ලක්වීමට ආසන්නව ඇතැයි නම්කර ඇති ශ්‍රී ලංකා තිත්පිය තිරාසිකයා *(Zoothera spiloptera)* සතුටුදායක ලෙස වනාන්තර තුනෙහිම වාර්තා විය. මේ අනුව බලන කල මෙම පක්ෂි විශේෂ අවම අවධානයක් යොමුකර ඉතා පහසුවෙන් සංරක්ෂණය කළ හැකි බව පෙනෙන නමුත් ඔවුන්ගේ පැවැත්ම හුදෙක්ම රඳ පවතින්නේ ඔවුන් ජීවත්වන පරිසර තත්වයන් ඒ ආකාරයෙන්ම පවත්වා ගනිමින් වනාන්තර රැක ගැනීමට පියවර ගතහොත් පමණි.

කඳුකර ප්‍රදේශයේ ජීවත්වන ආවේනික විශේෂ වන ලංකා පීත කන් කොණ්ඩයා *(Pycnonotus penicillatus)* ලංකා අරංගයා *(Myphonius blighii)* ලංකා රුසි රැවියා *(Bradypterus palliser)* සහ ලංකා අඳුරු නිල් මැසි මාරා *(Eumyias sordida)* හැරුණු විට අන් ආවේණික විශේෂ 19 ම වාර්තා විය. මුහුදු මට්ටමේ සිට මීටර 200 - 1200 ක දක්වා පරාසයක මෙම අධ්‍යයනය සිදු කළ අතර මෙම උස මට්ටමේ හමුවීමට අඩු ප්‍රවණතාවයක් දක්වන (ස්ටැටර්ෆීල්ඩ් et. al 1998) ලංකා මයිල ගොයා *(Columba torringtoni)* සහ ලංකා සිතැසියා *(Zosterops ceylonensis)* ද වාර්තා විය.

පක්ෂි විශේෂ තුනක කුඩු වාර්තා විය. (මයිල ගොයා, තිත්පිය තිරාසිකයා සහ ලංකා සිතැසියා)

මිශ්‍ර විශේෂ නඩ ඉතා සුලභ වූ අතර රතු දෙමලිච්චා *(Turdoides rufescens)* සහ කළු සිළු කවුඩා *(Dicrurus paradiseus)* න්‍යෂ්ඨීය විශේෂ ලෙස හඳුනා ගත හැකිවිය. මෙම නඩ තුළ විශේෂ 32 සුලභව නිරීක්ෂණය කළ හැකි වූ අතර විශේෂ 7 ක් කලාතුරකින් දකිය හැකිවිය. අඳුරු දැල් භාවිතයෙන් ඉතා සවිස්තරාත්මක අධ්‍යයනය සිදු කල අතර දෙල්වල යෝජිත රක්ෂිතයේ පැය 5879 ක් හා වලන්කන්ද රක්ෂිතයේ පැය 2255 ක කාලයක් තුළ විශේෂ 19 කට අයත් පක්ෂීන් 101 ක් මුදු දමන ලදි. ඉන් විශේෂ 9 දුර්ලභ හා තර්ජනයට ලක්වී ඇති විශේෂ වේ.

ක්ෂීරපායින්

තර්ජනයට ලක්වූ විශේෂ 5 ක් හා අවදනමට ලක්වී ඇති විශේෂ 3 ක් ද ඇතුළුව ක්ෂීරපායින් විශේෂ 18 ක් හඳුනාගත හැකිවිය. වලන්කන්ද හා කුඩුමේරිය ප්‍රදේශවලින් දිවියා *(Panthera pardus)* වාර්තාවූ අතර කුඩුමේරිය වනාන්තරය තුළ ඉතා දුර්ලභ කළු *(melanic)* දිවියෙක් නිරීක්ෂණය කරන ලදි.

ශ්‍රී ලංකාවේ වෙසෙන 3000 ක් පමණ වන ආසියානු අලි (සාන්තියා පිල්ලේ සහ ද සිල්වා 1994) වැඩි වශයෙන් වියළි කලාපයේ ජීවත් වන නමුදු ඉතා සීමා සහිත සංඛ්‍යාවක් තෙත් කලාපය තුළ ද සිටී. මෙම තෙත් කලාපීය අලි 3 ක් හෝ 4 කින් යුත් කණ්ඩායමක් දෙල්වල හා වලන්කන්ද වනාන්තරය අතර ඔබ මොබ සැරිසරන බවට සාධක ලැබුණි. මොවුන් හඳපාන් ඇල්ල හා තංගමලේ ප්‍රදේශවලින් වෙන්වූ කුඩා කණ්ඩායමක් බව විශ්වාස කළ හැකිය.

උරගයින්

උභය ජීවීන් සහ උරගයන් 22 ක් අඳුනා ගත් අතර ආවේනික ගෝත්‍ර 4 ක් මෙයට අයත්වේ. කටුස්සන් විශේෂ 2 ක් *(Ceratophora aspera)* සහ *(Lyriocephalus scutatus)* සර්ප විශේෂයක් *(Balanophils ceylonehsis)* සහ Nannophrys විශේෂයයේ ගෙම්බෙක්ද මෙයට අයත්ය. CITES වාර්තාවේ සඳහන් උරග විශේෂ 3 ක් ද වාර්තාවිය. (පිඹුරා, නයා සහ කබරගොයා)

ශාක

ශ්‍රී ලංකාවේ ශාක විශේෂවලින් 1/4 ක් පමණ ආවේණික වේ. (ගුණතිලක හා ඇස්ටන් 1987) එයින් 90% ක් පමණ තෙත් කලාපීය වනාන්තර වලින් හමුවේ. IUCN වාර්තාවේ අඩංගු තර්ජනයට ලක්වූ ශාක විශේෂ අතරින් 50 ක් පමණ අඳුනා ගත හැකිවිය.

ඉදිරි දැක්ම

ශ්‍රී ලංකාවේ තෙත් කලාපය තුළ ඒකරාශී වී සිටින විශාල ජනගහනය නිසා වනාන්තර කැබලිවීමේ තර්ජනයට මුහුණ දී සිටියද යම්තාක් දුරට ඒවා ආරක්ෂා කර ගැනීමේ ප්‍රවනතාවයක් ඇත. වන සංරක්ෂණ දෙපාර්තමේන්තුව හා වනජීවී සංරක්ෂණ දෙපාර්තමේන්තුව විසින් සකස් කරන ලද පරිපාලන වාර්තා වලින් මෙම වනාන්තර කෙරෙහි සැලකිය යුතු අවධානයක් යොමු කර ඇත. මේ අනුව යෝජිත තත්වයේ පවතින දෙල්වල වනාන්තරය රක්ෂිතයක් බවට පත්කළ යුතුව ඇත. (එස්. කොටගම වාචික 1997) එවිට නව නීති යටතේ මෙම වනාන්තරය අධ්‍යාපනික හා පර්යේෂණ කටයුතු සඳහා පමණක් වෙන් කළ හැකිය.

ශ්‍රී ලංකා ක්ෂේත්‍ර පක්ෂි විද්‍යා අධ්‍යයන කවය විසින් (FOGSL) දනට තාවකාලික පර්යේෂණ මධ්‍යස්ථානයක් පවත්වාගෙන යන අතර ඉදිරියේදී වඩාත් පුළුල් පර්යේෂණ කටයුතු සිදුකිරීමට බලාපොරොත්තු වේ.

ප්‍රදේශවාසීන් හා වනාන්තර අතර මනා අවබෝධාත්මක සම්බන්ධතාවයක් ඇත අතීතයේ සිට පැවතුණු අතර (ද සොයිසා සහ රහීම්) බහුතරයක් ජනතාව තම වනාන්තර රැකගැනීමේ උනන්දුවක් ඇතිව සිටියහ. මෙය තවදුරටත් තහවුරු

කිරීම වැදගත්වේ. ඒ සඳහා අප පහත සඳහන් යෝජනා ඉදිරිපත් කරමු.

යෝජනා

1991 සිට 1996 දක්වා කාලය තුළ ජාතික සංරක්ෂණ කණ්ඩායම් මඟින් හෙක්ටයාර 200 වඩා වැඩි වනාන්තර ප්‍රදේශවල සිදු කරන ලද ගවේෂණ තුලින් එකී වනාන්තර ප්‍රදේශ තුලින් ජල වහන පද්ධතියට හා ජීව විවිධත්වයට සිදුවන මෙහෙය පෙන්වා දෙන ලදි. එහිදී අවධානය ට ලක්වූ දෙල්වල යෝජිත රක්ෂිතය වලන්කන්ද රක්ෂිතය හා කුඩුමේරිය යෝජිත රක්ෂිතය වැඩි අවධානයක් ලක්විය යුතු බව ද පෙන්වා දෙන ලද අතර අපගේ අධ්‍යයනය තුළින් පක්ෂීන් සම්බන්ධයෙන් සලකා බලන විට එම ප්‍රකාශය තහවුරු කළ හැක. එම නිසා ශ්‍රී ලංකාවේ නීතියට අනුව එකී ප්‍රදේශ ආරක්ෂිත ප්‍රදේශයක් බවට පත් කළ යුතු බව අප යෝජනා කරමු. එසේ ම හෙක්ටයාර 250 ට වඩා වැඩි භූමි ප්‍රදේශයක ව්‍යාප්තව ඇති දෙල්වල හා වලන්කන්ද එකම වනාන්තරයක් ලෙස සලකා සංරක්ෂණය කළ යුතු බව ද යෝජනා කරමු.

නීති සම්පාදනය කිරීමෙන් හෝ පර්යේෂණ කිරීමෙන් පමණක් වනාන්තර ආරක්ෂා කිරීම සාර්ථක නොවන අතර අධ්‍යාපනික වැඩ සටහන් මඟින් විශාල මෙහෙයක් සිදුකළ හැකිය. ඒ අනුව

1. වනාන්තර මඟින් ජල වහන පද්ධතිය ට සිදුවන මෙහෙය සහ ඒ තුළින් ගැමි ජීවිතය ආරක්ෂාවන ආකාරය ප්‍රදේශවාසීන්ට අවබෝධ කරවීම.
2. වනාන්තර තුළ ඇති අද්විතීය සහ ආවේනික ශාක සහ සතුන් පිළිබඳ සහ ඒවායේ වටිනාකම ඔවුනට අවබෝධ කරවීම ඉතා වැදගත් වේ.

මේ සඳහා රජයේ දෙපාර්තමේන්තු සහ ප්‍රදේශවාසීන් අතර මනා අවබෝධයක් තිබිය යුතුය. වනාන්තර තුළින් යම් යම් ප්‍රයෝජන (මහ පරිමාණයේ දැව ලබා ගැනීමෙන් තොර) ප්‍රදේශවාසීන්ට ලබා ගත හැකි අයුරින් නීති සකස්විය යුතු අතර ඒවා මනා පාලනයකින් යුතුව සිදුවේදැයි සොයා බැලීමට රාජ්‍ය හා රාජ්‍ය නොවන සංවිධාන වල සහාය ලබාගත යුතුවේ.

තවද වනාන්තර තුළ ඇති දුර්ලභ ශාක හා සත්ත්ව විශේෂ පිළිබඳ කුඩා හෝ මහා පරිමාණයේ පර්යේෂණ සිදුකිරීම ඉතා වැදගත් වන අතර මේ සඳහා රාජ්‍ය නොවන පරිසර සංවිධාන පක්ෂි සංගමය, තරුණ සත්ත්වවේදීන්ගේ සංගමය වල ඉදිරිපත්වීම ඉතා අත්‍යාවශ්‍ය වේ.

සමහර පක්ෂි විශේෂ පිළිබඳව වඩාත් සුළුල් පර්යේෂණ සිදු කළ යුතුව ඇත.

1. වත රතු මල්කොහා
2. ශ්‍රී ලංකා මයිලගොයා

   ස්ථිර භූමි ප්‍රදේශයක් තුළ පදිංචිවී නොසිටින ආහාර සොයමින් වනාන්තර ප්‍රදේශවල සැරිසරන මොවුන්ගේ හෝජන රටා පිළිබඳ තවදුරටත් පර්යේෂණ සිදුකළ යුතු බවට යෝජනා කරමු.
3. හිස සුදු ශාරිකාවා - සංක්‍රමණය කරන මෙම විශේෂය පිළිබඳ තොරතුරු ඉතා අල්පය.
4. තිත්පිය තිරාසිකයා - සතුටුදායක ලෙස වාර්තා වුවද වඳවී යාමේ අවදානමක් සහිත බැවින් තවදුරටත් පර්යේෂණ කිරීම වැදගත්වේ.

Chestnut-backed Owlet
Glaucidium castanonotum

சுருக்கம

சிறீலங்கா ஆசியாவில் ஒரு சதுர நிலப்பரப்பில் அதி கூடிய உயிரனங்களின் வளத்தை கொண்ட நாடுகளில் ஒன்றுமட்டுமல்லாமல் ஆசியாக் கண்டத்தில் இரண்டாவது உயர்ந்த சனத்தொகை அடர்த்தியை கொண்ட நாடாகும; (Jansen & de Zoysa 1992). அரசியல் வாதிகளுக்கும் பொருளாதாரநிபுணர்களுக்கும், இயற்கை வனகாப்பாளர்களுக்கும், 17 மில்லியன் மக்களின் பொருளாதார அபிவிருத்தியை தேசத்தின் தனித்துவமான இயற்கை வளங்களுக்கு பாதிப்பு ஏற்படாவண்ணம் செய்வது மிகப்பெரிய சவாலாகும். பலவகையான உயிரினங்கள் அதிகமாக வாழும் ஈரவலயத்தில் நாட்டின் சனத்தொகை செறிந்திருப்பது இசசவாலை மேலும் மிகப்படுத்தியுள்ளது.

சிறீலங்காவின் ஈரவலயத்தில் வாழும் பலவகையான உயிரினங்களை எதிர்நோக்கியுள்ள மிகப்பெரிய அபாயம் உயிரினங்கள் இயற்கையாக செழித்து வாழும் இடங்கள் சிதறிப்போவதும் அவற்றை இழப்பதுமாகும். வனப்பிரதேசங்கள் கடந்த 40 வருடகாலத்தில் 50 % மாக குறைக்கப் பட்டதோடு தற்போது நாட்டின் மொத்தநிலப்பரப்பில் 24 வீதம் மட்டுமே இயற்கையான வனப்பிரதேசம் ஆகும். எஞ்சியுள்ள காட்டுப்பிரதேசங்களும் பெரிய நிலப்பரப்புள்ள விவசாயக்காணிகளால் தனிமைப் படுத்தப்பட்டிருப்பதோடு காட்டு உயிரினங்கள் பல பரந்து வாழ்வதற்கு இது தடையாக இருக்கிறது.

1992 ஆம் ஆண்டு ஈரவலயத்தில் விறகு வெட்டுவது சட்டபூர்வமாக தடைசெய்யப்பட்டுள்ளது. இது விறகு வெட்டுவதை வெற்றிகரமாக நிற்பாட்டியதோடு குறிப்பாக மிகப்பெரிய பாதிப்பை ஏற்படுத்தும் பாரியஅளவிலான விறகு வெட்டுதலையும் நிறுத்தியது. அப்படியிருந்தும் சட்டவிரோதமாக சிறிய அளவில் விறகு வெட்டுதல் தொடர்ந்தும் எஞ்சியுள்ள காடுகளை அழித்துக்கொண்டிருக்கிறது.

கடந்த காலத்தில் சிறீலங்காவின் ஈரவலயத்தில் வாழும் உயிரினங்கள் பற்றிய ஆராய்ச்சி சிறீலங்காவில் எஞ்சியுள்ள முதன்மையான மழைக்காடுகளில் மிகப்பெரிய நிலப்பரப்பை கொண்ட தேசிய வனாந்திரப்பிரதேசமான சிங்கராயா காட்டில் செய்யப்பட்டது. உயிரினங்களைப் பற்றிய அளவீடுகள் செய்வதற்கும் பொருத்தமான இயற்கை வனப் பாதுகாப்பு நோக்கத்தோடு இடத்தை அடையாளம் காண்பதற்கும; 1997 ஆம் ஆண்டு காலத்தில் நாங்கள் வேறு மூன்று ஈரவலய காடுகளுக்கு சென்றிருந்தோம்.

சிறீலங்காவில் 200 கெக்ரேக்கர் நிலப்பரப்பிற்கு

மேற்பட்ட எல்லா காட்டுத்துண்டுப் பிரதேசங்களும் 1991க்கும் 1996 க்குமிடையே தேசிய இயற்கைவனப் பாதுகாப்பு பரிசீலனைக் குழுவினால் (IUCN/WCMC/FAO1997) அளவீடு செய்யப்பட்டது. NCR இனால் உயிரினங்களைப் பற்றி செய்யப்பட்டஅளவீடுகள் முதற்கட்ட வேலையாதலால், அடையாளம் காணப்பட்ட இடங்களுக்கு மேலதிக வேலை, குறிப்பாக, பலவகையான உயிரினங்களின் இயற்கை வனப்பாதுகாப்பிற்கும், நீர்வரப்பு பாதுகாப்பிற்கும் முக்கியமானதென்று சிபார்சு செய்யப்பட்டது.

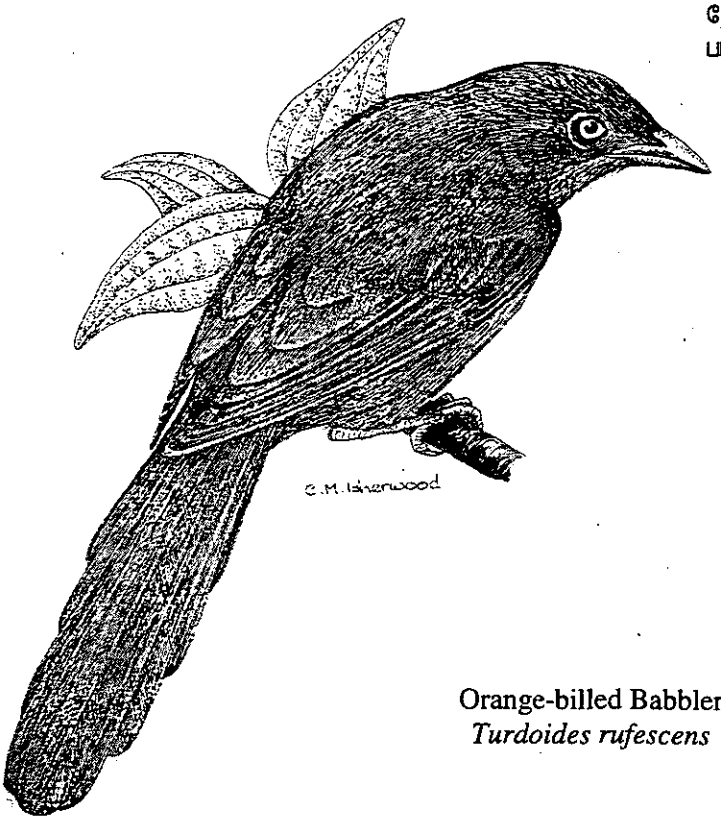
இந்த படிப்பு சம்பந்தமாக சென்ற, பாதுகாக்க திட்டமிடப்பட்ட வனப்பிரதேசங்களான டெல்வள, குடுமிரிய, பாதுகாக்கப்பட்ட வனப்பிரதேசமான வளங்கண்ட, காடுகள் யாவும் அதிமுக்கியம் வாய்ந்த காடுகள் என NCR இனால் அடையாளம் காணப்பட்டுள்ளது. இவ்வனப் பிரதேசங்கள் ஒவ்வொன்றும் சிறீலங்காவில் அரிதாகிவரும் தாவரவகையான டிப்ரிறோகாப் (Dipterocarp) அதிகமாகப் பரந்துள்ள துண்டுகளை கொண்டுள்ளது.

எஞ்சியுள்ள துண்டுப்பிரதேசங்கள் தனித்துவமான மறைந்துவரும் இயற்கையாக உயிரினங்கள் செழித்து வாழும் வளங்களுள்ள இடங்களாக இருப்பதால் ஈரவலயத்திலுள்ள எல்லா வனத்துண்டுப் பிரதேசங்களும் இயற்கைவனப்பாதுகாப்பு முகாமைத்துவதுதிற்கு தகுதியுடையன. தொடர்ந்து வாழக்கூடிய பல உயிரினங்கள் இத்துண்டுகளில் இருப்பதற்கு கூடிய சாத்தியக்கூறுகள் இருப்பதாலும், அவை குறைந்த அடர்த்தியாக இருப்பதாலும், வெளிப்புற அழுத்தத்திற்கு நன்கு பாதுகாக்கப் பட்டிருப்பதாலும், பெரிய துண்டுப்பிரதேசங்கள் சிறிய துண்டுப் பிரதேசங்களை விட அதிக பெறுமதியானவை (Soule 1983). உலகம் முழுவதும் இயற்கை வனப்பாதுகாப்பிற்கு நிதிப்பற்றாக்குறை இருப்பதால் செய்யப்படவேண்டிய விடயங்களின் முக்கியத்துவம் கட்டாயம் தீர்மானிக்கப்பட வேண்டும;. 2,500 கெக்ரேக்கருக்கு மேற்பட்ட நிலப்பரப்பை தொடர்ச்சியாக உள்ளடக்கி இருப்பதால் டெல்வள பாதுகாக்க திட்டமிடப்பட்ட வனப்பிரதேசமும், வளங்கண்ட பாதுகாக்கப்பட்ட வனப்பிரதேசமும் குறிப்பாக பெறுமதியானவை என நாங்கள் கருதுகின்றோம். 10,000 கெக்ரேக்கருக்கு மேற்பட்ட மழைக்காடுகள் சில மட்டும் மிஞ்சி

இருப்பதால் இது குறிப்பிடத்தக்க அளவு பெரியதாகும் (Legg & Jewell 1995). இவ்வனப்பிரதேசங்கள் ஒருமித்து அழிந்துவரும் 5 பறவை இனங்களையும் குறைந்தது 7 அழிந்துவரும் முலையூட்டி இனங்களையும் கொண்டுள்ளது. ஒரு சிறிய கூட்டமான யானைகள; (*Elephas maximus*) இந்த தொடர்ச்சியான இரு காடுகளுக்குமிடையே நடமாடி இக்காட்டை பாவித்து வருகின்றன. இது இந்த இரண்டு வனப்பிரதேசங்களையும் ஒன்றாக, முடிந்தவரை ஒரு இயற்கை வனபாதுகாப்புவலயமாக, முகாமைப்படுத்த வேண்டுமென்ற எமது ஆலோசனையை ஆதரிக்கின்றது.

அரிதாகிக்கொண்டிருக்கின்ற (Green-billed Coucal) கிரீன்பில்ட் கௌக்கல; (*Centropus chlororhynchus*) போன்ற சிறீலங்காவிற்கு சொந்தமான அதிமுக்கியத்துவம் வாய்ந்த பாதுகாக்கப்பட வேண்டிய பல உயிரினங்களை கொண்டுள்ள, 1,936 கெக்ரேக்கரை கொண்ட பாதுகாக்க திட்டமிடப்பட்டுள்ள குடுமிரிய வனப்பிரதேசம், இயற்கைவன பாதுகாப்பு சம்பந்தப்பட்ட முக்கியமான பல உயிரினங்களையும் கொண்டுள்ளது.

நாங்கள் சென்ற மூன்று காடுகளும் அந்த சுற்றாடலில் வசிக்கும் மக்களின் அன்றாட வாழ்க்கையில் முக்கிய பங்கை வகிக்கின்றன. அத்தகைய காடுகளை பாதுகாப்பதற்கு நிதி முதலீடு, கடமையுணர்ச்சியுள்ள அரசாங்க இலாகாவுகள், அரசுசார்பற்ற அமைப்புகள் மட்டுமல்லாமல் தங்கள் நாளாந்த தேவைகளுக்கு காட்டை நம்பி வாழ்பவர்களின் பங்களிப்பும் தேவையானதாகும்.



Orange-billed Babbler
Turdoides rufescens

Conclusions and Recommendations

Wet zone Sri Lanka

Sri Lanka's "wet zone" is the most important area for biodiversity conservation in the country (Senanayake *et al.* 1977). Most biological survey work in the region has so far been concentrated in the Sinharaja National Wilderness Area. This report presents results of the first detailed biological surveys at three other wet zone forest sites. All three sites contain remnants of primary lowland rainforest, one of the most threatened natural habitats in Sri Lanka (Gunatilleke & Gunatilleke 1990a). These unique biogeographic relicts contain an extremely high diversity of plant and animal species, many of which are endemic (Erdelen 1988).

Importance of south-west Sri Lanka for bird conservation

The Sri Lanka Endemic Bird Area (EBA 124), contains 23 restricted-range bird species, more than any EBA in continental Asia (Stattersfield *et al.* 1998). Fourteen such species are restricted to the lowland and montane forests of the wet zone (see Figure 1). Of these, five are considered globally threatened (Collar *et al.* 1994): Green-billed Coucal *Centropus chlororhynchus;* Sri Lanka Wood-Pigeon *Columba torringtoni;* Sri Lanka Whistling-Thrush *Myiophonus blighi;* Ashy-headed Laughingthrush *Garrulax cinereifrons* and Sri Lanka Blue Magpie *Urocissa ornata.* We recorded 19 restricted-range species including five threatened and four near-threatened species.

Importance of south-west Sri Lanka for other vertebrates

The forests of the wet zone provide habitat for many non-avian vertebrates, some of which are endemic to this climatic area. Generally the mammals show the least degree of distributional zonation (Erdelen 1988), although some endemic forms exist (e.g. Golden Palm Civet *Paradoxurus zeylonensis*). These forests also hold important populations of more widespread threatened species, such as Leopard *Panthera pardus,* Slender Loris *Loris tardigradus* and Fishing Cat *Prionailurus viverrinus.*

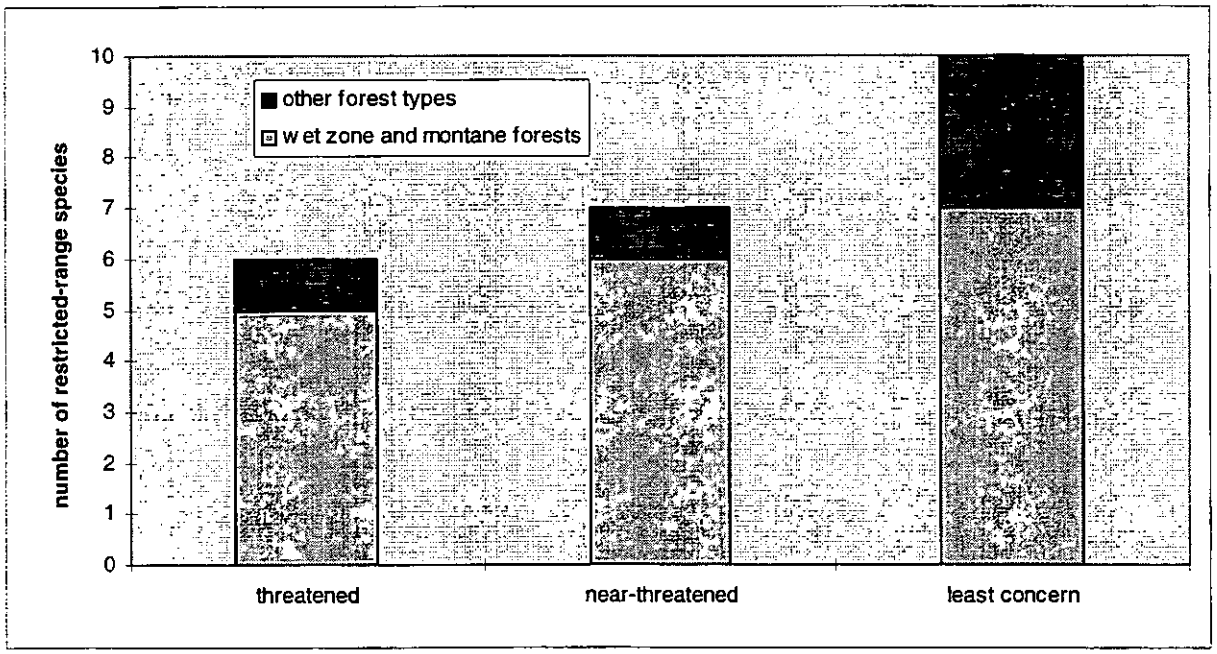


Figure 1 Nineteen out of Sri Lanka's 23 endemic bird species and 11 out of the country's 13 threatened or near-threatened species are found in the wet zone.

The largest remaining populations of Asian Elephant *Elephas maximus* in Sri Lanka are found in the dry zone, but scattered small populations persist in wet zone forests. During our surveys we recorded six threatened and two near-threatened mammal species.

Amphibian and reptile species in Sri Lanka tend to show very restricted geographical ranges (Erdelen 1988). Of the nine endemic genera of lizards and amphibians, eight are confined to the wet lowland or montane regions (Senanayake *et al.* 1977). During our surveys four endemic genera and seven endemic species of reptile were recorded. Three non-endemic reptiles listed by CITES were also recorded.

Importance of south-west Sri Lanka for threatened plants

At least a quarter of the flowering plants in Sri Lanka are endemic (Gunatilleke & Ashton 1987). More than 90% of these endemic species are found in wet zone forests (Gunatilleke & Gunatilleke 1990a). This study identified more than 50 angiosperms listed as Endangered, Vulnerable or Rare by IUCN (1998).

Threats

The major threats facing Sri Lanka's wet zone biodiversity are habitat destruction and fragmentation. Since 1992, all wet zone logging activities have been prohibited by law in recognition of the forest's value for watershed protection and biodiversity conservation (IUCN/WCMC/FAO 1997). However, despite the prevention of large logging operations in the area, small scale logging continues and many forests suffer encroachment from agricultural land (USAID 1991). We observed a number of cases of illegal small-scale activities that appeared to be logging for timber rather than clearing land for agriculture.

The state Forest Department is responsible for overseeing management of most of the wet zone forests and effectively controls the problem of logging in most areas. However, with such a large area under their jurisdiction, the task is problematic.

Outlook

Despite the high human population density in south-west Sri Lanka and the severe fragmentation of much of the remaining forests, there is cause for optimism. The Forest Department and the Department of Wildlife Conservation regard conservation as a high priority, and management plans are being developed for many of the country's forests (IUCN/WCMC/FAO 1997). Delwala Proposed Reserve is to be upgraded in status to that of Conservation Forest (S. Kotagama verbally 1997). Under new legislation, the forest will be preserved for conservation, education and research. The Field Ornithology Group of Sri Lanka (FOGSL) are establishing a semi-permanent base in Delwala village and will be carrying out a research program along with students from the University of Colombo.

Local communities have a long history of harmonious use of the forest (e.g. de Zoysa & Raheem 1993) and many people are enthusiastic towards schemes aimed at preventing further forest loss.

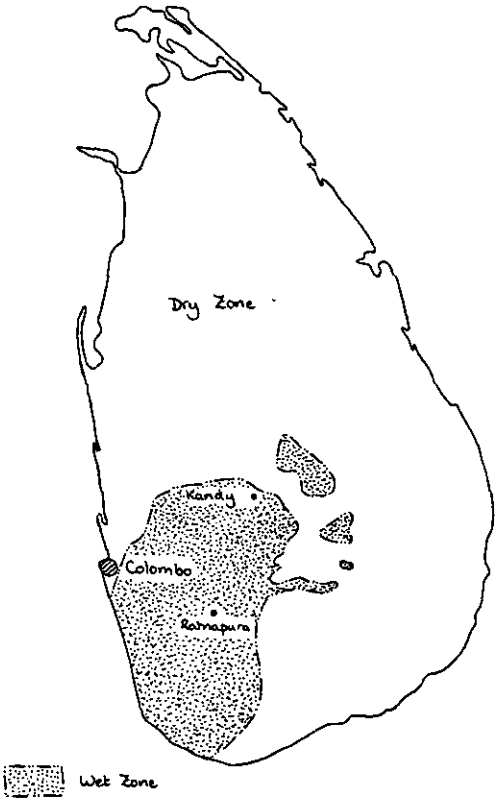


Figure 2 Sri Lanka has two distinct climatic zones: the wet zone and the dry zone.

Recommendations

From 1991 to 1996, the National Conservation Review team surveyed all natural forests larger than 200 ha in Sri Lanka and prioritised them according to their importance in watershed protection and biodiversity conservation (IUCN/WCMC/FAO 1997). The three sites visited in this study (Delwala Proposed Reserve, Walankanda Forest Reserve and Kudumiriya Proposed Reserve) were all identified by NCR as being 'of highest importance'. The results of our biological surveys, focusing particularly on the avifauna, confirm this assessment, and we support NCR's recommendations that such forests be afforded full protection under Sri Lankan law.

The adjacent sites of Walankanda and Delwala are a particularly high priority as they contain over 2,500 ha of contiguous forest, one of the larger remaining forest tracts in the wet zone. We recommend that these two forests be managed as a single unit and raised in status to that of Conservation Forest.

Neither legislation to prevent forest fragmentation nor research to look at its effects tackle the crux of the problem of habitat loss. We recommend an education program in villages in wet zone forested areas. This could concentrate on:

- Raising awareness of the importance of the forests for watershed protection;
- Raising awareness of the unique nature of the local fauna and flora.

The Forest Department may wish to explore partnership arrangements, whereby local villagers agree to protect forests in exchange for sustainable use of certain non-timber forest products. The Forest Department could monitor and control the level of forest use to ensure its sustainability, possibly with the involvement of Non-Governmental Organisations (NGOs).

There are a number of NGOs involved in conservation and biological research in Sri Lanka (e.g. FOGSL, Ceylon Bird Club and Young Zoologists Association). Small-scale research projects focusing on some of the rarer and more poorly known species could yield valuable information to aid the making of conservation decisions. We recommend further research on:

- The Red-faced Malkoha *Phaenicophaeus pyrrhocephalus*, focusing on its distribution and abundance both in the wet zone and in any remnant populations in riverine forests of the dry zone. This species appears very rare and its global status may merit upgrading from Vulnerable (Collar *et al.* 1994) to Endangered.
- The Sri Lanka Wood-Pigeon *Columba torringtoni* is likely to be highly nomadic, using areas temporarily when certain trees are in flower or fruit. We recommend a study relating feeding ecology to forest phenology to help in understanding how this endemic pigeon uses the remaining forests.
- The White-faced Starling *Sturnus albofrontatus* is apparently nomadic and its status is difficult to ascertain. A study on its movements between forest patches would give a clearer understanding of its conservation status and dispersal ability.
- The Spot-winged Thrush *Zoothera spiloptera* is moderately tolerant of human disturbance, locally abundant and relatively widespread. We tentatively propose that its threat category be downgraded from near-threatened to least concern. However, this view is not shared by some Sri Lankan ornithologists (e.g. Hoffmann 1998, R. de Silva *in litt.* 1998). Further research is recommended.

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Organisational Profiles

Field Ornithology Group of Sri Lanka (FOGSL)

Founded in 1976, FOGSL is now BirdLife International's Sri Lanka partner. Its aims are to increase knowledge about Sri Lanka's birds through field research and observations and to raise awareness of the threats faced by many of Sri Lanka's unique species.

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Ceylon Bird Club (CBC)

The Ceylon Bird Club exists to encourage amateur ornithologists in Sri Lanka and to collate information on Sri Lankan birds through the publication of the monthly CBC notes.

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BirdLife International

BirdLife International is a worldwide partnership of organisations, working for the diversity of all life through the conservation of birds and their habitats. Its aims include monitoring the conservation status of all bird species and securing adequate conservation for the world's critically important sites for the conservation of bird diversity.

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Young Zoologist's Association (YZA)

The Young Zoologist's Association was established in 1972. Its aim is to work for conservation through education. YZA runs weekend courses on Sri Lanka's flora and fauna for its 600 members between the ages of 12 and 35. In addition, an ongoing outreach program in schools is being carried out which spreads the concept of conservation through lectures, photography and painting workshops.

Young Zoologist's Association
Mahesh Priyadarshana
National Zoological Gardens
Dehiwela
Sri Lanka

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Conventions and Abbreviations

Nomenclature and systematic order for birds both follow Inskipp *et al.* (1996). The exception is White-faced Starling *Sturnus albofrontatus,* referred to in Inskipp *et al.* as *Sturnus senex;* the correct nomenclature for this species was recently clarified by Mees (1997). For bird species of conservation interest, threat categories from Collar *et al.* (1994) are followed. The Ceylon Bird Club has recently published an updated version of their Threatened Birds of Sri Lanka National Red List (Hoffmann 1998). This includes a number of suggested changes to the currently accepted IUCN categories. Hoffmann's proposed amendments are given under the status and distribution section of each species account.

Bird species treated as endemic to Sri Lanka follow Stattersfield *et al* (1998). A further three species: Ceylon Small Barbet *Megalaima rubricapilla*, Black-capped Bulbul *Pycnonotus penicillatus* and Ceylon Hill Munia *Lonchura kelaarti*, are considered endemic by some authorities (e.g. Wijesinghe 1994).

Nomenclature and systematic order for mammals follows Corbet & Hill (1992). Nomenclature for reptiles follows Daniels (1983) for species which occur in India as well as Sri Lanka, Manamendra-Aracchchi & Liyanage (1994) for endemic agamid lizards and de Zoysa & Raheem (1993) for other species not listed by either of the first two sources. Threat categories for non-avian vertebrates are those given in IUCN (1996).

Nomenclature for plants follows Dassanayake (1980-1996) where possible. For species not listed in Dassanayake (1980-1996), Abeywickrama (1959) is used.

Terminology

POST-1994 IUCN

THREATENED: species considered to be in danger of extinction; includes the categories Critical, Endangered and Vulnerable (Collar *et al.* 1994).

CRITICAL: taxa facing an extremely high risk of extinction in the wild in the immediate future (Collar *et al.* 1994).

ENDANGERED: taxa which, while not Critical, face a very high risk of extinction in the wild in the near future (Mace & Stuart 1994, IUCN 1996).

VULNERABLE: taxa which, while not Critical or Endangered, face a high risk of extinction in the wild in the medium-term future (Mace & Stuart 1994).

NEAR-THREATENED: species not (yet) considered to be in serious danger of global extinction but whose status gives cause for concern (Collar *et al.* 1994).

CITES APPENDIX I: lists species currently threatened with extinction and in which virtually all trading is prohibited.

CITES APPENDIX II: lists species that are not currently threatened with extinction but may become so unless trade is regulated.

CITES APPENDIX III: lists species that are not currently threatened with extinction but trade is regulated by some countries within the species' range.

ENDEMIC: species restricted to a defined geographical area. In this report the defined area is the island of Sri Lanka unless otherwise stated.

ENDEMIC BIRD AREA (EBA): an area which includes the entire breeding range of two or more restricted-range bird species. (Stattersfield *et al.* 1998).

RESTRICTED-RANGE BIRD SPECIES: species with a total global range of 50,000 km^2 or less (Stattersfield *et al.* 1998). All Sri Lanka's restricted-range bird species are endemic to the country.

SRI LANKA ENDEMIC BIRD AREA 124 (Stattersfield *et al.* 1998): The island of Sri Lanka.

CHENA CULTIVATION: a system of shifting cultivation where the forest is burnt, used for a few seasons, then abandoned.

DRY ZONE: climatic zone that covers the northern and eastern regions of Sri Lanka.

FIELD-HOUR: one hour of field observation carried out by either one person or a group of people working together.
FOREST BIRD: species occurring in primary or selectively logged forest, excluding species seen only in disturbed forest and more common in other habitat types.
GANGA: river (Sinhala term).
HOME GARDEN: a traditional village garden that contains many domestically useful plants.
HILL COUNTRY: region of the central massif with an average altitude of over 500 m.
KANDA: mountain (Sinhala term).
NATIONAL CONSERVATION REVIEW: From 1991 to 1996 the NCR team (IUCN/WCMC/FAO 1997) surveyed all natural forests in Sri Lanka larger than 200 ha and prioritised sites for their importance in watershed protection and conservation.
METRE-NET HOUR: One metre of mist-net operated for one hour.
WET ZONE: climatic zone that covers the south-western sector of the island and is heavily influenced by the monsoon, receiving more than 2,000 mm of rain per annum.

Estimates of Abundance

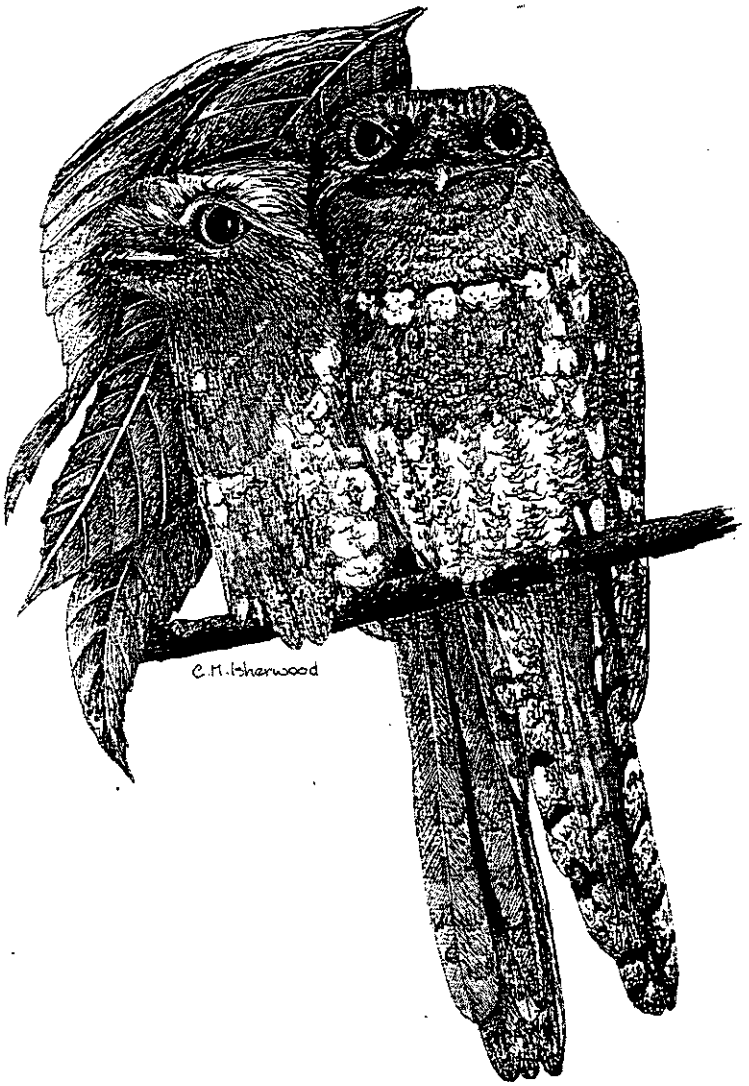
The following subjective estimates of abundance were made for all bird species. They offer some guide to the relative status of species at the sites visited.

VERY COMMON: recorded daily in large numbers.
COMMON: recorded daily in moderate numbers.
FAIRLY COMMON: recorded fairly regularly in small numbers.
UNCOMMON: seldom recorded and only in small numbers.
RARE: recorded on a few occasions only.

Abbreviations

CITES: Convention on International Trade in Endangered Species of Flora and Fauna.
EBA: Endemic Bird Area.
FOGSL: Field Ornithology Group of Sri Lanka.
ICBP: International Council for Bird Preservation (now BirdLife International).
IUCN: International Union for the Conservation of Nature.
MAB: Man and Biosphere.
NCR: National Conservation Review.
WCMC: World Conservation Monitoring Centre.
YZA: Young Zoologist's Association, Sri Lanka.
EN: Endangered.
FR: Forest Reserve.
PR: Proposed Reserve.
RR: Restricted-range
VCP: Variable Circular Plot.
VU: Vulnerable.
NT: Near-threatened.
c.: circa.
dbh: diametre at breast height.
gbh: girth at breast height.
ha: hectares.
km: kilometres.
m: metres.
mm: millimetres.
G: grams.

Overview



Sri Lanka Frogmouth *Batrachostomus moniliger*

"The southern forests and highlands of Sri Lanka are a unique biological treasure trove of evolutionary relicts" (Senanayake *et al.* 1977).

Introduction

Sri Lanka is one of the smallest but most biologically diverse countries in Asia (IUCN/WCMC/FAO 1997) and has been recognised as a hotspot of global biological importance for plants (Davies & Heywood 1994). It also has one of the highest population densities in Asia and, as in many parts of the world, there is a strong correlation between increasing human population and increased forest clearance (Erdelen 1988).

Endemism

Sri Lanka's flora and fauna share their origins with India, the forests being relicts of the Deccan-Gondwanic forests that once covered much of south Asia (Senanayake *et al.* 1977). These forests are of considerable biogeographic importance to the south Asian region (Gunatilleke & Ashton 1987).

Despite its geographical proximity to India, Sri Lanka supports a surprising level of endemism. Among flowering plants, 11 genera and 830 species are endemic (Peeris 1975). Endemism stands at 50% in reptiles, 51% in amphibians and 27% in freshwater fish (Crusz 1986, Gunatilleke & Gunatilleke 1983). Endemism within birds is lower (around 8%), reflecting the ease of dispersal of this group (Senanayake *et al.* 1977). Nevertheless, the country contains 23 restricted-range bird species, all endemic to the country, and has been designated an Endemic Bird Area (ICBP 1992, Stattersfield *et al.* 1998).

Geography

Sri Lanka is situated between 5° 54' and 9° 52' N and 79° 39' and 81° 53' E, and is separated from India by the shallow Palk Strait. It has a land area of 65,600 km^2 and a maximum elevation of 2,518 m. The climate is tropical and is influenced by both the south-west monsoon (June-September) and the north-east monsoon (December-February). Monsoon rains have most effect in the exposed south-west of the island known as the "wet zone", where annual rainfall exceeds 2,000 mm. The rest of the island, known as the "dry zone", is sheltered from the monsoon by the central and south-western highlands.

The wet zone

The country's biological diversity is concentrated in the wet zone, the climatic region covering only 23% of the island's land area. More than 90% of the endemic species (and all the endemic genera) of flowering plant are found in the wet zone forests (Gunatilleke & Gunatilleke 1990a). Wet zone lowland forests have been described as "floristically the richest in Sri Lanka, and indeed of all south Asia" (Gunatilleke & Gunatilleke 1990a).

Of the 23 endemic bird species, 14 are found primarily in lowland and montane wet zone forests (Stattersfield *et al.* 1998). This includes four species considered Vulnerable and one considered Endangered.

The wet zone is also the region of highest human population density. Nearly 60% of the country's 17.2 million inhabitants live here (IIED 1992).

Forest cover

In 1956 natural forests covered nearly 44% of Sri Lanka's land area (Soussan & O'Keefe 1985). Remote sensing information shows that by 1983 natural closed-canopy forest covered just 18.5% of the island's area (Collins *et al.* 1991). Most of the remaining forest is in the dry zone and only 9% remains in the wet zone, the area with the highest endemism. The reality may be even worse than these figures suggest. In many areas the forest is underplanted with Cardamom *Elletaria cardamomum* (Zingiberaceae); such areas may appear to be healthy natural forest with an intact canopy, but effective regeneration is prevented by the removal of young trees and saplings (Erdelen 1988). Forest fragmentation is another problem facing these lowland rainforests where few tracts are larger than 10,000 ha (IUCN/WCMC/FAO 1997). Progressive encroachment of agricultural land continues to isolate small forest patches.

Protected areas system

Sri Lanka has an unusually long history of establishing protected areas which dates back to the introduction of Buddhism in 246 BC (de Alwis 1969). This traditional affinity with conservation is laid down in the second Republican Constitution (Article 28F):

"It is the duty of every person in Sri Lanka to protect nature and conserve its riches."

Currently, 14% of the Island's land area falls within protected areas, but this cover is least extensive in the wet zone (Mackinnon & Mackinnon 1986). The recent NCR study (IUCN/WCMC/FAO 1997) suggests that up to 15% of species diversity may not be included in any protected area.

In 1992, a moratorium was placed on logging in all state owned wet zone forests pending a review of their value for watershed protection and biodiversity conservation (S. Kotagama *in litt.* 1998). Certain forests are assigned additional protection by the Wildlife Department (as Strict Natural Reserves, Nature Reserves, National Parks or Jungle Corridors) or by the Forest Department (as Forest Reserves or Conservation Forests). For a full explanation of most terms see de Alwis (1969); Conservation Forest is a new designation defined by the 1995 Forest Policy. It has been noted (IUCN/WCMC/FAO 1997) that some national designations of protected areas do not meet IUCN's definition and criteria for a protected area (IUCN 1994).

Many protected areas are small, reflecting the fragmentation of the country's remaining natural habitat. More than half of the protected areas in the wet zone are less than 1,000 ha in size (IUCN/WCMC/FAO 1997).

Sri Lanka participates in three international initiatives concerned with protected areas: RAMSAR Wetland Convention, UNESCO MAB Program and the World Heritage Convention. Protected areas have been designated under each of these programs.

Human use of the forests

Many rural people in Sri Lanka are dependent in part on non-timber forest products for their subsistence and income (Gunatilleke *et al.* 1993).

Plants are collected for many uses: medicinal plants, such as the woody climber *Coscinium fenestratum* (Menispermaceae) are used to treat aliments including fever and tetanus; the starchy tubers of the Dioscoreaceae family are used as food; poles, resins, and lianas are important building materials; and rattans (*Calamus* spp.) are collected for weaving household utensils (Gunatilleke & Gunatilleke 1993, Gunatilleke *et al.* 1993). A traditional cottage industry is based around the tapping of the inflorescence of the Kittul Palm *Caryota urens*. The sweet nectar is used to make a hard sugar known as *jaggery* or the alcoholic drink *toddy* (Ratnayake *et al.* 1991).

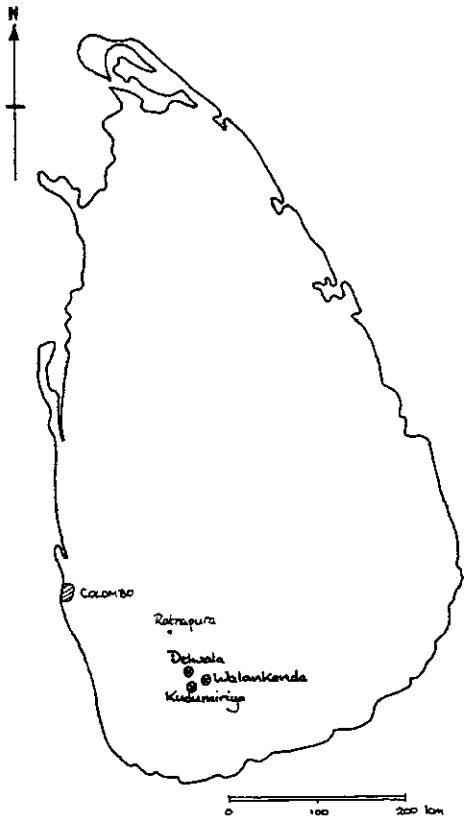


Figure 3 A map of Sri Lanka showing Sinharaja and the study sites

Animals such the Wild Boar *Sus scrofa* and Sambar Deer *Cervus unicolor* are hunted in some areas. Semi-precious gems—such as sapphires, rubies and topaz—are mined in shallow pits along water courses in the forest (IIED 1992).

Under current forestry policy, all these activities, apart from licensed tapping of the Kittul Palm, are illegal. This has caused conflict between local people and the Forest Department in some areas (Gunatilleke *et al.* 1993).

Previous research

Research in wet zone Sri Lanka has previously focused on the Sinharaja National Wilderness Area. At 11,187 ha, this is the largest protected area in the wet zone and in 1988 was designated a World Heritage Site in recognition of its global conservation importance. Intensive studies have been undertaken in the reserve (de Zoysa & Raheem 1993) focusing particularly on botany (e.g. Gunatilleke & Gunatilleke 1983, Gunatilleke & Gunatilleke 1990b, de Zoysa *et al.* 1986), vertebrates (e.g. Kotagama & Thambiah 1986, Kotagama *et al.* 1986) and human use of the forest (e.g. McDermott 1986, de Zoysa 1992). Other work in wet zone forests has been carried out, for example in Peak Wilderness Sanctuary and the KDN Forest Complex, most of which has focused on plants (e.g. Singhakumara 1994, Singhakumara 1995).

From April 1991 to September 1996, the National Conservation Review (administered by the Forest Department with technical assistance from IUCN) visited all natural forests in Sri Lanka with an area greater than 200 ha with the aim of designing an optimal protected areas system for the country. Due to the limited time available at each site, detailed faunal surveys were not made. NCR recommended that more detailed and wide-ranging surveys be carried out in the forests they identified as potentially important (IUCN/WCMC/FAO 1997).

Project research

The research documented in this report was carried out during a three month project involving participants from the University of Cambridge (U.K.) and the Field Ornithology Group of Sri Lanka. From July to September 1997, we conducted surveys at three forest sites in south-west Sri Lanka that had been visited only briefly by the National Conservation Review (IUCN/WCMC/FAO 1997) and identified as of "highest importance".

Our surveys focused primarily on birds, but opportunistic encounters with mammals and reptiles were recorded, and basic botanical information and human use of the forest were noted.

Sri Lanka Blue Magpie
Urocissa ornata

Summary of Biological Results

Birds

A total of 110 bird species were recorded (see Appendix I). These included the Green-billed Coucal *Centropus chlororhyncus*, considered Endangered, and four species classed as Vulnerable: Sri Lanka Wood-Pigeon *Columba torringtoni;* Red-faced Malkoha *Phaenicophaeus pyrrhocephalus*; Sri Lanka Blue Magpie *Urocissa ornata* and Ashy-headed Laughingthrush *Garrulax cinereifrons* (Collar *et al.* 1994).

Of the four species classed as Vulnerable, we found significant, if small, populations of three. However, we are concerned about the status of the Red-faced Malkoha *Phaenicophaeus pyrrhocephalus*. Surveys carried out in supposedly prime habitat for this species produced a maximum of three individuals in 10 weeks fieldwork. Reasons for the species' extreme rarity are not known, but we recommend further research and a possible elevation in threat category to that of Endangered.

We found the near-threatened Spot-winged Thrush *Zoothera spiloptera* in good numbers at each of the sites. We cautiously suggest that the species' population is sufficiently large and stable to merit a drop in status to that of 'least concern'. However, it is important to note that this species' long term survival depends on continued existence of forest.

Sri Lanka supports 23 restricted-range species, all of which are endemic to the country (Stattersfield *et al.* 1998). Nineteen endemic species were recorded; those not found inhabit higher montane areas (Stattersfield *et al.* 1998): Yellow-eared Bulbul *Pycnonotus penicillatus*; Sri Lanka Whistling-thrush *Myiophonius blighi*; Sri Lanka Bush-warbler *Bradypterus palliseri* and Dull-blue Flycatcher *Eumyias sordida.* Fieldwork was carried out between 200 m and 1,200 m and two of the endemic species classed as montane by Stattersfield *et al.* (1998) were recorded: Sri Lanka Wood-Pigeon *Columba torringtoni* and Sri Lanka White-eye *Zosterops ceylonensis.*

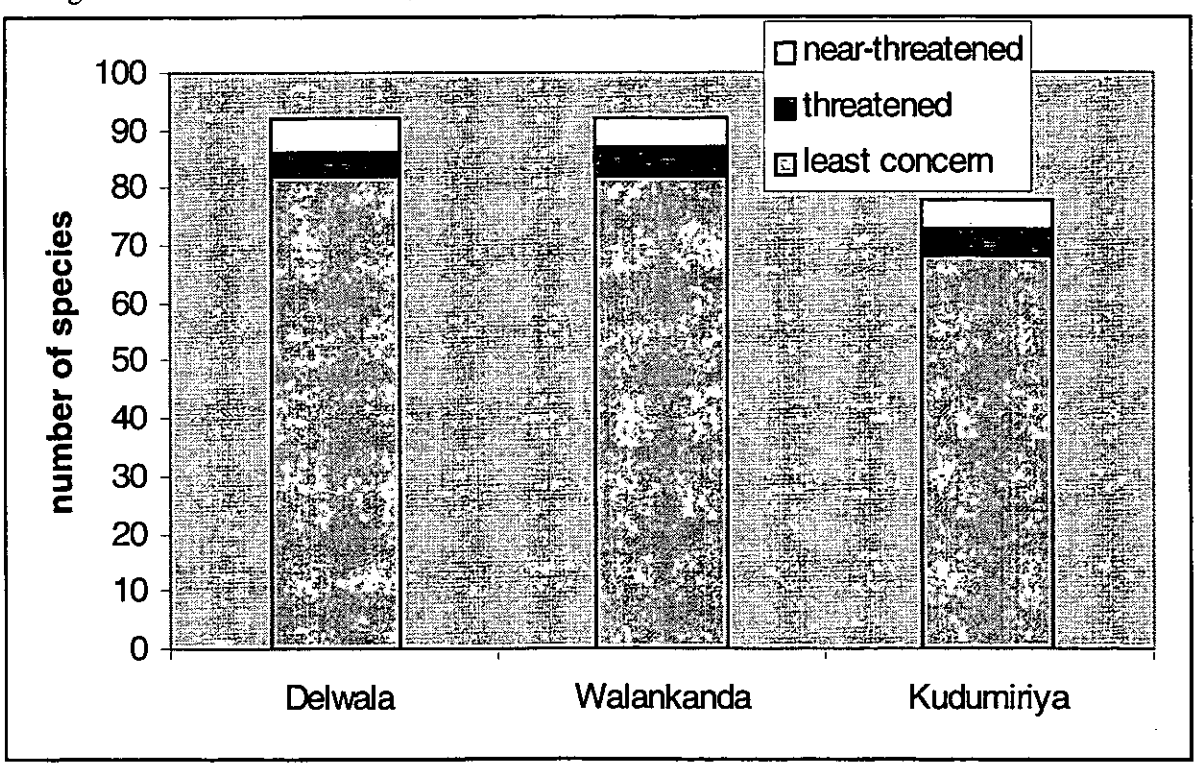


Figure 4 A graph to show the threatened, near-threatened and least concern bird species recorded at each site. Note there is little difference between the sites.

We found the nests of three endemic species: Sri Lanka Wood-Pigeon *Columba torringtoni;* Spot-winged Thrush *Zoothera spiloptera* and Sri Lanka White-eye *Zosterops ceylonensis* (see species accounts for nest descriptions).

Mixed-species foraging flocks were a notable feature of the ecology of the forest avifauna. Of the 50 species that are primarily forest birds (see Appendix IV), 32 were commonly seen associating in mixed-species flocks; seven others rarely or very rarely joined flocks. Orange-billed Babblers *Turdoides rufescens* and Greater Raquet-tailed Drongos[1] *Dicrurus paradiseus* were common flock-forming or 'nuclear' species, as defined by Moynihan (1962).

Mist-netting was undertaken in the forest at Delwala and Walankanda. In total 5,879 metre net-hours were carried out at Delwala and 2,255 metre net-hours at Walankanda. One hundred and one individuals of 19 species were netted. Nine of these were restricted-range species, two of which (Green-billed Coucal *Centropus chlororhyncus* and Ashy-headed Laughingthrush *Garrulax cinereifrons*) are globally threatened (Collar *et al.* 1994).

Mammals

Eighteen species of mammal were identified, including five threatened and three near-threatened species (see Appendix I). Leopard *Panthera pardus* was recorded at both Walankanda and Kudumiriya. At Kudumiriya an individual of the less common melanistic form was seen.

Fewer than 3,000 Asian Elephants *Elephas maximus* remain in Sri Lanka (Santiapillai & de Silva 1994) and most are restricted to the dry zone. A small population, probably a group of three and a single adult male, was recorded in Walankanda. Evidence of the species' recent presence was also seen in Delwala, and it is likely that the group moves between the two contiguous forests. This population is extremely isolated; their nearest conspecifics are likely to be in another small population in Handapan-Ella and Thangamali plains (de Zoysa & Raheem 1993).

Reptiles

Of the 22 amphibian and reptile species identified (see Appendix I), four belong to endemic genera: two lizards (*Ceratophora aspera* and *Lyriocephalus scutatus*), one snake (*Balanopphis ceylonensis*) and a frog (*Nannophrys* spp.). Three reptile species listed by CITES were recorded, including the widespread threatened Python *Python molurus* (CITES Appendix II), Common Cobra *Naja naja* (CITES Appendix III) and Water Monitor *Varanus salvator* (CITES Appendix II).

Purple-faced Leaf Monkey
Trachypithecus vetulus

[1] In the south-west this species appears as a distinctive subspecies *D. p. lophorhinus*, known locally as Crested Drongo.

Methods

Ornithology

Most data on species' distribution, abundance and general ecology were collected using qualitative techniques. Quantitative methods for estimating population density were attempted but it is felt that the results of these surveys add little to the findings of this project and so the results, methods of data collection and analysis are not presented in detail here. They are, however, available in an unpublished report from the authors.

Quantitative methods

The Variable Circular Plot method or VCP (Reynolds *et al.* 1980) is presently the most commonly used method for estimating tropical bird population densities (Riley 1997). We attempted a simplified version of the VCP (Buckland 1987) as described by Bibby *et al.* (1992). This involves locating all birds either inside or outside a set radius from the observer.

We feel that such methods may be unsuitable for surveys of rare species when limited time is available at a site. Rare species are, by their very nature, infrequently encountered or have patchy distribution. Therefore, although it may be possible to collect sufficient data on the more common species in an area, accurate information on the density of the rarer species is difficult or impossible to obtain.

During this survey transects though the forest with points marked at 250 m intervals were walked 0600 to 0900 and 1530 to 1730 daily. Birds encountered during 10 minute periods at each point were recorded and assigned as either inside or outside a fixed radius. Carrying out fieldwork in this way helped to fix field effort at each site and to give a good feel for the relative abundances of species at the different sites visited. The data from these transects has been analysed and is available from the authors. However we do not consider it helpful to present it in full in this report and so do not discuss the methods and analysis further.

Qualitative methods

General field observations At each site we conducted systematic field observations. For rare or endemic species, information was collected on number of individuals, foraging behaviour and habitat type. Approximate altitude was estimated where possible. When mixed-species flocks were encountered, these were followed and the composition, number of individuals of each species and foraging methods were noted. Species discovery curves were plotted as fieldwork progressed to give an indication of when a relatively complete site inventory had been obtained.

Ornithological field guides used were Kotagama & Fernando (1994) and Henry (1955). Many species are recognisable by their call, and time was spent practising this skill, comparing notes with other team members and listening to tapes.

Canopy breaks were used as observation points for raptors and at dusk to locate roost sites for mynas and starlings.

Mist-netting Two twelve metre and six nine metre mist-nets were used in a variety of combinations in the forest at both Delwala and Walankanda. This allowed capture and in-hand identification of elusive and skulking species.

The following measurements were recorded for all birds caught: weight, wing length, tail length, tarsus, bill length (skull to tip), bill length (nares to tip), bill width (see Appendix V for details). Birds caught were marked with colour plastic rings, where possible, to allow recaptures to be identified.

Photography

All birds mist-netted were photographed, as were a number of species in the field. Some photographs were also taken of identified reptile and amphibian species. The different forest types at each site visited were photographed as was damage to the forest by

illegal logging or elephant grazing. Appendix VI gives a list of species photographed.

Sound-recording

Sound-recording of bird calls and identified mammal and amphibian species were made using a Marantz CP430 tape recorder and a Sennheiser ME66 directional microphone, on loan from the National Sound Archive (Wildlife Section) U.K. Appendix VI gives a list of species sound-recorded.

Non-avian vertebrate surveys

Mammals, reptiles and amphibians encountered during the course of fieldwork were identified where possible. A number of checklists, field guides and leaflets were consulted for identification. Existing knowledge of some of the team members was also used.

Habitat assessments

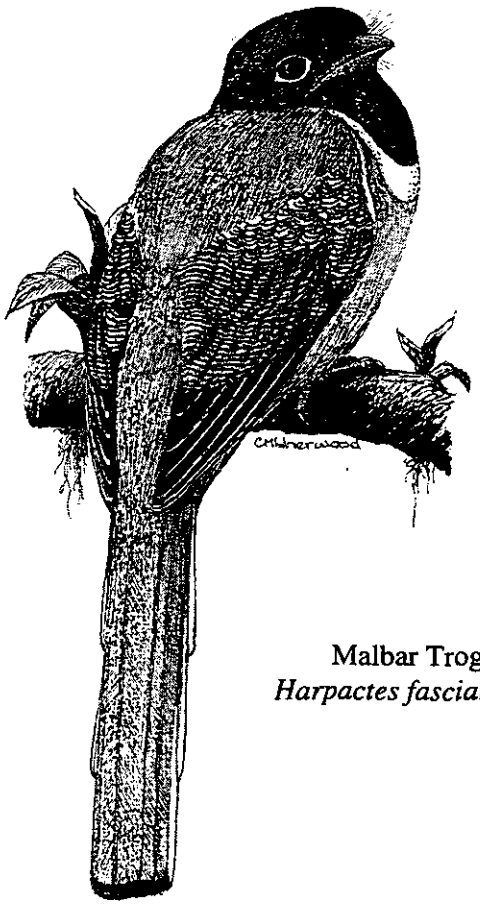
Habitat descriptions were made at a sample of transect points used for bird surveys. A set 'pro forma' was established, loosely based on that of Webb *et al.* (1976). Slope, aspect and approximate altitude were recorded, as were evidence of human or animal disturbance, such as ring barking of trees, tracks or pig scrapes. Observations on forest structure were made within a 30 m radius of the point. Variables recorded were: canopy height, uniformity and percentage cover; height and percentage cover of sub-canopy; percentage cover of understorey and groundstorey.

Dominant species in all strata were identified where possible with the help of M. Wijesinghe. Abundance, on a qualitative scale, of special life forms such as lianas, tree ferns and epiphytes was noted as was percentage moss cover on rocks and trees. Girth at breast height (gbh) was measured for five canopy trees close to the transect point and for the tree with the largest girth within 30 m of the point. These were used to calculate average and maximum diametre at breast height (dbh). Canopy height was estimated by sight to the nearest 5 m and gbh was measured with a tape measure to the nearest 5 cm.

Interviews with local people

The project worked closely with local people at all sites. Our proximity to human habitation at each site facilitated regular contact with people of most social groups and anecdotal information was obtained through informal interviews. Three team members were fluent in Sinhala, the first language of the villagers in the area.

Conversations often centred on use of the forest and changes in the forest over the years. The basic economics of some families in each of the villages visited was established through informal conversations. People particularly knowledgeable about the area's birds were identified through informal conversations. To verify the reliability of this knowledge bird books were shown, e.g. the plate of the genus *Psittacula* from Ali & Ripley (1995) and questions asked as to which ones they were familiar with. Some people were able to easily pick out those species present in the area and avoid ones not found in Sri Lanka. The knowledge of these people with regard to local avifauna was considered to be quite reliable.



Malbar Trogon
Harpactes fasciatus

Introduction to the sites

Surveys were carried out in three forest sites in south-west Sri Lanka: Delwala Proposed Reserve, Walankanda Forest Reserve and Kudumiriya Proposed Reserve. All these come under the control of the Forest Department. Proposed Reserve is an administrative rather than legal designation; boundary demarcation was originally planned but never took place as economic developments over the last 10 years led to much of the land from within such areas being released for use outside the forestry sector (IUCN/WCMC/FAO 1997). The legal status of these areas is now under review, but in practice Proposed Forest Reserves are now managed in much the same way as Forest Reserves.

Each site account contains:

- Summary information box;
- Map of the study area;
- Site descriptions including physical features and geography;
- Human activities in the vicinity of the forest site;
- Biological importance;
- Threats faced by the site;
- Preliminary inventories for birds, mammals, reptiles, amphibians and plants.

The preliminary inventories for plants at each site are very basic and are not close to a complete list. More complete floral surveys were carried out by NCR (IUCN/WCMC/FAO 1997). We include our plant lists only to give an idea of the type of vegetation in each area.

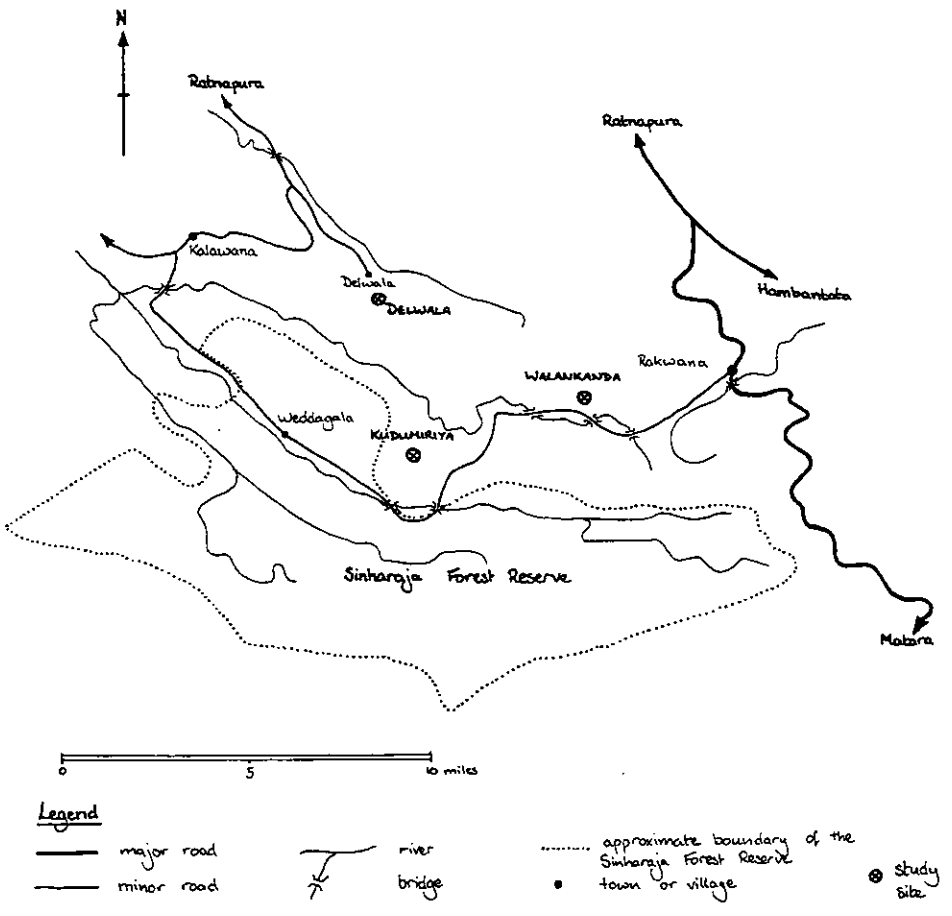


Figure 5 A map showing the position of Delwala PR, Walankanda FR and Kudumiriya PR

Delwala Proposed Reserve

Location:	Base camp 6° 31' N 80° 28' E Sub-camp 6° 30' N 80° 28' E
Altitude:	213 to 1,041 m. Surveys were carried out between 240 and 730 m. Base camp was in the forest ranger's building on the forest edge; a sub-camp was established at approximately 700 m.
Size:	1,589 ha designated as Proposed Reserve, of which 1,552 ha is forested.
Access:	Delwala is one and a half hours by bus from Ratnapura. The Forest Ranger's building (base camp) is 30 minutes walk up a forestry track from Delwala village. From here tracks lead into the forest.
Major habitat types:	Selectively logged and primary lowland wet rainforest. Dominant communities of *Dipterocarpus* and *Mesua-Shorea* complex (Wijesinghe *et al.* 1993).
Fieldwork dates:	7 July to 13 August 1997
Fieldwork hours:	570
Previous fieldwork:	National Conservation Review (1991-1996). These surveys concentrated on floristic diversity. The ornithological work was preliminary, recording only 21 species.
No. of bird species :	92 **EN:** 1 **VU:** 3 **NT:** 6 **Endemic:** 17
No. of mammal species:	16 **EN:** 2 **VU:** 3 **NT:** 2 **Endemic:** 3
Reptiles and amphibians:	21 **VU:** 1 **Endemic:** 8

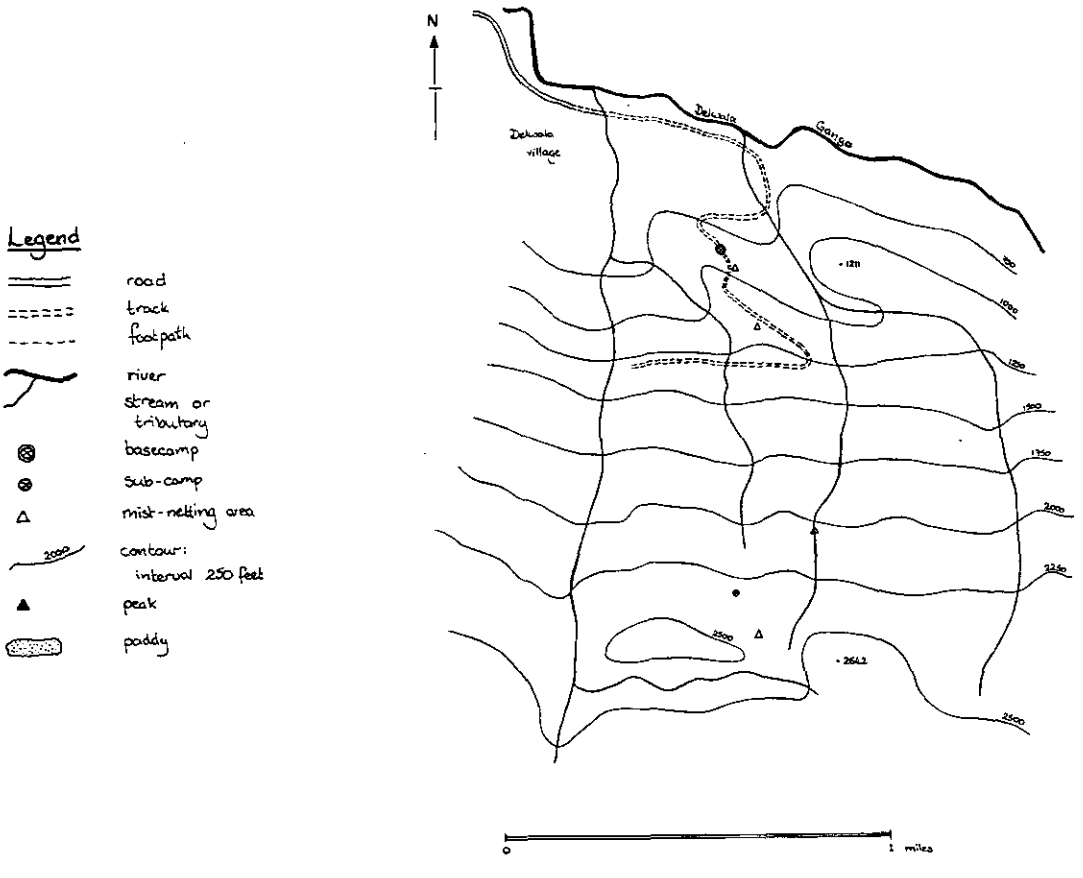


Figure 6 Map of Delwala Proposed Reserve

A total of 37 days were spent at Delwala forest. The forest currently has the status of 'Proposed Reserve' although it has been recommended for elevation to Conservation Forest. As a Conservation Forest it will be reserved entirely for conservation and research.

Site description

Physical features Delwala is located on the north-facing slope of an east-west ridge. It extends from about 200 m to the ridge top at 1,041 m. Surveys were only carried out up to a lower ridge at about 730 m. Average slope dip values are in the range 25-30°. Rivers running north downslope are separated by minor ridges and eventually drain into the Delwala Ganga.

Forest vegetation This is essentially a lowland hill Dipterocarp-dominated forest containing both selectively logged and primary habitat. Selective logging continued until the late 1980s and was concentrated at lower altitudes, close to human habitation. Many large trees have been removed, resulting in a lower, less continuous canopy than in primary forest (20-30 m height, 15-30% cover). The maximum dbh recorded in logged forest was 92 cm compared to 110 cm in primary forest. A distinct sub-canopy occurs at 15-20 m. In many areas, the understorey is quite dense with up to 50% cover at 3-5 m. Leaf litter coverage is variable, with thicker, more complete cover in the river valleys and sparse cover or bare earth on slopes.

Logging paths up to three metres wide provide access through logged forest into primary forest. In these canopy gaps, secondary regeneration has allowed species such as *Macaranga peltata, Osbeckia octandra, Clidemia hirta* etc. to become established. Narrow tracks lead higher into the primary forest up to an altitude of *c.*450 m.

In the primary forest, canopy trees reach heights of 30-35 m in most areas with a mean dbh of 41 cm (n=85). The canopy is dense with few emergents. Trees include families such as *Dipterocarpaceae* (e.g. *Dipterocarpus* and *Shorea* spp.) and *Sapotaceae* (e.g. *Palaquium* spp.). Many species are endemic and considered under some threat (Gunatilleke & Gunatilleke 1990a). The sub-canopy and shrub layers are less dense than those in selectively logged forest and occur at 18-25 m and 3-5 m respectively. The upper slopes are covered in rocks and boulders, some moss-covered. Epiphytes such as orchids and mosses are more prevalent than at lower altitude. Larger trees have well developed buttress roots. A swathe of bamboo (*Ochlandra* sp.) occurs from *c.*600 to 730 m.

Forest edge habitats The forest grades into secondary scrub that borders the tea plantations and 'home gardens' of the village. Much of this secondary scrub has regenerated after chena cultivation was discontinued in the area about 40 years ago (M. Wijesinghe verbally 1997). The maximum tree height reached is about 20 m, and the undergrowth is very dense. Typical pioneer tree and shrub species such as *Macaranga peltata, Gompia serata, Symplocus cochicinensis* and *Melostoma malabatilicum* are present. Tea, interspersed with the nitrogen-fixing legume *Giriuda maculata,* is grown on steep slopes with terracing to reduce erosion.

Human activity

Village economy The village of Delwala extends along the valley of Delwala Ganga. The village economy is based around small-scale tea plantations and paddy fields. Most families are self-sufficient to some extent with plants for domestic use being grown in 'home gardens' (Caron 1995). These include: Wild Breadfruit *Artocarpus nobilis,* Jack Fruit *Artocarpus heterophyllous,* Cashew Nut *Anacardium occidental,* Coconut *Cocos nucifera* and Banana *Musa acuminata.* Two large tea factories operate in the valley and employ a number of the villagers. Small-scale gem pit-mining occurs along the river valley.

Delwala school serves around 500 children between the ages of five and 18 from the village and surrounding hills.

Human use of the forest Although logging has been prohibited in wet zone forests since 1992, a small amount of illegal activity still takes place. A single case was reported to the Forest Ranger during our time at this site and was investigated by the Forest Department.

Traditional uses of the forest continue, such as collection of seeds and plants for medicinal or culinary uses. As mentioned in Gunatilleke *et al.* (1993), *Shorea* seeds (locally known as *beraliya*) are collected. The *Shorea* trees were masting during our work at this site, and we frequently met villagers in the forest collecting these seeds. Other plants collected include: Wild Cardamom *Ellettaria ensal*, Rattan *Callamus* spp. and the medicinal liana *Coscinium fenestratum*. Honey from wild bees is also collected and some trapping of Wild Boar *Sus scrofa* occurs on the forest edge.

Narrow trails lead into primary forest, over the ridge top to Walankanda; these were used until recently by villagers from the neighbouring valley bringing tea to the factories in Delwala.

Recently disused illegal gem pits were found in small streams near the ridge top.

Biological importance

Seventeen of Sri Lanka's 23 endemic bird species were recorded at Delwala. Of these, four are threatened and four near-threatened (Collar *et. al.* 1994). Two near-threatened species with a wider distributions were also encountered: Sri Lanka Frogmouth *Batrachostomus moniliger* and Spot-bellied Eagle Owl *Bubo nipalensis*. Five threatened mammal species were identified including the Endangered Asian Elephant *Elephas maximus*.

Threats

Despite good control of illegal logging by the Forestry Department, this practice persists. Villagers use the forest for traditional purposes as described above and some elderly people expressed concern that the collection of medicinal plants and other forest products is no longer being carried out at a sustainable level. Over-harvesting of forest products may prove a problem as the village population size increases and traditional, low impact methods of harvesting are forgotten. Trapping of some mammal species, such as the Giant Squirrel *Ratufa macroura melanochra*, does occur but is likely to have a limited impact on wild populations.

Preliminary biological inventories

Key
Vu Vulnerable
En Endangered
NT Near-threatened
* Endemic species
** Endemic genus
[1] CITES Appendix I species
[2] CITES Appendix II species
[3] CITES Appendix III species

Birds

*Galloperdix bicalcarata**
*Gallus lafayetii**
Dendrocopos nanus
Picus chlorolophus
Dinopium benghalense
Chrysocolaptes lucidus
Megalaima zeylanica
*Megalaima flavifrons**
Megalaima rubricapilla
*Ocyceros gingalensis**
Harpactes fasciatus
Alcedo atthis
Halcyon smyrnensis
Merops leschenaulti
Eudynamys scolopacea
Centropus sinensis
Centropus chlororhynchus[En]
*Loriculus beryllinus**
Psittacula eupatria
Psittacula krameri
Psittacula cyanocephala
*Psittacula calthropae**
Collocalia unicolor
Hirundapus giganteus
Cypsiurus balasiensis
Apus affinis
Hemiprocne coronata
Bubo nipalensis[NT]
*Glaucidium castanonotum**[NT]
Batrachostomus moniliger[NT]
*Columba torringtoni**[Vu]
Streptopelia chinensis
Chalcophaps indica
Treron pompadora
Ducula aenea
Amaurornis phoenicurus
Spilornis cheela
Accipiter badius
Ictinaetus malayensis
Spizaetus cirrhatus
Spizaetus nipalensis
Egretta garzetta
Mesophoyx intermedia
Ardeola grayii
Chloropsis cochinchinensis
Chloropsis aurifrons
*Urocissa ornata**[Vu]
Corvus splendens
Corvus macrorhynchos
Oriolus xanthornus
Coracina macei
Pericrocotus cinnamomeus
Pericrocotus flammeus
Hemipus picatus
Rhipidura aureola
Dicrurus caerulescens
Dicrurus paradiseus
Hypothymis azurea
Aegithina tiphia
*Zoothera spiloptera**[NT]
Cyornis tickelliae
Copsychus saularis
*Sturnus albofrontatus**[NT]
Acridotheres tristis
*Gracula ptilogenys**
Gracula religiosa
Sitta frontalis
Hirundo daurica
Pycnonotus melanicterus
Pycnonotus cafer
Pycnonotus luteolus
Iole indica
Hypsipetes leucocephalus
Prinia hodgsonii
Prinia inornata
*Zosterops ceylonensis**
Zosterops palpebrosus
Orthotomus sutorius

*Garrulax cinereifrons**Vu*
*Pellorneum fuscocapillum**
Pomatorhinus horsfieldii
Rhopocichla atriceps
*Turdoides rufescens**
Turdoides affinis
*Dicaeum vincens**NT*
Dicaeum erythrorynchos
Nectarinia zeylonica
Nectarinia lotenia
Passer domesticus
Lonchura striata
Lonchura kelaarti
Lonchura punctulata

Mammals

*Manis crassicaudata*NT*
Maderma spasma ceylonense
Rhinolaphus rouxi rouxi
*Loris tardigradus*Vu2*
*Macaca sinica**NT2*
*Trachypithecus vetulus**Vu*
*Paradoxurus zeylonensis**
Herpestes smithii
*Elephas maximus maximus*En1*
Sus scrofa
Cervus unicolor
*Ratufa macroura melanochra*Vu2*
Funambulus layardi
Funambulus sublineatus obscurus
Hystrix indica

Reptiles and amphibians

*Trimeresurus trigonocephalus**
Hypnale hypnale
*Balanophis ceylonensis***
Naja naja[3]
*Dendrelaphis caudolineolatus**
Ahaetulla nasutus
Ahaetulla pulverulentus.
Python molurus pimbura[2]
Rhinophis tricolourata
Calotes calotes
Calotes versicolour
*Lyriocephalus scutatus***
*Otocryptis wiegmanni**
*Ceratophora aspera***
*Varanus salvator*Vu2*
Mabuya carinata
Mabuya macularia
*Nessia bertoni***
Rana corrugata
Philautus spp
Nannophrys spp.** *(guntheri ?)*

Plants	
Dicotyledons Acanthaceae	*Strobilanthes* sp.
Anacardiaceae	*Anacardium occidentale* *Mangifera indica* *Semecarpus marginata*
Annonaceae	*Uvaria sphenocarpa* *Xylopia championii*
Anisophylleasea	*Anisophyllea cinnamomoides*
Apocyanaceae	*Alstonia macrophylla*
Araceae	*Pothos scandens*
Aristolochiaceae	*Apama siliquosa*
Bambusaceae	*Ochlandra stridula*
Burseraceae	*Canarium Zeylanicum*
Clusiaceae	*Calophyllum bracteatum* *Calophyllum moonii* *Garcinia hermonii*
Dilleniaceae	*Schumacheria castaneifolia*
Dipterocarpaceae	*Dipterocarpus zeylanicus* *Hopea jucunda* *Shorea affinis* *Shorea congestiflora* *Shorea disticha* *Shorea dyeri* *Stemonoporus canaliculatus* *Vateria copallifera*
Ebenaceae	*Diospyros* sp.
Elaeocarpaceae	*Elaeocarpus serratus*
Euphorbiaceae	*Agrostistachys* sp. *Agrostistachys coriacea* *Aporosa lanceolata* *Bridelia moonii* *Chaetocarpus castanocarpus* *Cleistanthus pallidus* *Glochidion* sp. *Macaranga peltata* *Putranjiva zeylanica*
Flacourtiaceae	*Hydnocarpus octandra* *Trichadenia zeylanica*
Lauraceae	*Cinnamomum dubium* *Cryptocarya wightiana* *Litsea gardneri*
Loganaceae	*Fragraea ceilanica* *Gaertnera* sp. *Gaertnera rosea* *Gaertnera vaginans*
Melastomataceae	*Clidemia hirta*
	Melastoma sp. *Melastoma malabathiricum* *Memecylon* sp. *Lijndenia gardneri* *Memecylon rostratum* *Memcylon wightii* *Osbeckia octandra*
Meliaceae	*Swietenia mahogani*
Menispermaceae	*Coscinium fenestratum*
Moraceae	*Artocarpus heterophyllus* *Artocarpus nobilis* *Ficus diversiformis*
Myristicaceae	*Myristica dactyloides*
Myrtaceae	*Syzygium makul* *Syzygium caryophyllatum* *Syzygium firmum* *Syzygium makul* *Syzygium micranthum* *Syzygium neesianum* *Syzygium rubicundum*
Ochnaceae	*Gomphia serrata*
Papilionoideae (subfamily of Leguminosae)	*Dalbergia* spp. *Dalbergia pseudo-sissoo*
Rubiaceae	*Brysophyllum ellipticum* *Lasianthus obliquus* *Mussaenda frondosa* *Nargedia macrocarpa* *Psychotria* sp. *Psychotria dubia* *Wendlandia bicuspidata*
Rutaceae	*Acronychia pedunculata* *Luvunga* sp.
Sapindaceae	*Allophyllus cobbe*
Sapotaceae	*Palaquium* sp. *Palaquium grande* *Palaquium petiolare*
Symplocaceae	*Symplocos cochinchinensis*
Ulmaceae	*Trema orientale*
Verbenaceae	*Vitex altissima*
Vitaceae	*Cissus acuminata*
Monocotyledons Palmae	*Calamus digitatus* *Calamus zeylanicus*
Pandanaceae	*Pandanus* sp.

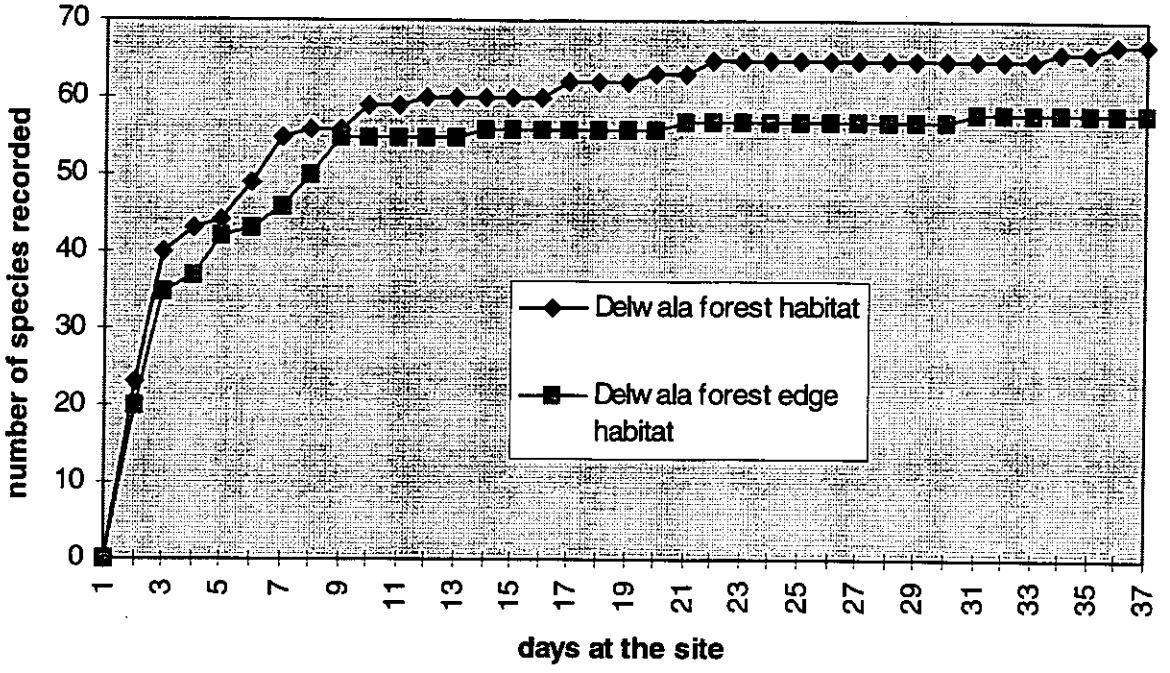
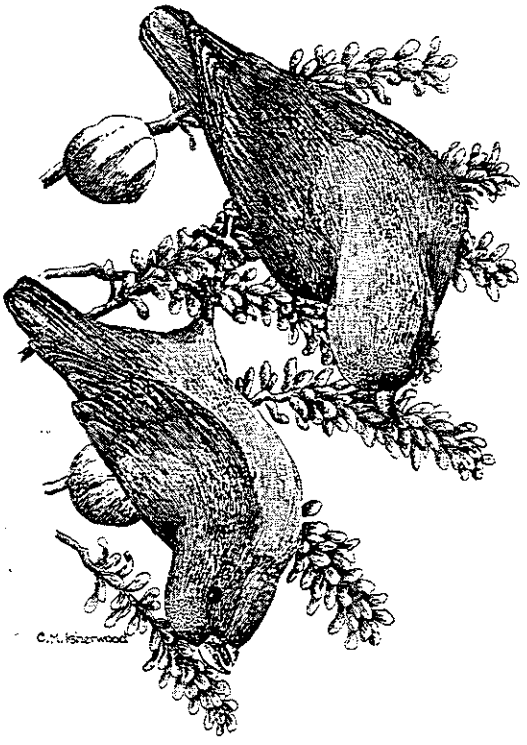


Figure 7 Bird species discovery curve for Delwala

Thirty seven days were spent at Delwala. As shown in Figure 7, the species discovery curve for the forest habitat flattens off reasonably quickly with only two species being discovered after day 22 at the site. This indicates that the species inventory is reasonably complete. Less field effort was invested in edge habitat surveys and this inventory is likely to be less complete.



Sri Lanka Hanging Parrot
Loriculus beryllinus

Walankanda Forest Reserve

Location:	House: 6° 27' N 80° 32' E Camp: 6° 28' N 80° 32' E
Altitude:	425-1,245 m. Surveys were carried out between 425 m and 1,160 m.
Size:	1,010 ha designated as a Forest Reserve, of which 988 ha is forested.
Access:	Kajugaswatte village is easily reached by bus from Rakwana. From here to the edge of the forest is 30 minutes walk.
Major habitat types:	Selectively logged and primary lowland wet rainforest. Dominant communities are *Dipterocarpus* and *Mesua-Shorea* (Wijesinghe *et al.* 1993). A small patch of cloud forest is found at the top of the ridge.
Fieldwork dates:	19 August to 3 September 1997.
Fieldwork hours:	178
Previous fieldwork:	National Conservation Review (1991 to 1996). These surveys concentrated on floristic diversity; the ornithological work was preliminary, recording only 23.
No. of bird species:	92 **EN:** 1 **VU:** 4 **NT:** 5 **Endemic:** 19
No. of mammal species:	11 **EN:** 2 **VU:** 2 **NT:** 3 **Endemic:** 3
Reptiles & amphibians:	14 **Endemic:** 4

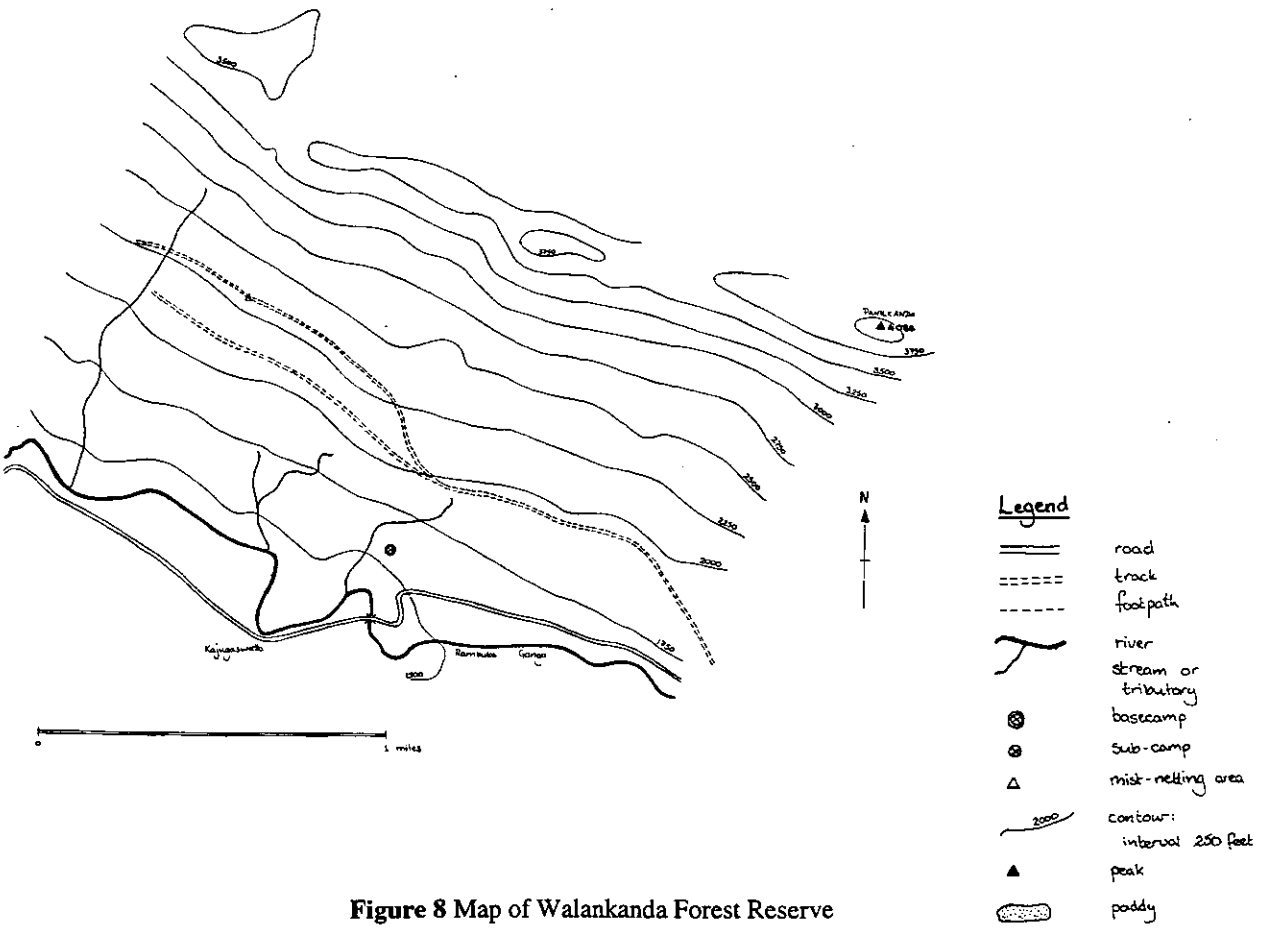


Figure 8 Map of Walankanda Forest Reserve

Fifteen days were spent in Walankanda. This forest is contiguous with Delwala and is located on the south-facing side of the same east-west ridge.

Site description

Physical features South-facing slopes dip at approximately 20°. Two large logging roads cut through the forest at about 500 m altitude, running parallel to the ridge top. Three main rivers run through the study sites, draining eventually into the Ramubka and Koswatta Gangas.

Forest vegetation Two distinct forest types are present in Walankanda; lowland hill Dipterocarp-dominated forest, with a small patch of cloud forest occurring above 900 m. The lower altitude forest has a similar composition to that at Delwala. Much of this has been subject to logging and mahogany planting. Primary forest only occurs above 500 m. Canopy tree heights are in the range 25-30 m and mean dbh is 52 cm (n=21). In many areas the shrub layer is dominated by dense bamboo *Ochlandra stridula*, broken only by large boulders and elephant tracks.

The transition to cloud forest is characterised by Dipterocarp dominance giving way to genera such as *Calophyllum*, *Cinnamomum*, *Litsea*, *Syzygium*, *Symplocus* and *Elaeocarpus*. *Stemanoporus canaliculatus* and *Canthium dicoccum* were also recorded. Cloud forest occurs at a lower altitude than that proposed by Werner & Balasubramaniam (1992), perhaps because of local climatic factors, such as lower cloud cover due to topography. Canopy height is lower than in the lowland forest (10 to 15 m) and dbh less (21 cm, n=10). *Strobilanthus* spp. are common in the understorey, along with bamboos (*Ochlandra* sp.). The cloud forest is rich in lianas (including *Dalbergia pseudosissoo* and *Smilax zeylanica)*, parasitic flowers, ground and epiphytic orchids, ferns and mosses. Several endemic orchids were identified including *Aneoctochtlus scetacius, Eryea lindly* and *Dendrobium* spp.

Forest edge habitats There is a patchy transition between selectively logged forest and cultivated land. *Citronella* grass interplanted with *Eucalyptus* is grown closest to the forest. Tea and cinnamon fields occur nearer to the village.

Human activity

Village economy Kajugaswatte village lies on the main road from Potupitiya to Rakwana. The agricultural land of the villagers reaches up to the boundary with Walankanda Forest Reserve. The village economy is similar to that of Delwala, being based on small-scale tea, cinnamon and paddy cultivation. Gem pit-mining occurs along the river valley on the road to Rakwana. A school serves around 400 children (aged five to 18) from the surrounding areas.

Human use of the forest Before the ban on logging, mahogany planting and harvesting took place in the forest. This has been discontinued but a number of mahogany stands remain. Plank sawing structures and abandoned sawn logs provided evidence of recent illegal logging activity. This had been dealt with by the local branch of the Forest Department in early 1997.

Local people collect plant items as at Delwala; the collection of bamboo scrapings for making gem sieves was particularly evident. A stream near the ridge top had a number of disused gem pits close to a muddy stream.

Biological importance

A total of 19 restricted-range bird species were recorded here including five threatened and four near-threatened species. The widespread, near-threatened Spot-bellied Eagle Owl *Bupo nipalensis* was heard and two Vulnerable Red-faced Malkohas *Phaenicophaeus pyrrhocephalus* were recorded. Four threatened mammal species were identified including Leopard *Panthera pardus* and Asian Elephant *Elephas maximus*, both considered Endangered. Elephants appear to use the contiguous forest between Delwala and Walankanda, moving between the two sides of the ridge. Paw prints and scats of the near-threatened Fishing Cat *Prionailurus viverrinus* were seen. This is the only site where evidence of this species was found.

Threats

Illegal logging has clearly occurred recently in this area, evidenced by the presence of numerous plank sawing structures in the forest. We were told, however, that it had been investigated by the Forest Department some months before our arrival and that the loggers had been prosecuted. The forest is rather fragmented close to the village, without a buffer zone of scrub vegetation between village and forest (as at Delwala). Trapping and hunting are not major problems, although the eggs of terrestrial birds (e.g. Sri Lanka Junglefowl *Gallus lafayetii*) are occasionally eaten. Conflict occurs between villagers and elephants on occasions when the latter forage outside the forest. This can be taken as indication that the remaining forest may be too small to support the local elephant population (Mackinnon & Mackinnon 1986). Deterrents used by the villagers, such as fire crackers, are not designed to cause actual harm to the elephants but simply to scare the animals back towards the forest.

Preliminary biological inventory

Key

Vu Vulnerable
En Endangered
NT Near-threatened
* Endemic species
** Endemic genus
[1] CITES Appendix I species
[2] CITES Appendix II species
[3] CITES Appendix III species

Birds

*Galloperdix bicalcarata**
*Gallus lafayetii**
Picus chlorolophus
Dinopium benghalense
Chrysocolaptes lucidus
Megalaima zeylanica
*Megalaima flavifrons**
Megalaima rubricapilla
*Ocyceros gingalensis**
Harpactes fasciatus
Halcyon smyrnensis
*Phaenicophaeus pyrrhocephalus**Vu
Centropus sinensis
*Centropus chlororhynchus**En
*Loriculus beryllinus**
Psittacula eupatria
Psittacula krameri
Psittacula cyanocephala
*Psittacula calthropae**
Collocalia unicolor
Hirundapus giganteus
Cypsiurus balasiensis
Hemiprocne coronata
*Bubo nipalensis*NT
*Glaucidium castanonotum**NT
*Columba torringtoni**Vu
Streptopelia chinensis
Chalcophaps indica
Treron pompadora
Ducula aenea
Amaurornis phoenicurus
Elanus caeruleus
Spilornis cheela
Accipiter badius
Ictinaetus malayensis
Spizaetus cirrhatus
Spizaetus nipalensis
Falco tinnunculus
Ardeola grayii
Chloropsis cochinchinensis
Chloropsis aurifrons
*Urocissa ornata**Vu
Corvus macrorhynchos
Oriolus xanthornus
Pericrocotus cinnamomeus
Pericrocotus flammeus
Hemipus picatus
Dicrurus caerulescens
Dicrurus paradiseus
Hypothymis azurea
Aegithina tiphia
*Zoothera spiloptera**NT
Zoothera dauma
Cyornis tickelliae
Culicicapa ceylonensis
Copsychus saularis
Saxicoloides fulicata
*Sturnus albofrontatus**NT
Acridotheres tristis
*Gracula ptilogenys**
Gracula religiosa
Sitta frontalis
Hirundo rustica
Hirundo tahitica
Hirundo daurica
Pycnonotus melanicterus
Pycnonotus cafer
Pycnonotus luteolus
Iole indica
Hypsipetes leucocephalus
Cisticola juncidis
Prinia sylvatica
Prinia socialis
Prinia inornata
*Zosterops ceylonensis**
Zosterops palpebrosus
Orthotomus sutorius
*Garrulax cinereifrons**Vu
*Pellorneum fuscocapillum**
Pomatorhinus horsfieldii
Dumetia hyperythra
Rhopocichla atriceps
*Turdoides rufescens**
Turdoides affinis
*Dicaeum vincens**NT
Dicaeum erythrorynchos
Nectarinia zeylonica
Nectarinia lotenia
Motacilla cinerea
Lonchura striata
Lonchura kelaarti
Lonchura punctulata

Mammals

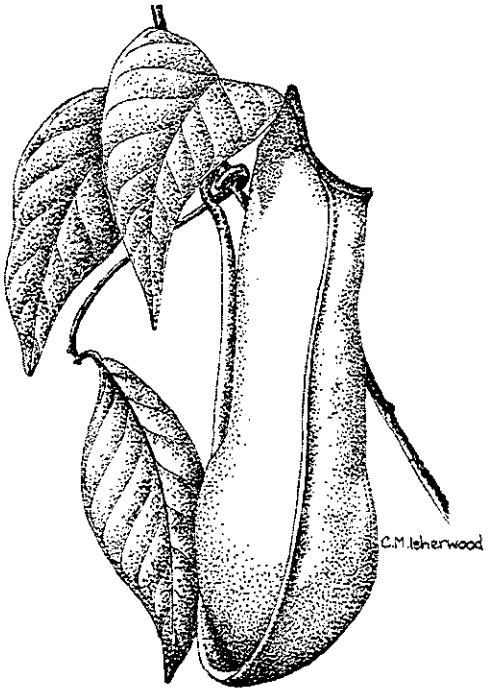
*Manis crassicaudata*NT
*Macaca sinica**NT2
*Trachypithecus vetulus**Vu
*Prionailurus viverrinus**NT
*Panthera pardus*En1
*Elephas maximus maximus*En1
Sus scrofa
Cervus unicolor
*Ratufa macroura melanochra*Vu2
Funambulus layardi
Funambulus sublineatus obscurus

Reptiles and amphibians

*Trimeresurus trigonocephala**
Hypnale hypnale
Naja naja[3]
Ahaetulla nasutus
Ahaetulla pulverulentus.
Calotes calotes
Calotes versicolour
*Lyriocephalus scutatus***
*Otocryptis wiegmanni**
Mabya carinata
Mabuya macularia
*Nessia bertoni***
Rana corrugata
Philautus spp.

Plants	
Dicotyledons	
Acanthaceae	*Strobilanthes* sp.
Anacardiaceae	*Campnosperma zeylanicum* *Mangifera zeylanica* *Semecarpus moonii*
Anisophylleasea	*Anisophyllea cinnamomoides*
Aquifoliaceae	*Ilex zeylanica*
Araceae	*Pothos scandens*
Bambusaceae	*Ochlandra stridula* *Oxytenanthera monadelpha*
Bombacaceae	*Cullenia ceylanica* *Cullenia rosayroana*
Clusiaceae	*Calophyllum bracteatum* *Calophyllum moonii* *Garcinia hermonii* *Mesua ferrea*
Dilleniaceae	*Dillenia* sp. *Schumacheria castaneifolia*
Dipterocarpaceae	*Dipterocarpus hispidus* *Dipterocarpus zeylanicus* *Hopea jucunda* *Shorea dyeri* *Shorea trapezifolia*
Ebenaceae	*Diospyros insignis*
Euphorbiaceae	*Agrostistachys coriacea* *Bridelia moonii* *Chaetocarpus castanocarpus* *Cleistanthus pallidus* *Glochidion* sp. *Macaranga peltata*
Flacourtiaceae	*Scolopia acuminata* *Trichadenia zeylanica*
Loganaceae	*Gaertnera vaginans*
Lauraceae	*Cryptocarya wightiana* *Litsea gardneri* *Litsea longifolia*
Liliaceae	*Dracaena* sp. *Dracaena thwaitesii*
Melastomataceae	*Clidemia hirta* *Melastoma malabathiricum* *Memecylon* sp. *Osbeckia octandra*
Meliaceae	*Swietenia* sp.
Menispermaceae	*Coscinium fenestratum*
Moraceae	*Artocarpus nobilis* *Ficus* sp.
Myristicaceae	*Myristica dactyloides*
Myrtaceae	*Syzygium* sp. *Syzygium makul* *Syzygium rubicundum*
Papilionoideae (subfamily of Leguminosae)	*Dalbergia spp.* *Dalbergia pseudo-sissoo*
Rhizophoraceae	*Carallia brachiata*
Rubiaceae	*Ixora jucunda* *Lasianthus* sp. *Mussaenda frondosa* *Nargedia macrocarpa* *Psychotria dubia* *Wendlandia bicuspidata*
Rutaceae	*Luvunga angustifolia* *Toddalia spp.*
Sapindaceae	*Filicium decipiens*
Sapotaceae	*Palaquium grande* *Palaquium petiolare*
Symplocaceae	*Symplocos spp.*
Tiliaceae	*Grewia* sp.
Verbenaceae	*Clerodendrum infortunatum* *Vitex altissima*

Monocotyledons	
Palmae	*Calamus ovoideus* *Calamus thwaitesii*
Pandanaceae	*Pandanus thwaitesii*
Smilacaceae	*Smilax zeylanica*



Pitcher plant
Nepenthes sp.

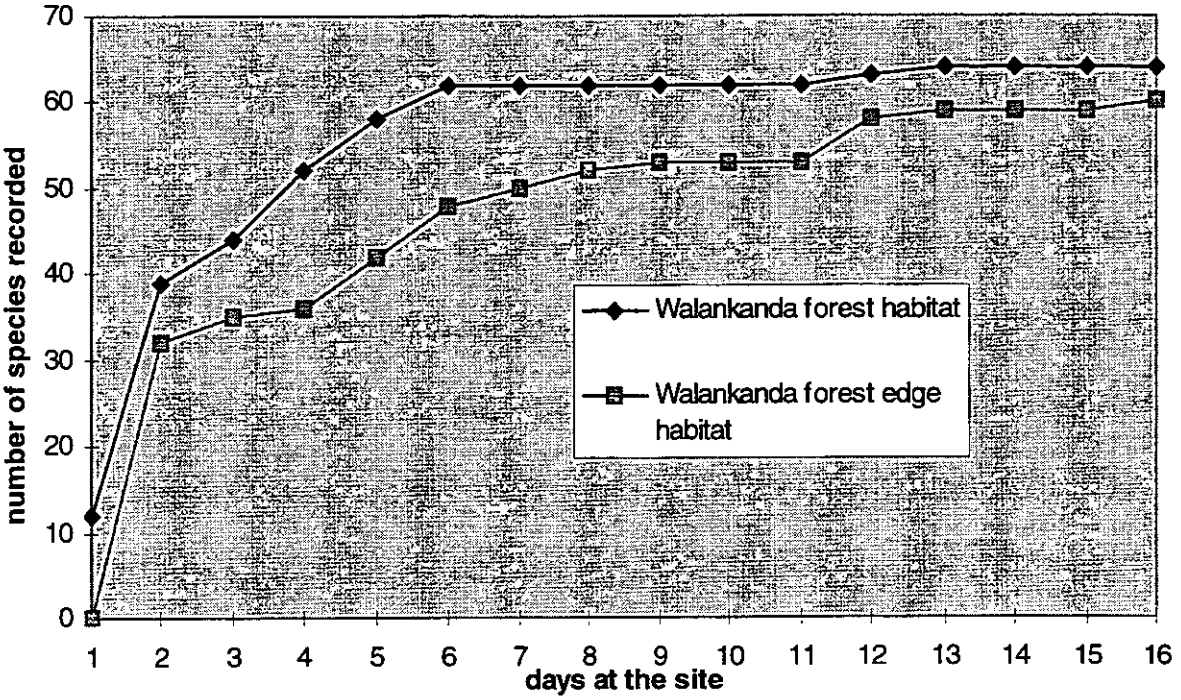
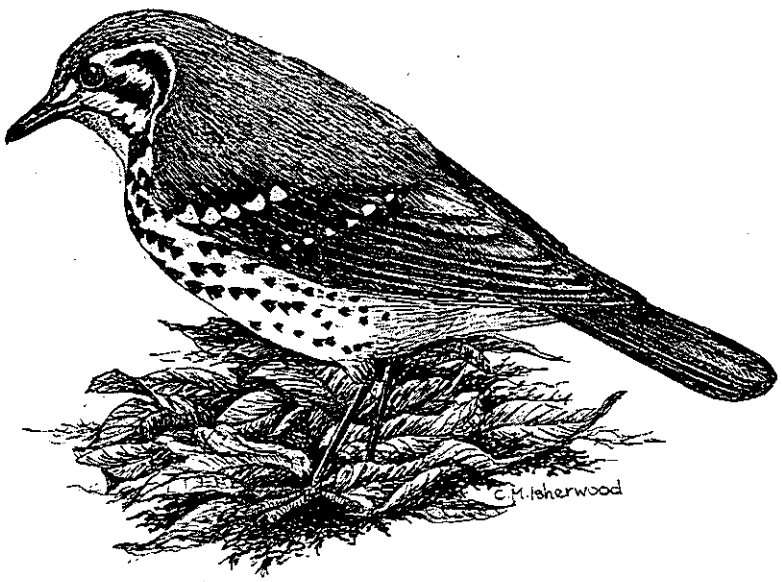


Figure 9 Bird species discovery curve for Walankanda

Fourteen days were spent at Walankanda. The species discovery curve (Figure 9) for forest habitat flattens off around day six, with another slight increase from days 11 to 14. The latter corresponds with intensive netting which turned up a number of species (e.g. White-rumped Munia *Lonchura striata* and Black-throated Munia *Lonchura kelaartii*) not encountered during other fieldwork. Despite less time being spent at this site, it is felt that the bird species inventory is probably as complete as that obtained for Delwala.



Spot-winged Thrush
Zoothera spiloptera

Kudumiriya Proposed Reserve

Location:	House: 6° 27' N 80° 27' E Camp: 6° 27' N 80° 27' E
Altitude:	365-835 m. Surveys were carried out from 365 to 760 m.
Size:	2,161 ha designated as Proposed Reserve, of which 1,936 ha is forested.
Access:	Kotanakanda village is a one hour walk from the bus stop at Weddagala junction. The edge of the forest is a one hour walk along small paths from the village.
Major habitat types:	Selectively logged and primary lowland wet rainforest. Dominant communities are *Dipterocarpus* and *Mesua-Shorea* (Wijesinghe *et al.* 1993).
Fieldwork dates:	4 September to 13 September 1997
Fieldwork hours:	182
Previous fieldwork:	National Conservation Review (1991-1996). These surveys concentrated on floristic diversity; the ornithological work was preliminary, recording only 27 species.
No. of bird species:	78 **EN:** 1 **VU:** 4 **NT:** 5 **Endemic:** 19
No. of mammal species:	9 **EN:** 1 **VU:** 3 **NT:** 2 **Endemic:** 2
Reptiles & amphibians:	13 **Endemic:** 4

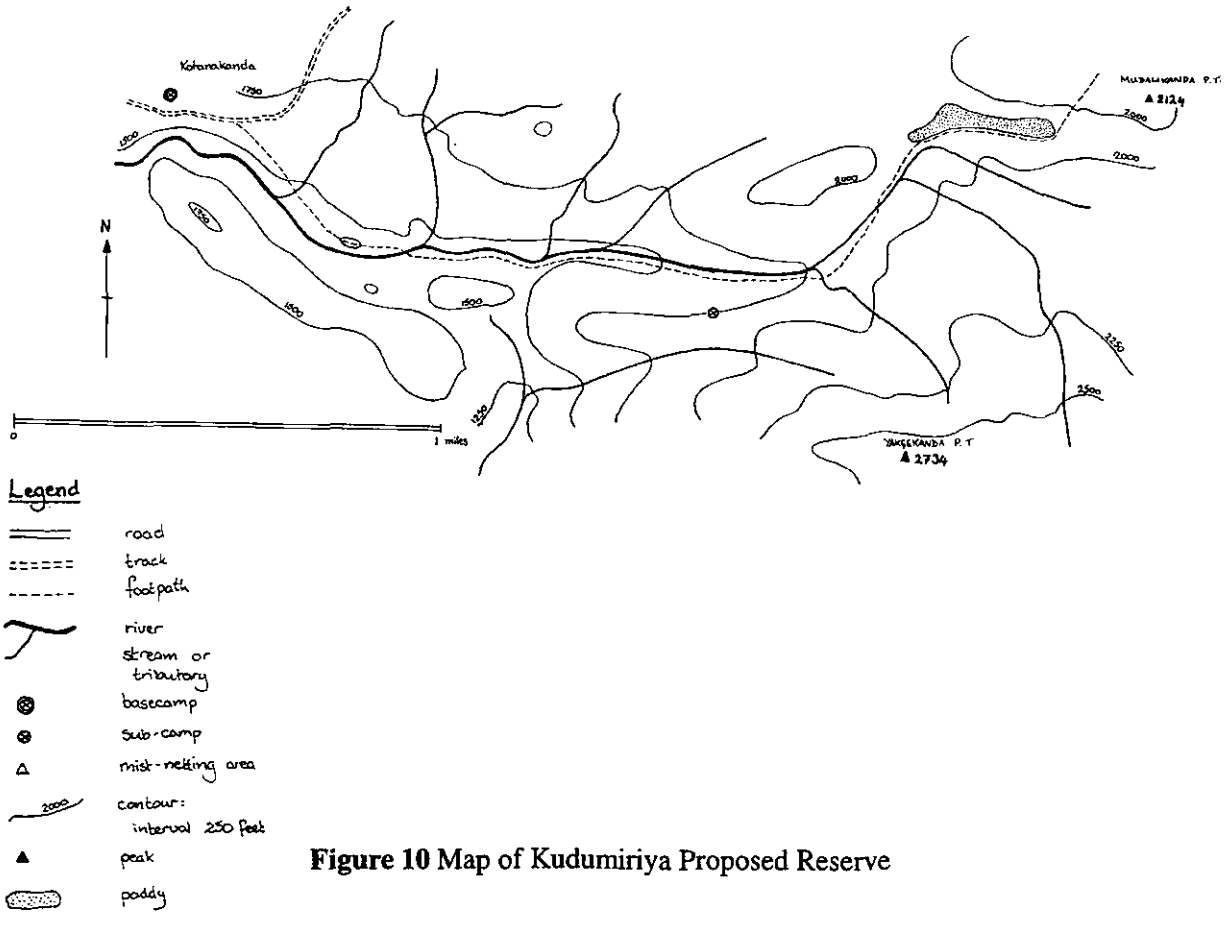


Figure 10 Map of Kudumiriya Proposed Reserve

Ten days were spent in Kudumiriya Proposed Reserve. The team was based in a house in the village of Kotanakanda but a permanent camp was established within the Proposed Reserve.

Site description

Physical features The study area encompassed a number of small hills and valleys, the highest point being Yakgahekanda at 835 m. A large river runs east-west through the forest and drains into Delgoda Ganga.

Forest vegetation This area consists primarily of lowland hill Dipterocarp dominated forest, as at the other two sites. However, due to recent and extensive chena cultivation, the forest is a patchwork of primary forest interspersed with regenerating chena of varying ages.

Primary forest is mostly found higher up the ridges, further from habitation. The structure and species composition is similar to the low altitude forest at the other two sites. Some areas, possibly due to lower fertility, have a very different structure. Trees are of lower stature (maximum 25 m) and trunks noticeably thinner (mean dbh=28 cm; n=10). The understorey consists almost exclusively of *Agrostistachys hookerii* and ground cover is minimal.

Disused chena plots, most likely to be over 20 years old (M. Wijesinghe verbally 1997), are concentrated nearer to the village but some are scattered throughout the forest. Typically chena plots are approximately 50 x 100 m in size. Regenerating patches contain many pioneer species (e.g. *Macaranga peltata*) with a dense understorey of thorny scrub, bamboo and grasses. Older patches contain some rainforest tree species such as *Callophyllum* spp. All canopy trees in a chena plot are felled, apart from trees with domestic use such as Kittul Palm *Caryota urens*. One recently abandoned home garden was found quite deep in an area of primary forest and contained Kittul as well as Wild Breadfruit *Artocarpus nobilis*, Jack *Artocarpus heterphyllous* and Coconut *Cocos nucifera* trees.

Forest edge It is impossible to define a precise edge to the forest at Kudumiriya. The area is best described as a patchwork of forest, agricultural land and scrub. A *Pinus* plantation adjoins the forest along one side.

Even close to the village, patches of forest remain but these are small and highly disturbed. They are interspersed with cleared land, tea plantations and paddy fields.

Human activity

Village economy The village of Kotanakanda is a diffuse arrangement of houses and home gardens interspersed between paddy and tea fields. A well used path through the forest connects with a neighbouring village. There are two small shops and a primary school.

Human use of the forest More evidence of illegal logging activity was observed here than at the other two sites. Recently constructed plank sawing structures were found throughout the forest, each near to the stumps of two or three large canopy trees. Logging is for timber rather than clearance for agriculture. Trap-guns are used in the dense undergrowth of the disused chena patches, probably primarily for Wild Boar *Sus scrofa*. Illegal gem pits were found along small streams in the forest but appeared to be abandoned.

Biological importance

Eighteen restricted-range bird species were recorded from this site, five of which are threatened and four near-threatened. The Green-billed Coucal *Centropus chlororhynchus*, considered Endangered (Collar *et al.* 1994), was found here in much higher numbers than at the other two sites. It appeared to be using the abandoned chena patches amidst the primary rainforest. The Spot-bellied Eagle Owl *Bubo nipalensis*, a widespread near-threatened species, was also heard.

Four threatened species of mammal, including the threatened Leopard *Panthera pardus*, were recorded at this site.

Threats

Illegal logging appears to be more active at this site than at the others. Despite these

operations being small-scale, with only a few trees being removed at a time, continuation of logging at its current level may seriously damage the remaining primary forest. Well-used tracks are found throughout much of the forest. These, as well as the area's low altitude and easy terrain, mean that most areas are easily accessible to loggers and trappers. Further encroachment into the forest may have serious consequences on the Leopard *Panthera pardus*, with its need for a large home range (Eisenberg & Lockhart 1972). Villagers note that Leopards frequently enter the gardens of some of the village houses. This may be a new phenomenon that is caused by diminishing natural habitat for the species.

Preliminary biological inventory

Key

Vu Vulnerable
En Endangered
NT Near-threatened
* Endemic species
** Endemic genus
1 CITES Appendix I species
2 CITES Appendix II species
3 CITES Appendix III species

Birds

*Galloperdix bicalcarata**
*Gallus lafayetii**
Picus chlorolophus
Dinopium benghalense
Chrysocolaptes lucidus
Megalaima zeylanica
*Megalaima flavifrons**
Megalaima rubricapilla
*Ocyceros gingalensis**
Harpactes fasciatus
Halcyon smyrnensis
*Phaenicophaeus pyrrhocephalus**Vu
Centropus sinensis
*Centropus chlororhynchus**En
*Loriculus beryllinus**
Psittacula cyanocephala
*Psittacula calthropae**
Collocalia unicolor
Hirundapus giganteus
Cypsiurus balasiensis
Apus affinis
Hemiprocne coronata
Otus bakkamoena
Bubo nipalensis NT
*Glaucidium castanonotum**NT
Ninox scutulata
*Columba torringtoni**Vu
Streptopelia chinensis
Chalcophaps indica
Treron pompadora
Ducula aenea
Amaurornis phoenicurus
Pernis ptilorhynchus
Spilornis cheela
Ictinaetus malayensis
Spizaetus cirrhatus
Chloropsis aurifrons
*Urocissa ornata**Vu
Corvus macrorhynchos
Oriolus xanthornus
Pericrocotus cinnamomeus
Pericrocotus flammeus
Hemipus picatus
Dicrurus caerulescens
Dicrurus paradiseus
Hypothymis azurea
Aegithina tiphia
*Zoothera spiloptera**NT
Cyornis tickelliae
Copsychus saularis
*Sturnus albofrontatus**NT
Acridotheres tristis
*Gracula ptilogenys**
Sitta frontalis
Parus major
Hirundo daurica
Pycnonotus melanicterus
Pycnonotus cafer
Pycnonotus luteolus
Iole indica
Hypsipetes leucocephalus
*Zosterops ceylonensis**
Orthotomus sutorius
*Garrulax cinereifrons**Vu
*Pellorneum fuscocapillum**
Pomatorhinus horsfieldii
Rhopocichla atriceps
*Turdoides rufescens**
Turdoides affinis
Dicaeum agile
*Dicaeum vincens**NT
Dicaeum erythrorynchos
Nectarinia zeylonica
Nectarinia lotenia
Passer domesticus
Lonchura striata
Lonchura kelaarti
Lonchura punctulata

Mammals

*Manis crassicaudata*NT
*Loris tardigradus*Vu2
*Macaca sinica**NT2
*Trachypithecus vetulus**Vu
*Panthera pardus*En1
Sus scrofa
Ratufa macroura melanochra Vu2
Funambulus layardi
Funambulus sublineatus obscurus

Reptiles and amphibians

*Trimeresurus trigonocephala**
Hypnale hypnale
Ahaetulla nasutus
Ahaetulla pulverulentus.
Calotes calotes
Calotes versicolour
*Lyriocephalus scutatus***
*Otocryptis wiegmanni**
Mabya carinata
Mabuya macularia
*Nessia bertoni***
Rana corrugata
Philautus spp.

Plants	
Dicotyledons	
Anacardiaceae	*Mangifera indica*
	Semecarpus marginata
Anisophylleasea	*Anisophyllea cinnamomoides*
Apocyanaceae	*Alstonia macrophylla*
Bambusaceae	*Ochlandra stridula*
Clusiaceae	*Calophyllum bracteatum*
	Garcinia spicata
Compositae	*Vernonia zeylanica*
Convolvulaceae	*Erycibe paniculata*
Dilleniaceae	*Schumacheria castaneifolia*
Dipterocarpaceae	*Dipterocarpus hispidus*
	Dipterocarpus zeylanicus
	Shorea affinis
	Shorea congestiflora
	Shorea trapezifolia
	Stemonoporus sp.
Ebenaceae	*Diospyros* sp.
Elaeocarpaceae	*Elaeocarpus subvillosus*
Euphorbiaceae	*Agrostistachys hookerii*
	Chaetocarpus castanocarpus
	Macaranga peltata
Fabaceae	*Humboldtia laurifolia*
Flacourtiaceae	*Scolopia acuminata*
	Trichadenia zeylanica
Lauraceae	*Cryptocarya* sp.
	Cryptocarya wightiana
	Litsea gardneri
Melastomataceae	*Axinandra zeylanica*
	Clidemia hirta
	Melastoma malabathiricum
	Osbeckia octandra
Mimosaceae	*Entada* sp.
Moraceae	*Artocarpus heterophyllus*
	Artocarpus nobilis
Myristicaceae	*Horsfieldia irya*
	Myristica dactyloides
Myrtaceae	*Syzygium makul*
	Syzygium rubicundum
Ochnaceae	*Gomphia serrata*
Papilionoideae (subfamily of Leguminosae)	*Dalbergia* spp.
	Dalbergia pseudo-sissoo
Rosaceae	*Prunus walkeri*
Rubiaceae	*Brysophyllum ellipticum*
	Canthium dicoccum
	Ixora jucunda
	Mussaenda frondosa
	Psychotria dubia
Rutaceae	*Toddalia* spp.
Sapotaceae	*Isonandra zeylanica*
	Palaquium petiolare
Symplocaceae	*Symplocos cochinchinensis*
Thymelaeaceae	*Gyrinops walla*
Verbenaceae	*Clerodendrum infortunatum*
Vitaceae	*Cissus vitiginea*
Monocotyledons	
Palmae	*Calamus ovoideus*
	Calamus radiatus

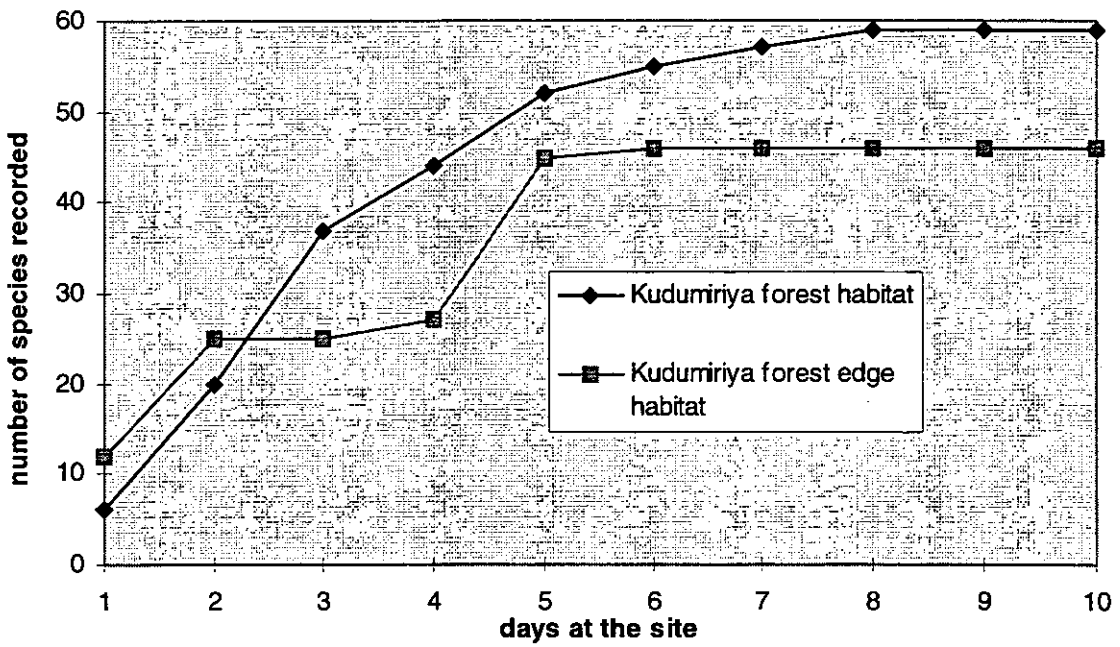


Figure 11 Bird species discovery curve for Kudumiriya

Despite the fact that the species discovery curves (figure 11) appear to level off, we feel this site was not sufficiently surveyed. Just 10 days were spent at this site and only 59 bird species were recorded in forest habitat.

Biological Surveys

BIRDS

We recorded a total of 110 bird species, including 19 of Sri Lanka's 23 restricted-range species, five threatened and six near-threatened species. An annotated checklist of all bird species recorded during fieldwork is given in Appendix III. The following accounts provide more detailed information on threatened, near-threatened and restricted-range species.

GREEN-BILLED COUCAL
Centropus chlororhynchus[2]

Status and distribution
Endangered (Collar *et al.* 1994). Endemic to Sri Lanka. Restricted to low country wet zone and strongly associated with undisturbed habitat (Kotagama & Fernando 1994).

Project records
Rare at Delwala and Walankanda. One individual was seen and two were heard at Delwala (almost certainly at least two different individuals). At Walankanda one was seen, calls were heard and a single individual was netted. It is possible that all records at this site referred to the same bird or pair of birds. At Kudumiriya the species was more frequently encountered; records at this site probably refer to more than 10 individuals.

Observations and ecology
At Delwala, all three encounters were in undisturbed forest with thick bamboo (*Ochlandra* sp.) understorey at *c.*700 m. At Walankanda, an individual was seen at an altitude of about 500 m in selectively logged forest. It was flying at about 15 m (top of the shrub layer) and may have been following a mixed-species flock. Close to this point, also in selectively logged forest, an individual was trapped in the bottom panel of a mist-net. At Kudumiriya, Green-billed Coucals appeared more common than at the other two sites. The habitat was very different, consisting of abandoned chena cultivation interspersed with areas of primary forest (see site descriptions). Coucals were often heard in abandoned chena, mostly early in the morning and particularly after rain.

Wijesinghe (in prep) provides new and important ecological information on this species including the first full nest description and detailed notes on feeding and behaviour during the nesting period.

Conclusions
The Green-billed Coucal was uncommon or rare at the three sites, which all contained areas of relatively undisturbed, lowland tropical forest, described by many authors as the species' preferred habitat (Henry 1955, Kotagama & Fernando 1994, Legge 1880). This indicates that the species is very rare and deserves its status as Endangered.

The main threat faced by the species is habitat destruction. It appears very sensitive to human disturbance, being found generally far from human habitation. Although at Kudumiriya Green-billed Coucals were using areas of abandoned chena, these disturbed patches were far from current human habitation, had been long disused and were surrounded by primary forest.

The species' tendency not to fly long distances (Henry 1955; pers. obs.) and its strong reliance on primary habitat restrict its ability to disperse. It may therefore be particularly susceptible to genetic isolation as forest fragmentation increases.

The Green-billed Coucal is the subject of an 18-month research project to be carried out in 1998/1999 by Deepal Warakagoda, Upali Ekanayake and Kithsiri Gunawardena (Anon 1997). They plan to work in many forest patches inside and outside the species' known range, to help determine the precise status and distribution of this poorly known bird.

[2] Originally spelt *Chlororhynchos* (Blyth 1849); we follow the currant spelling, *Chlorohynchus*, used by Blyth (1867).

RED-FACED MALKOHA
Phaenicophaeus pyrrhocephalus

Status and distribution
Vulnerable (Collar *et al.* 1994). Hoffmann (1998) considers it Endangered. A number of sightings have been recorded from the South Indian states of Kerala and Tamil Nadu (Biddulph 1956). However, since no specimen has been obtained and no recent sightings or confirmed breeding records exist for India, most authorities treat it as endemic to Sri Lanka (Hoffmann 1996, Stattersfield *et al.* 1998, Tirimanna 1981). The species is found in both the wet and dry zones but is confined to riverine forests in the dry zone and undisturbed rainforest in the wet zone (Kotagama & Fernando 1994). It has been recorded up to 1,700 m but doubt exists as to whether it still occurs at such high elevations (Fuller & Erritzoe 1997). The species may be (or may have been) a seasonal migrant, but forest fragmentation may now deny it access to the highlands (de Silva *in litt.* cited in Fuller & Erritzoe 1997).

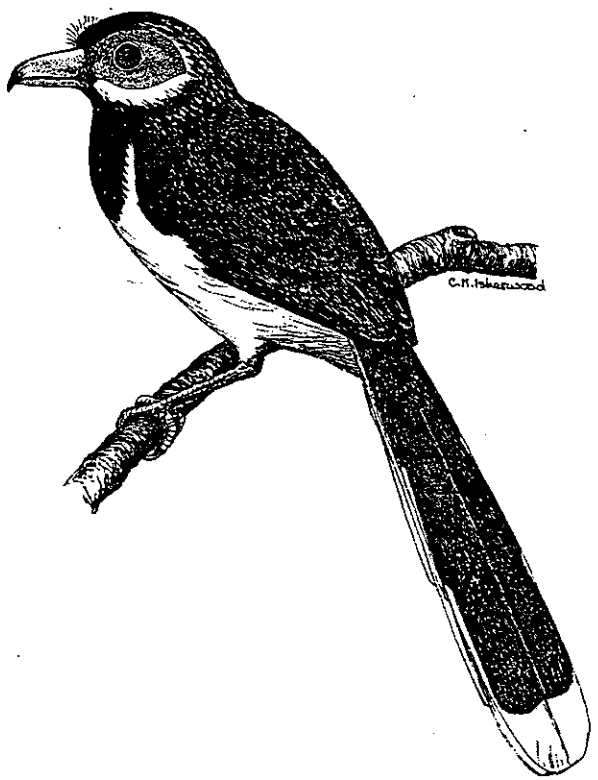
Project records
Rare at Walankanda, with just two sight records, possibly relating to the same individual. Rare at Kudumiriya, where a single bird was seen. One wing and some tail feathers were found at Delwala.

Observations and ecology
At Walankanda, an individual was seen high in the canopy (approximately 30 m) in an undisturbed area of forest. It was heard to produce a quiet, monosylabic *kaarr*. It appeared extremely wary and proved very difficult to follow. The second observation occurred nearby with a bird following a mixed-species flock. At Kudumiriya a single individual was seen in the understorey of primary forest. It was associated with a large mixed-species flock containing *c.*20 species.

Conclusions
We are extremely concerned about the paucity of records of this species. In nine weeks of fieldwork only three birds were seen, including and none in five weeks at Delwala. This site contains large areas of relatively undisturbed high canopy forest and might be expected to be prime habitat for this species (Fuller & Erritzoe 1997).

The species is shy and moves quietly through the forest (Fuller & Erritzoe 1997), so it is possible that some individuals were missed. However, it is felt that the species is distinctly rare at all the sites visited and may even be absent from Delwala. Most local people, who were very familiar with the avifauna of the surrounding forest, did not recognise the Malkoha when shown pictures. One man remembered seeing one some years earlier.

Due to its apparent rarity in the small patches of remaining suitable habitat, we recommend that its threat category be elevated to 'Endangered'. This opinion is shared by Hoffmannn (1998). Further work to investigate the threats to this distinctive yet poorly known species (apart from habitat destruction) is vital for its conservation.



Red-faced Malkoha
Phaenicophaeus pyrrhocephalus

SRI LANKA WOOD-PIGEON
Columba torringtoni

Status and distribution
Vulnerable (Collar *et al.* 1994). Endemic to Sri Lanka. Normally confined to the hill country (above 1,000 m) but descends to lower altitudes in fruiting seasons (Henry 1955, Kotagama & Fernando 1994).

Project records
From the start of fieldwork at Delwala in early July until 23 July, only two *C. torringtoni* were observed. After 23 July, the species became fairly common and individuals were encountered most days. It seems that the species moved into the area, possibly from higher up the ridge. At Walankanda it was uncommon, with only nine records. At Kudumiriya it was similarly uncommon, with a maximum of six individuals recorded.

Observations and ecology
The observation of *C. torringtoni* in larger numbers at Delwala coincided with the bombu tree *Symplocos cochinchinensis* coming into fruit. While the *bombu* was fruiting, the species was regularly seen in twos and threes feeding in the subcanopy or canopy.

At Walankanda on 20 August, a recently fledged *C. torringtoni* was seen at *c.*900 m in thick bamboo *Ochlandra stridula* understorey. On 9 September at Kudumiriya (at *c.*520 m), a nest with an incubating *C. torringtoni* was found. The nest was very similar in design to that of European Wood-Pigeon *C. palumbus* with a disorganised arrangement of twigs balanced on a thin supporting branch. It was situated about four metres from the ground in an area of primary forest with an open understorey (i.e. no bamboo). This breeding record at such a low altitude is interesting since the species is considered primarily montane (Stattersfield *et al.* 1998).

Conclusions
The species, like many pigeons, appears to be mobile, moving between areas in search of fruiting and flowering trees. The temporary abundance at Delwala should therefore not be taken as a direct indication of year-round status.

There have been reports of this species occurring in wooded village areas (Collar *et al.* 1994, G. de Silva Wijeyeratne verbally 1998), but during this study all observations were in forest away from human habitation. Due to the species' restricted range within Sri Lanka and its apparent preference for primary habitat, its current status as Vulnerable seems appropriate.

SRI LANKA BLUE MAGPIE
Urocissa ornata

Status and distribution
Vulnerable (Collar *et al.* 1994). Hoffmann (1998) considers it Endangered. Endemic to Sri Lanka and confined to forested areas of the low country wet zone and hill country (Kotagama & Fernando 1994).

Project records
Uncommon at Delwala, the ten records referring to between five and ten individuals. Uncommon at Walankanda with 29 records. Fairly common at Kudumiriya, with 28 records during our short survey.

Observations and ecology
At Delwala, Magpies were very seldom observed in the selectively logged forests up to *c.*450 m. Most records for this site were obtained in undisturbed forest at 500-800 m. The species was most commonly seen early in the morning or after rain, often in pairs, and frequently with mixed-species flocks. At Kudumirya, three individuals were seen close to a Spot-winged Thrush *Zoothera spiloptera* nest. Both the Magpies and the adult Thrushes appeared very excited, and there was much alarm calling. This may have been a predation attempt by the Magpies on the Thrush nest.

Conclusions
The species is very obvious where it is present due to its noisy vocalizations, large size and bright colour. It thus appears to have been truly scarce at both Delwala and Walankanda, particularly in the more disturbed areas. This species' close association with primary forest puts it under threat from continued habitat destruction. It has been suggested that brood parasitism from Asian Koel *Eudynamys scolopacea* is a major factor in restricting the species to primary forest (Erdelen 1988).

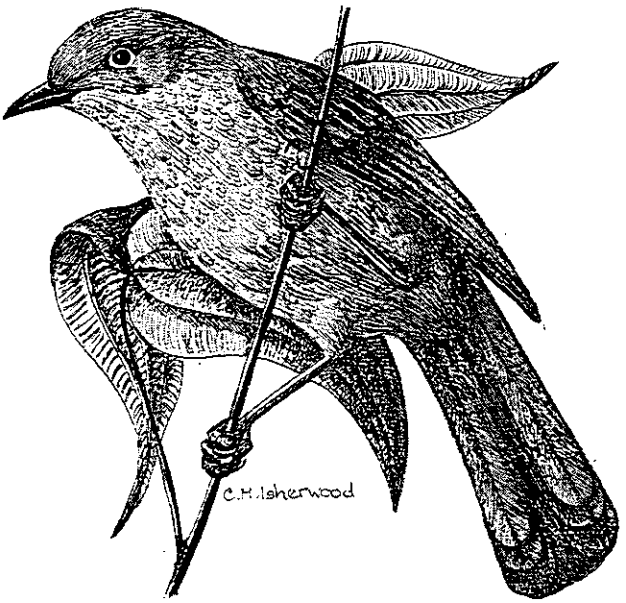
ASHY-HEADED LAUGHINGTHRUSH
Garrulax cinereifrons

Status and distribution
Vulnerable (Collar *et al.* 1994). Hoffmann (1998) considers it Endangered. Endemic to Sri Lanka. Restricted to the low country wet zone and the hill country up to 1,200 m (Ali & Ripley 1987, Kotagama & Fernando 1994).

Project records
Uncommon at Delwala, with between 15 and 20 individuals encountered. Similarly uncommon at Walankanda, with a maximum of 24 birds seen. Fairly common at Kudumiriya, with 52 records during the short survey. However, many of these records are likely to refer to a smaller number of regularly encountered individuals since flocks containing the species were frequently observed in a similar area.

Observations and ecology
This species spends much of its time on the ground foraging in the leaf litter. It was frequently observed in mixed-species flocks, often with Orange-billed Babblers *Turdoides rufescens*. In such flocks, Ashy-headed Laughingthrushes were present in small numbers (typically two or three in a flock). They were also observed foraging in monospecific groups of up to six individuals. Observations suggest that they feed on small invertebrates buried in the leaf litter. Most records were in relatively undisturbed habitat, none being obtained close to the logging tracks at Delwala or Walankanda. However, a few individuals were seen in disused chena cultivation at Kudumiriya.

Conclusions
At all sites, the species was found to be well distributed throughout areas of undisturbed forest. However, at no site was it found to be common. The restricted range of this species within Sri Lanka, its relatively low density where it does occur and its dependence on undisturbed habitat indicate that it is worthy of close monitoring.



Ashy-headed Laughingthrush
Garrulax cinereifrons

SPOT-BELLIED EAGLE OWL[3]
Bubo nipalensis

Status and distribution
Near-threatened (Collar *et al.* 1994). Widely distributed in south Asia, being found throughout much of the Indian subcontinent from the foothills of the Himalayas in the north through the Western Ghats to Sri Lanka in the south (Ali & Ripley 1983). Within Sri Lanka, it is a breeding resident of both wet and dry zones (Kotagama & Fernando 1994).

Project records
Calls attributed to this species (by M. Wijesinghe and S. Kotagama) were heard regularly at both Delwala and Walankanda, but probably refer to just one or two individuals at each site.

Observations and ecology

[3] Forest Eagle Owl is the name given by Henry (1955) and is commonly used in Sri Lanka.

Calls were heard throughout the night, more frequently in clear weather than during wet or cloudy nights.

Conclusions
The species is generally nocturnal, roosting deep in the forest during the day (Henry 1955), making it difficult to locate. Many authors mention its dependence on forest (Henry 1955, Kotagama & Fernando 1994, Legge 1880). As a large owl, it is likely to occur naturally at relatively low densities. Its dependence on forest habitat is likely to put it under threat in the long term if current trends of forest clearance in the Indian subcontinent continue.

CHESTNUT-BACKED OWLET
Glaucidium castanonotum

Status and distribution
Near-threatened (Collar *et al.* 1994). Hoffmann (1998) considers it to be Vulnerable. Endemic to Sri Lanka. Found mainly in the low country wet zone and hill country. Not confined to forest but also frequents scrub areas and cultivation (Kotagama & Fernando 1994).

Project records
Uncommon at all three sites. A pair were seen at Delwala and an individual was netted in the same area. A bird later heard about one km away was assumed to be a different individual. At Walankanda two separate individuals were seen. At Kudumiriya there were four records; these are likely to refer to at least three individuals

Observations and ecology
This is a highly diurnal owl species, often active in broad daylight (Henry 1955, pers. obs.). The individual that was trapped at Delwala was caught at 0900 in the bottom panel of a mist-net. Twice our attention was drawn to the presence of an owlet by the alarm calls of small passerine birds in mixed-species flocks. The species was recorded in selectively logged forest and primary forest alike.

Conclusions
The species was present in low numbers at all sites. It seems to show some degree of tolerance of disturbed habitats, being found in selectively logged forest and disused chena as well as primary rainforest. This, along with its wide distribution within Sri Lanka, means that at present the species does not seem to be under immediate risk of extinction. However, it should be noted that the species' range has reduced drastically since Legge's time when it was found throughout lowland Sri Lanka to the outskirts of Colombo (Legge 1880).

SRI LANKA FROGMOUTH[4]
Batrachostomus moniliger

Status and distribution
Near-threatened (Collar *et al.* 1994). Confined to South India (the southern, forested parts of the Western Ghats) and Sri Lanka (Ali & Ripley 1983). In Sri Lanka it is a breeding resident in both zones (Kotagama & Fernando 1994).

Project records
A pair were seen at Delwala. No other records were obtained despite careful searches of possible roost sites in both Walankanda and Kudumiriya. Searches included careful observation of lower branches surrounded by dead leaves.

Observations and ecology
A male and female were flushed from a perch at about three metres above ground level near a major logging track in selectively logged forest at Delwala. They landed again close by and sat very still, despite being closely approached. This site was returned to daily for five weeks and frequently searched closely but the birds were never seen again.

Conclusions
The problems of detecting this cryptic species make it very difficult to assess its status. The pair observed in Delwala were next to a logging track in selectively logged forest, and this may indicate at least some tolerance of disturbance.

[4] In this case, 'Sri Lanka Frogmouth' is a misnomer as the species is also found in South India.

SPOT-WINGED THRUSH
Zoothera spiloptera

Status and distribution
Near-threatened (Collar *et al.* 1994). Hoffmann (1998) considers it to be Vulnerable. Endemic to Sri Lanka. Found in both zones, but with only scattered populations in the dry zone (Henry 1955).

Project records
Common at all sites. The length of time spent at Delwala allowed territories to be identified. More than 25 singing individuals were located at this site.

Observations and ecology
Most often seen on the forest floor, foraging amongst the leaf litter. Observed feeding on small invertebrates and fallen fruits (e.g. Wild Bread Fruit *Artocarpus nobilis*).

Although *Z. spiloptera* appeared most common in undisturbed habitat, it was often recorded in selectively logged forest and was occasionally seen on the forest edge, close to small-scale tea cultivation and secondary scrub.

The song is very distinctive, which made the species very obvious when it was present. Singing occurs mostly in the early morning (0630-0730) or just before dusk. A shrill, insect-like contact call is made throughout the day. The species appears to be highly territorial with individuals singing from a similar point every day and responding well to playback of another individual's song.

Four nests were found; all were built in the fork of a sapling between one and a half and three metres above the ground. The nest consists of a cup of woven roots and leaves surrounded by a messy tangle of twigs. An egg shell was found at one nest; this was pale in colour and heavily speckled brown.

In primary forest at Delwala on 9 August a nest with one or two chicks was found. Both adults were actively feeding the young. The nest was visited again three days later, and it appeared the chicks had fledged successfully as two or three Spot-winged Thrushes were heard calling close to the now empty nest.

On 9 September, a nest was found with some broken egg shell at the base of the sapling. Attention was drawn to this nest by the excited calls of three Sri Lanka Blue Magpies *Urocissa ornata* and Spot-winged Thrush alarm calls. This appears to have been an attempted nest predation by the Magpies; it was not possible to see if chicks remained in the nest.

An abandoned nest was found in primary forest at Kudumiriya on 10 September. On 11 September, a nest with a single chick close to fledging was found, also in primary forest at Kudumiriya. On 12 September, in another part of Kudumiriya forest, two recently fledged young were observed with an adult.

Conclusions
In all forests surveyed this species was common. It appears to be quite tolerant of human disturbance, occasionally being found in scrub on the forest edge. We therefore do not consider the species to be threatened.

However, all breeding attempts were recorded in relatively undisturbed forest, away from human habitation and it seems likely that the species' long term survival is linked to the persistence of quality forest.

Hoffmann (1998) considers that the species is Vulnerable, based both on his own observations and on the species' limited geographic range. In light of these conflicting assessments of the species' rarity, further research is recommended.

WHITE-FACED STARLING
Sturnus albofrontatus[5]

Status and distribution
Near-threatened (Collar *et al.* 1994). Hoffmann (1998) considers it Endangered. Endemic to Sri Lanka. Restricted to low country wet zone and the hill country (Kotagama & Fernando 1994).

Project records
Rare at Delwala, where between six and 11 birds were seen. Calls attributed to the species

[5] Until recently known as *Sturnus senex*; correct nomenclature clarified by Mees (1997).

(by S. Kotagama) were heard occasionally but not confirmed visually. At Walankanda the species was also rare, being seen only four times. In Kudumiriya the species was uncommon, with between five and seven birds seen during our short time at the site. Unfamiliarity with the call of this species means that some of the many variations of the calls attributed to Sri Lanka Mynas may actually have been *S. albofrontatus*, which therefore may have been under-recorded.

Observations and ecology
White-faced Starlings were most commonly seen as members of large, mixed-species flocks. In such a flock the starlings foraged in the canopy, apparently feeding on small fruits and insects. Most observations were from relatively undisturbed habitat, but at Walankanda an individual was observed in a flock close to a logging track on forest edge.

Conclusions
This species is highly mobile; individuals are thought to move quite long distances between roosting and feeding areas (S. Kotagama verbally 1997). It is therefore very difficult to determine the species' status.

Hoffmann (1998) considers remaining populations to be so small and severely isoltated so as to deserve the threat category of Endangered. On the basis of our study we recommend that this species' threat category is at least upgraded to Vulnerable.

We hope that further research on this species will be carried out to provide the much-needed information on distribution and status.

LEGGE'S FLOWERPECKER[6]
Dicaeum vincens

Status and distribution
Near-threatened (Collar *et al.* 1994). Hoffmann (1998) considers it Endangered). Endemic to Sri Lanka. Confined to the low country wet zone (Kotagama & Fernando 1994).

Project records
Common at all sites.

Observations and ecology
Observed most frequently in pairs, but occasionally singly, in small groups or in mixed-species flocks. Frequently heard high in the canopy, but also regularly descend to feed on flowers and fruit in the shrub layer (e.g. of *Clidemia hirta* and *Osbeckia octandra*). As such fruiting and flowering shrubs are more common in secondary vegetation, this species was most often seen in disturbed sites (e.g. along logging tracks). However, *D. vincens* was never observed far from forest and was not common close to human habitation, though occasionally observed in small villages close to forest.

Conclusions
This species' highly restricted range and the small amount of suitable habitat that this contains places the species under potential threat. However, it is locally abundant in the lowland forests of the wet zone and displays some degree of tolerance to human disturbance. We consider the species should be monitored but at present do not consider it threatened.

White-faced Starling
Sturnus albofrontatus

[6] White-throated Flowerpecker is the name given by Kotagama & Fernando (1994) and is in common usage in Sri Lanka.

SRI LANKA SPURFOWL
Galloperdix bicalcarata

Status and distribution
Endemic to Sri Lanka. Distributed throughout the wet zone and in the southern and eastern sectors of the dry zone (Kotagama & Fernando 1994).

Project records
Common at all sites. This species is very vocal and its distinctive call allows it to be easily identified. This led to many records for the species at each site. A simple tally of records gives little information on the species' abundance, as the call can be heard for several hundred metres.

Observations and ecology
This species is mainly terrestrial, but one individual was seen fly into the low branches of a tree when startled. It is most often seen individually or in pairs. On 8 July an adult female with two chicks was seen in selectively logged forest at Delwala. The species was usually associated with relatively undisturbed habitat, but was also seen in the abandoned chena cultivation at Kudumiriya and in selectively logged forest at Delwala and Walankanda.

Conclusions
This species is under no immediate threat of extinction, due to its distribution through much of Sri Lanka and its relatively high local abundance. It appears to require forest habitat, although not necessarily primary forest. Continued forest clearance may, therefore, pose a long-term threat for the species.

SRI LANKA JUNGLEFOWL
Gallus lafayetii

Status and distribution
Endemic to Sri Lanka being found in all zones (Kotagama & Fernando 1994).

Project records
Fairly common at all three sites; most frequently observed at Delwala.

Observations and ecology
Like *Galloperdix bicalcarata* this species was far more often heard than seen. However, on a number of occasions it was observed walking on the forest floor, singly or in pairs. The species appears to be confined to forest undergrowth, not solely undisturbed forest. It was frequently recorded in selectively logged forest at Delwala and Walankanda, and in disused chena cultivation at Kudumiriya.

Henry (1955) identified two breeding seasons; the first January to March with a second clutch sometimes being laid in August or September. Two breeding records were obtained during this project; on 17 July an adult female and two juveniles were seen at Delwala; on 29 August a female and at least four chicks were seen on a logging track at Walankanda.

Conclusions
The species is widespread within Sri Lanka and is thought to be more tolerant of habitat disturbance than *Galloperdix bicalcarata*.

In some parts of Sri Lanka the species suffers from exploitation for the pet trade and hunting (McGowan & Garson 1995). In the areas visited these activites did not appear to be a major threat, although some local people reported occasionally eating eggs.

SRI LANKA GREY HORNBILL
Ocyceros gingalensis

Status and distribution
Endemic to Sri Lanka. Found throughout the low country and occasionally in the hill country (Kotagama & Fernando 1994).

Project records
Common at Delwala. Uncommon at Walankanda and Kudumiriya (seven and three records respectively).

Observations and ecology
Food items taken included wild fruits such as *Palaquium petiolare*. Also observed in small villages near the forest feeding on cultivated fruits, in particular Papaya *Carica papaya* and Uguressa *Flacourtia inermis*. One individual at Delwala was observed capturing and consuming a tree frog.

On two occasions an individual of this species was seen at the nest tree shared by Sri Lanka Mynas *Gracula ptilogenys* and Hill Mynas *G. religiosa* (see account for Sri Lanka Myna). Both species of Myna mobbed the Hornbill, driving it away. Hornbills nest in similar holes to Mynas (Henry 1955), so this may have been a case of nest site competition or an attempted nest predation.

The species is tolerant of disturbed habitat and was frequently observed in small villages feeding on planted fruit trees.

Conclusions
Its tolerance of disturbed habitats, even feeding on cultivated fruit and crops, means that this species is not of particular conservation concern.

YELLOW-FRONTED BARBET
Megalaima flavifrons

Status and distribution
Endemic to Sri Lanka. Found in the wet zone and hill country (Kotagama & Fernando 1994).

Project records
Very common at all three sites.

Observations and ecology
Most common in forested areas, both disturbed and undisturbed, but also observed amongst small scale cultivation on the forest edge and occasionally in small villages close to the forest. Brown-headed Barbet *Megalaima zeylanica* appears to replace *M. flavifrons* in less forested areas. There was a smooth transition from almost no *M. zeylanica* in forested or densely wooded areas to this species becoming common, and *M. flavifrons* rare, in village habitat.

In the forest, *M. flavifrons* was a frequent member of mixed-species foraging flocks, often three or four Barbets per flock being present. Individuals were observed on two occasions emerging from small holes in the trunks of trees; these may have been nest holes (Henry 1955).

Conclusions
The species is very common wherever forest cover remains. It is therefore of little conservation concern. Its distinctive, extremely frequent and far-reaching call means it can be easily monitored, and any decline in population detected.

Yellow-fronted Barbet
Megalaima flavirons

SRI LANKA HANGING-PARROT[7]
Loriculus beryllinus

Status and distribution
Endemic to Sri Lanka, found in both wet and dry zones (Kotagama & Fernando 1994).

Project records
Very common at Delwala. Common at Walankanda and Kudumiriya.

Observations and ecology
The species was seen frequently at all three sites, occupying undisturbed forest, selectively logged forest and small-scale tea and cinnamon cultivations. It was observed feeding on the flowers and fruits of many species including cultivated plants in village gardens. *L. beryllinus* was also observed in the *Pinus* plantation at Kudumiriya, apparently feeding on pine cones.

[7] Sri Lanka (Ceylon) Lorikeet is the name given in Henry (1955) and is commonly used in Sri Lanka.

Conclusions
The species is highly mobile which makes estimates of abundance very difficult. However, the species appeared common at all sites visited. The tolerance of this species to human habitation and its relatively wide distribution within Sri Lanka means it is not presently of particular conservation concern.

LAYARD'S PARAKEET
Psittacula calthropae

Status and distribution
Not lisited by Collar *et al.* (1994). Hoffmann (1998) considers it Vulnerable. Endemic to Sri Lanka. Mainly confined to forested areas of the low country wet zone (Kotagama & Fernando 1994).

Project records
Common at Delwala and Kudumiriya, both in disturbed and undisturbed forest. Fairly common at Walankanda.

Observations and ecology
Usually seen in pairs or in small groups of three or four individuals. Our observations contrast with those of Arndt (1996), who claims the species prefers forest edge habitat. Our observations show *P. calthropae* to be more common in the forest interior, though the species was observed in edge habitat at Delwala and Kudumiriya. At Walankanda, where Plum-headed Parakeets *Psittacula cyanocephala* were common on the forest edge, *P. calthropae* were restricted to the forest interior. It was observed feeding on fruit and leaves, including those from the tree *Campnosterma ceylonica* and shrub *Apama siliquosa.*

Conclusions
This species shows some degree of tolerance of human activities and has even been recorded in wooded gardens in Homagama near Colombo (G. de Silva Wijeyeratne verbally 1998). However, our observations do suggest that the species is reliant to some degree on forest. It has a restricted range within Sri Lanka, being found only in the low country wet zone, but its tolerance of human activities means it is unlikely to be under threat of extinction.

SRI LANKA MYNA[8]
Gracula ptilogenys

Status and distribution
Not listed by Collar *et al.* (1994). Hoffmann (1998) considers it Vulnerable. Endemic to Sri Lanka, common throughout the low country wet zone and hill country (Kotagama & Fernando 1994).

Project records
Very common at all three sites. The call may be confused with that of the Hill Myna *Gracula religiosa* (or *Sturnus albofrontatus*, see pp 43-44), but the two species are easily distinguished visually.

Observations and ecology
Most often seen in pairs or small groups. A frequent component of mixed-species flocks, most flocks containing at least one or two individuals. It was seen feeding on fruits e.g. *Macaranga peltata.* On one occasion a Myna was seen to capture and eat an unidentified arboreal green lizard (*c.* 8 cm long).

The species is known to nest in tree cavities (Henry 1955). A tree in selectively logged forest at Delwala with three vertically stacked cavities was observed for some days. It appeared that both *G. ptilogenys* and *G. religiosa* (at least one pair of each species) were using the tree, nesting in different holes. On one occasion a Sri Lanka Grey Hornbill *Ocyceros gingalensis* visited the tree (see *O. gingalensis* species account).

The species appeared much more common in relatively pristine forest than in disturbed forest or edge habitat.

Conclusions
We found this species to be very common and fairly tolerant of disturbance and therefore conclude that it is of little conservation concern.

[8] Sri Lanka (Ceylon) Grackle is the name given in Henry (1955) and commonly used in Sri Lanka.

SRI LANKA WHITE-EYE[9]
Zosterops ceylonensis

Status and distribution
Endemic to Sri Lanka. Confined to mid-elevations of the low country wet zone and the hill country (Kotagama & Fernando 1994). Frequents gardens and plantations in the hill country (Hoffmann 1998).

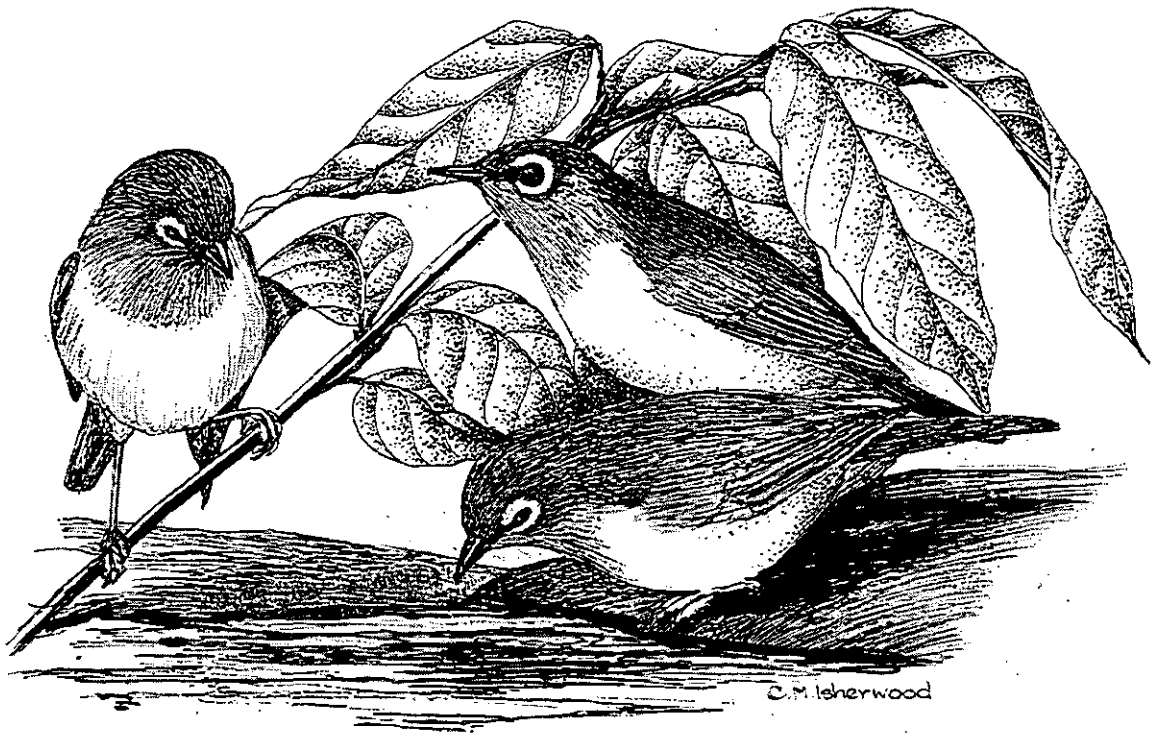
Project records
At Delwala it was generally common, but very common at higher altitudes. Common at Walankanda. Uncommon at Kudumiriya.

Observations and ecology
This species occurred in mixed and single species flocks throughout the forest. The maximum number recorded in a single flock was 35.

Z. ceylonensis are more numerous at higher altitudes, above about 600 m, being replaced by the Oriental White-eye *Z. palpebrosus* at lower altitudes and in more disturbed habitat. Both *Zosterops* species were seen foraging together in selectively logged forest at Walankanda at an altitude of about 500 m.

A nest of this species was found on 12 July in primary forest at Delwala at about 700 m. The nest was approximately 1.5 m off the ground in dense bamboo (*Ochlandra* sp.) understorey, and consisted of tightly bound leaves with a lining of moss and root fibres.

Conclusions
Locally abundant but has quite restricted habitat requirements and a limited range within Sri Lanka. Although not presently under threat it should be closely monitored.



Sri Lanka White-eye
Zosterops ceylonensis

[9] Hill White-eye is the name given by Henry (1955) and is commonly used in Sri Lanka.

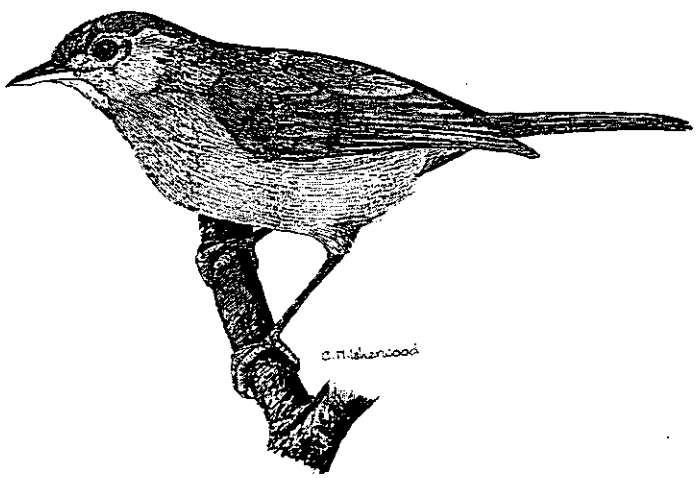
BROWN-CAPPED BABBLER
Pellorneum fuscocapillum

Status and distribution
Endemic to Sri Lanka. The species is found throughout the country and consists of three subspecies. *P. fuscocapillum scortillum* is confined to the low country wet zone (Kotagama & Fernando 1994).

Project records
Fairly common at all sites. Infrequently seen, but the distinctive call was heard regularly.

Observations and ecology
A low-strata bird, *P. fuscocapillum* was usually seen in pairs foraging on the forest floor or in the bottom metre of the understorey. It was observed in primary forest, selectively logged forest and in secondary scrub surrounding small-scale tea cultivation on the forest edge.

Conclusions
This species appears common and tolerant of disturbed habitat and is therefore of little conservation concern.



Brown-capped Babbler
Pellorneum fuscocapillum

SRI LANKA ORANGE-BILLED BABBLER[10]
Turdoides rufescens

Status and distribution
Not listed by Collar *et al* (1994). Hoffmann (1998) considers it Endangered. Endemic to wet zone Sri Lanka (Kotagama & Fernando 1994).

Project records
Common at both Walankanda and Kudumiriya. In selectively logged forest at Delwala, *T. rufescens* was seen on only one occasion but was fairly common higher up (above *c.*700 m).

Observations and ecology
At Delwala, *T. rufescens* was almost entirely restricted to undisturbed forest. This preference was not evident at the other two sites: at Walankanda birds were seen along logging tracks and in selectively logged forest; in Kudumiriya they were common in secondary scrub, disused chena and were occasionally seen in tea fields. The difference in habitat tolerance between the sites may relate to competition with Yellow-billed Babbler *Turdoides affinis*. In areas where *T. rufescens* was seen very disturbed habitat, *T. affinis* was not present. At Delwala, *T. affinis* was common in disturbed habitats and *T. rufescens* was confined to primary forest. The single record of *T. rufesens* in selectively logged forest at Delwala coincided with several days when the ridge was constantly covered in cloud and the rain was torrential. During this period, flocks with a composition usually seen only higher up were seen in selectively logged forest below the cloud line.

The species is a common component of mixed-species flocks. Eight to 12 were present in most flocks but up to 45 were seen in one flock.

Conclusions
This species is locally abundant and tolerant of disturbed habitats. Therefore, despite its restricted range within Sri Lanka, we consider it is not of immediate conservation concern.

[10] Sri Lanka Rufous Babbler is the name given in Henry (1955) and commonly used in Sri Lanka.

MAMMALS

All mammals encountered were identified where possible and aspects of their ecology or threats faced in the sites visited were recorded. Besides the following 18 species that were identified, a number of unidentified small bats and rodents were also recorded.

INDIAN PANGOLIN
Manis crassicaudata

Status and distribution
Listed by CITES (Appendix II) and considered Vulnerable (IUCN 1996). Found across Pakistan, India, Bangladesh and Sri Lanka, mainly in forest habitats (Corbet & Hill 1992).

Project records
This species was never seen but pangolin burrows were common at all sites. Burrows were found near logging tracks in selectively logged forest as well as in primary forest.

Conservation status
M. crassicaudata is sometimes hunted in Sri Lanka (S. Kotagama verbally 1997), but we did not hear of this occurring in any of the study sites. This species has a relatively wide distribution in Sri Lanka and the Indian subcontinent (Corbet & Hill 1992), being found in a variety of habitats. It is therefore unlikely to be under serious threat.

LESSER FALSE VAMPIRE BAT
Megaderma spasma

Status and distribution
Found across the Indomalayan realm with the sub-species *M. s. ceylonense* described from Trincomalee, Sri Lanka (Corbet & Hill 1992).

Project records
One was captured in a mist-net at dusk in selectively logged forest at Delwala.

Conservation status
Not believed to be under threat.

HORSESHOE BAT
Rhinolaphus rouxi

Status and distribution
Found throughout Sri Lanka and Indian and east to Vietnam (Corbet & Hill 1992).

Project records
One individual was found after dawn in a mist-net at Delwala base camp.

Conservation status
Not thought to be under threat.

SLENDER LORIS
Loris tardigradus

Status and distribution
Listed by CITES (Appendix II) and considered Vulnerable (IUCN 1996). This species is found below 1,850 m in Sri Lanka and India north to 15°N in the Western Ghats (Corbet & Hill 1992).

Project records
Calls attributed to *L. tardigradus* (by M Wijesinghe) were heard several times during the night at both Delwala and Kudumiriya but were never confirmed visually.

Conservation status
It is not known how many individuals may have been heard at each site but given its threat status we consider these forests to be potentially important sites for this species. Reported population densities of about one per hectare and the species' dependence on primary rainforest (McKay 1984) indicate that it is likely to suffer severely from habitat fragmentation.

WESTERN TOQUE MACAQUE
Macaca sinica

Status and distribution
This mainly arboreal species is endemic to Sri Lanka, is listed by CITES (Appendix II) and is considered near-threatened (IUCN 1996). It is found in evergreen and deciduous forest below 2,100 m (Corbet & Hill 1992).

Project records
Common at all forest sites. Seen regularly in groups of at least four, jumping through the canopy. Tolerant of disturbed habitat and found close to, or even in, small villages. Two subspecies are recognised (Fooden 1979), of which one — *M. s. aurifrons* — is restricted to lowland wet evergreen forest in the south of Sri Lanka.

Conservation status
Young Toque Macaques are commonly found captive in popular tourist areas (pers. obs.) where tourists pay to be photographed with them. The effects of this on the wild population are not known. However, the species' tolerance of human disturbance, its local abundance and wide distribution in Sri Lanka suggest it is unlikely to be under immediate threat.

PURPLE-FACED LEAF MONKEY
Trachypithecus vetulus

Status and distribution
Endemic to Sri Lanka, this species is listed as Vulnerable (IUCN 1996).

Project records
These monkeys were usually seen in groups of four or five but occasionally up to fifteen in a single group. The species was commonly seen and heard at each forest. The subspecies concerned is likely to be *T. v. vetulus*, which is confined to south-west Sri Lanka (Napier 1985).

Conservation status
This species appears much less tolerant of human disturbance than *Macaca sinica*. It was found only in forest habitat some distance from villages. Villagers did not report hunting the species. No animals were seen captive either in the villages or tourist areas.

GOLDEN PALM CIVET
Paradoxurus zeylonensis

Status and distribution
Endemic to wet zone Sri Lanka (Corbet & Hill 1992).

Project records
Seen twice at Delwala on the main logging path near base camp. Scats believed to be of a *Paradoxurus* sp. were also found regularly, although these could have been of the Common Palm Civet *P. hermaphroditus* which was not otherwise recorded.

Conservation status
The records are too few to accurately assess the species' status but conservation of its restricted habitat should continue given this civet's highly restricted range.

RUDDY MONGOOSE
Herpestes smithii

Status and distribution
Found in India north to 25°N in Rajasthan and throughout Sri Lanka (Corbet & Hill 1992).

Project records
A *Herpestes* sp. thought to be of this species was found wounded (cause unknown), at *c.*700 m in a clearing in bamboo (*Ochlandra* sp.) at Delwala. However it may have been mistaken for the Indian Brown Mongoose *H. fuscus* which varies in colour across south India and Sri Lanka (Corbet & Hill 1992).

Conservation status
Not thought to be under threat.

FISHING CAT
Prionailurus viverrinus

Status and distribution
Considered near-threatened (IUCN 1996) and listed on CITES Appendix II. Found across the Indomalayan realm (Corbet & Hill 1992).

Project records
Prints were found on two occasions in primary forest at Walankanda.

Conservation status
There were too few observations to assess the species' status. However, both sets of prints were found in primary forest far from human habitation. Destruction of wetlands is the major threat to the species over much of its range (Nowell & Jackson 1996).

LEOPARD
Panthera pardus

Status and distribution
Listed in CITES Appendix I and considered Endangered (IUCN 1996). Historically found throughout much of the Indomalayan region, but declining in numbers due to loss of habitat (Corbet & Hill 1992).

Project records
A scat and prints were found at Walankanda and a melanic individual was seen in a tree at

Kudumiriya. An endemic subspecies, *P. p. kotiya*, was proposed by Deraniyagala (1949) and is considered Endangered (Nowell & Jackson 1996).

Conservation status
Although hard to observe in the wild, reports from villagers confirmed that Leopards are rare at each site. A Leopard was familiar to the villagers at Kudumiriya as it has been known to enter the home gardens of families close to the forest. This was of the usual colouring and hence was a different individual to that seen during our surveys. Villagers at Delwala reported seeing Leopards regularly in the past but none had been seen for at least ten years. As a large carnivore it is likely to exist naturally at low densities; Eisenberg & Lockhart (1972) report home-range sizes of more than 10 km^2. Forest fragmentation therefore poses a serious threat to this species' survival in Sri Lanka.

ASIAN ELEPHANT
Elephas maximus maximus

Status and distribution
Listed in CITES Appendix I and considered Endangered (IUCN 1996). Originally found across the Indian subcontinent, Malay peninsula, Singapore, Sumatra and Java, but now only scattered populations remain due to hunting and habitat loss (Corbet & Hill 1992).

Project records
At Delwala, a clear elephant track was found running parallel with the ridge top for about one kilometre. The bamboo (*Ochlandra* sp.) understorey was grazed to ground level, and dung and tusk marks on trees were plentiful. The dung was at least a month old and the track was not used during our surveys at the site.

At Walankanda, a group of three or four regularly came out of the forest at dusk to feed in the village paddy fields, returning before dawn. Elephant dung and tracks were seen throughout the forest, except on very rocky, steep ground. The two forests of Delwala and Walankanda are contiguous and it is believed that one group of three elephants and a single adult male frequent the area, moving across the ridge.

Conservation status
Human/elephant conflict is understandably high in the villages visited by elephants. This conflict is reported to have led to direct persecution of elephants in some areas of Sri Lanka. However, in Kajugaswatta village (adjoining Walankanda), inhabitants used deterrents that did not harm the elephants. Young men kept all-night watches when elephants were known to be in the vicinity, and fire crackers were used to scare them back into the forest.

Santiapillai & de Silva (1994) state that around 3,000 elephants remain in Sri Lanka and that these are mainly restricted to the dry zone. However, very small isolated groups clearly do exist in the wet zone. Another small group is reported to survive in Handapan-Ella and Thangamalai plains to the north-east of the Sinharaja reserve (de Zoysa & Raheem 1993). Vancuylenberg (1977) suggested that habitat destruction and forest fragmentation pose serious threats to this species' long-term survival in Sri Lanka.

WILD BOAR
Sus scrofa

Status and distribution
Occurs in Europe, North Africa and Asia (Corbet & Hill 1992).

Project records
Although *S. scrofa* was never seen, scrapes were found throughout each forest. One was caught in a trap by villagers on the forest edge at Delwala.

Conservation status
Local people hunt this species using traps and trap-guns in the scrub bordering the forest and in former chena patches. The species is not hunted in primary forest where the undergrowth is less dense. Due to its large range and apparent local abundance, this species does not seem to be of any conservation concern.

SAMBAR DEER
Cervus unicolor

Status and distribution
Found across India and Sri Lanka to southern China and Malaya (Corbet & Hill 1992).

Project records
Two individuals were observed at Walankanda: one walking through bamboo *Ochlandra stridula* undergrowth, and another in selectively logged forest. One was seen on the logging track at Delwala. Presumed uncommon as no tracks or other evidence seen.

Conservation status
Although uncommon in the forests visited, Sambar Deer are found across Sri Lanka, including in the hill country, as well as over much of southern Asia. Not thought to be at risk.

SRI LANKA GIANT SQUIRREL
Ratufa macroura melanochra

Status and distribution
This endemic subspecies is listed in CITES Appendix II and is considered Vulnerable (IUCN 1996).

Project records
This squirrel was common at each study area. The species is easily recognised by its distinctive chattering call and is usually seen alone or in pairs jumping through the canopy.

Conservation status
In Delwala, one villager had recently captured a young squirrel to keep as a pet. The impact of this practice on the wild population is not known. The species is dependent on forest habitat but is commonly found in selectively logged forest as well as less disturbed areas.

LAYARD'S STRIPED SQUIRREL
Funambulus layardi

Status and distribution
An endemic subspecies, *F. l. signatus,* is proposed for south-west and central Sri Lanka (Thomas 1924).

Project records
Common at all sites, in both primary and selectively logged areas. Often found following mixed-species bird flocks, foraging on the ground or on the tree trunks and branches. It is likely that the squirrel takes food items disturbed by the birds.

Conservation status
Not thought to be under any threat.

DUSKY-STRIPED JUNGLE SQUIRREL
Funambulus sublineatus obscurus

Status and distribution
Found in south-west India and southern Sri Lanka (Corbet & Hill 1992).

Project records
Common at all sites. Often seen following mixed-species bird flocks, sometimes with *F. layardi* also present. Tolerant of human disturbance, being recorded in selectively logged forest and occasionally in secondary scrub.

Conservation status
Not thought to be under any threat.

INDIAN CRESTED PORCUPINE
Hystrix indica

Status and distribution
Found across the Indian subcontinent and the Indomalayan region in a wide variety of habitats, from rocky hillsides to monsoon forest (Corbet & Hill 1992).

Project records
Seen on one occasion in the forest at Delwala.

Conservation status
The paucity of records for this species prevents assessment of its status. The species is nocturnal and seldom encountered during the day. Other sources (e.g. Corbet & Hill 1992) suggest it tolerates a range of habitats and is not under any immediate threat.

REPTILES AND AMPHIBIANS

Systematic herpetological investigations were not carried out. All species that could be identified were recorded, but this inventory is far from complete. Even for the fairly obvious terrestrial taxa, such as geckos and skinks, many species are not listed. A number of fossorial snake species are likely to exist in the area, but with the opportunistic survey techniques used in this project they were undetected.

GREEN-PIT VIPER
Trimeresurus trigonocephala

Endemic to Sri Lanka, entirely arboreal and restricted to forest habitats (Wall 1921). This species was frequently observed at both Delwala and Walankanda. Often found curled between a creeping vine and a tree trunk or amongst understorey foliage.

HUMP-NOSED VIPER
Hypnale hypnale

Found in Sri Lanka and the Western Ghats (Smith 1943). Observed occasionally at all sites, often on the ground or close to water.

BLOSSOM KRAIT
Balanophis ceylonensis

Genus endemic to Sri Lanka, more common in the hills than low country (Smith 1943). Seen on two occasions in primary, ridge top forest (*c.*730 m) at Delwala and once in selectively logged forest.

INDIAN COBRA
Naja naja

Widespread across the Indian subcontinent and south-east Asia (Groombridge 1988). Listed as CITES Appendix III in India. At risk from hunting for skins for the leather trade (Groombridge 1988). Found throughout Sri Lanka. Seen on two occasions in the forest at Delwala and once at Walankanda.

GUNTHER'S BRONZE-BACK
Dendrelaphis caudolineolatus

Found in Sri Lanka and south India; described by Smith (1943) as 'rare' and confined to the hills. Seen on two occasions at Delwala; once in selectively logged forest and once close to the Forest Ranger's building.

GREEN WHIP SNAKE
Ahaetulla nasutus

Found in Sri Lanka and India up to 1,800 m (Daniels 1983). Apparently the commonest snake at all sites. Frequently encountered in forest moving through the understorey.

BROWN-SPECKLED WHIP SNAKE
Ahaetulla pulverulentus

Found in south India and Sri Lanka, up to 1,000 m (Wall 1921). Seen occasionally at all sites. On one occasion at Delwala, two Black-naped Monarchs *Hypothymis azurea* were seen fluttering round a bush in the forest. One appeared to land strangely, but on closer inspection it was caught in the jaws of *A. pulverulentus*. The snake took one hour to swallow the entire bird.

PYTHON
Python molurus molurus

Widespread across Asia, the subspecies *P. m. molurus* being restricted to India and Sri Lanka (Daniels 1983). The species is listed on CITES Appendix II and is considered near-threatened (IUCN 1996). It is under pressure from hunting for food, the leather trade and live animal trade (Groombridge 1988). One individual of this species was observed in selectively logged forest at Delwala; it had an enlarged abdomen and appeared to have eaten a 'rat sized' food item.

EARTH SNAKE
Rhinophis tricolourata

One individual thought to be of this species was found under a woodpile at Delwala Forest Ranger's building.

GREEN GARDEN LIZARD
Calotes calotes

Found in the hills of south India and Sri Lanka (Smith 1943). More common in well wooded country (Daniels 1983). Considered to be wide spread with a stable population (Manamendra-Arachchi & Liyanage 1994). Common in disturbed habitats and forest at all sites.

COMMON SAND LIZARD
Calotes versicolour

Widespread across the Indian subcontinent and south-east Asia (Daniels 1983). Common near human habitation with a stable population (Manamendra-Arachchi & Liyanage 1994). Common in disturbed habitats at all sites.

HUMP-NOSED LIZARD
Lyriocephalus scutatus

This is the only species in a genus endemic to Sri Lanka (Smith 1943). Smith described it as 'very common' in the hilly districts. However, Manamendra-Arachchi & Liyanage (1994) consider the species 'endangered' and restricted to forested areas below 1,650 m with a dense canopy. Seen fairly regularly in forest at all sites. The female of the species is more difficult to see due to her cryptic colouration; of the seven individuals seen only one was female. Always observed resting vertically on the trunk of small trees. Very slow moving; upon being disturbed the male opens his mouth to reveal the bright red interior and extends a bright yellow dewlap.

EARLESS LIZARD
Otocryptis wiegmanni

Endemic to Sri Lanka (Smith 1943). Found throughout the wet zone to elevations of 1,200 m (Manamendra-Arachchi & Liyanage 1994). Seen frequently on the forest floor at all sites.

ROUGH-NOSED HORNED LIZARD
Ceratophora aspera

The genus *Ceratophora* is endemic to Sri Lanka. In 1994 Manamendra-Arachchi & Liyanage (1994) considered the species 'very rare' and restricted to moist lowland and submontane forests below 900 m. Following more extensive field research they reassessed the species' status as stable (Manamendra-Arachchi & Liyanage 1998). This species was seen once at Delwala on the forest floor in an area of undisturbed primary forest.

WATER MONITOR
Varanus salvator

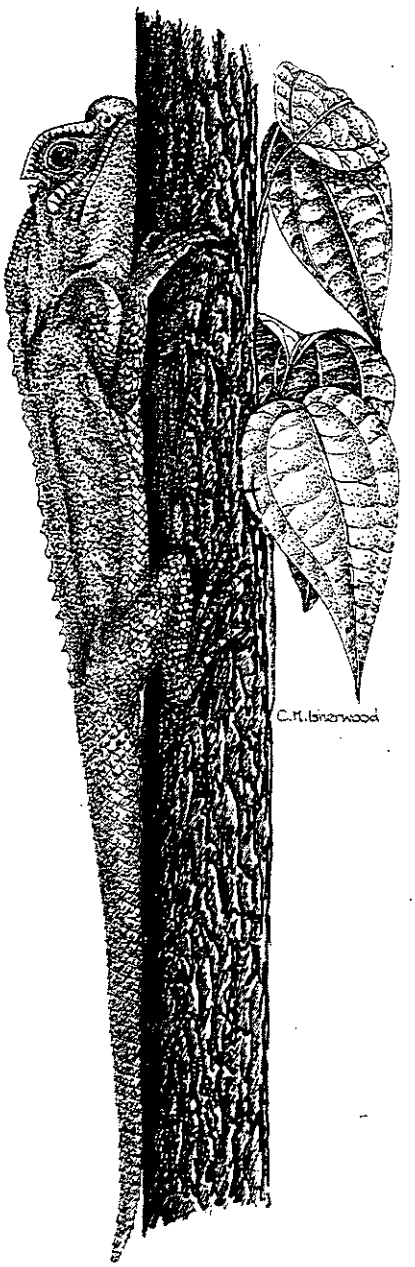
Widespread species across south-east Asia (Groombridge 1988). Listed on CITES Appendix II and considered Vulnerable (IUCN 1996). Threatened by hunting for the live animal trade and the leather trade (Groombridge 1988). One individual was seen close to a stream in primary forest at Delwala.

RAT-SNAKE SKINK
Mabuya carinata

Found in India and Sri Lanka. The commonest skink in India (Daniels 1983), being commonly found in semi-urban areas. Seen regularly at all sites.

SPOTTED SKINK
Mabuya macularia

Found in forest in Sri Lanka and India (Daniels 1983). A common leaf-litter skink at all sites.



Hump-nosed Lizard
Lyriocephalus scutatus

THREE-TOED SNAKE SKINK
Nessia bertoni

Nessia is a genus endemic to Sri Lanka (Raheem & de Zoysa 1993). This species was regularly seen at all three sites.

WRINKLED FROG
Rana corrugata

This species' very distinctive call was easily learnt, so its presence was easily confirmed at all sites.

TREE FROG
Philautus spp.

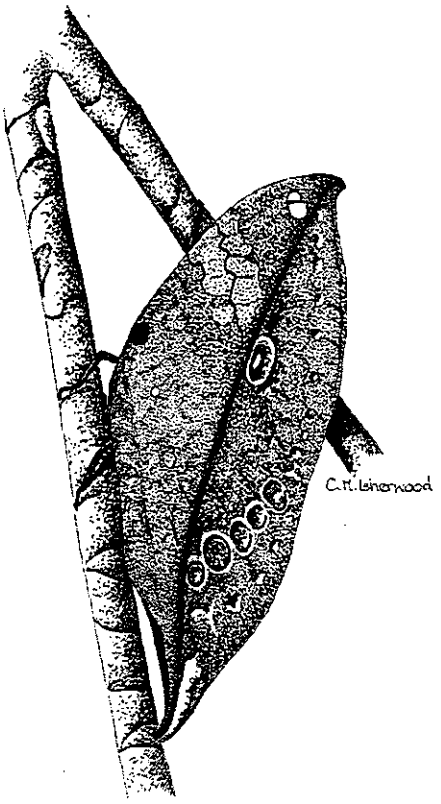
Numerous tree frogs of the genus *Philautus* were seen but were not identified to species level.

CLIFF FROG
Nannophrys sp. (*guntheri ?*)

Nannophrys is a genus endemic to Sri Lanka (Manamendra-Arachchi 1996). Tadpoles and adult frogs were found on a steep rock slope at Delwala, kept wet by a gentle stream of water. Tadpoles did not swim but moved with a shuffling action across the wet rock surface. Adults were found but not identified to species level, although it is thought they were of the species *guntheri*. This identification is based more on the habitat in which the species was found than on any morphological features.

COMMON TOAD
Bufo melanostictus

Widely distributed in Asia. Common in disturbed habitat and villages at all sites. Often found inside human habitation.



Oak-leaf Butterfly

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Appendices

Sri Lanka Myna
Gracula ptilogenys

Appendix I: Systematic list of vertebrate species recorded

The following list records species observed at the fieldwork sites and the surrounding area. We have included species encountered only in villages on the forest edge and in agricultural land (for an annotated checklist see Appendix III).

Key to symbols

D Delwala PR W Walankanda FR K Kudumiriya PR

✓ observed in the forest sites (may also have been seen in non-forest habitat)

observed during field work but not in forest habitat

* endemic species ** endemic genus

[En] Endangered [Vu] Vulnerable [NT] Near-threatened

Birds		D	W	K
Sri Lanka Spurfowl*	*Galloperdix bicalcarata*	✓	✓	✓
Sri Lanka Junglefowl*	*Gallus lafayetii*	✓	✓	✓
Brown-capped Pygmy Woodpecker	*Dendrocopos nanus*	✓		
Lesser Yellownape	*Picus chlorolophus*	✓	✓	✓
Black-rumped Flameback	*Dinopium benghalense psarodes*	✓	✓	✓
Greater Flameback	*Chrysocolaptes lucidus*	✓	✓	✓
Brown-headed Barbet	*Megalaima zeylanica*	✓	✓	#
Yellow-fronted Barbet*	*Megalaima flavifrons*	✓	✓	✓
Crimson-fronted Barbet	*Megalaima rubricapilla*	✓	✓	✓
Sri Lanka Grey Hornbill*	*Ocyceros gingalensis*	✓	✓	✓
Malabar Trogon	*Harpactes fasciatus*	✓	✓	✓
Common Kingfisher	*Alcedo atthis*	#		
White-throated Kingfisher	*Halcyon smyrnensis*	#	#	#
Chestnut-headed Bee-eater	*Merops leschenaulti*	#		
Asian Koel	*Eudynamys scolopacea*	#		
Red-faced Malkoha	*Phaenicophaeus pyrrhocephalus*		✓	✓
Greater Coucal	*Centropus sinensis*	#	#	✓
Green-billed Coucal*[En]	*Centropus chlororhynchus*	✓	✓	✓
Sri Lanka Hanging Parrot*	*Loriculus beryllinus*	✓	✓	✓
Alexandrine Parakeet	*Psittacula eupatria*	✓	✓	
Rose-ringed Parakeet	*Psittacula krameri*	✓	#	
Plum-headed Parakeet	*Psittacula cyanocephala*	✓	#	✓
Layard's Parakeet*	*Psittacula calthropae*	✓	✓	✓
Indian Swiftlet	*Collocalia unicolor*	✓	✓	✓
Brown-backed Needletail	*Hirundapus giganteus*	✓	#	#
Asian Palm Swift	*Cypsiurus balasiensis*	✓	#	#
House Swift	*Apus affinis*	#		#
Crested Treeswift	*Hemiprocne coronata*	✓	✓	#
Collared Scops Owl	*Otus bakkamoena*			#
Spot-bellied Eagle Owl[NT]	*Bubo nipalensis*	✓	✓	#
Chestut-backed Owlet*[NT]	*Glaucidium castanonotum*	✓	✓	✓
Brown Hawk Owl	*Ninox scutulata*			✓
Sri Lanka Frogmouth[NT]	*Batrachostomus moniliger*	✓		
Sri Lanka Wood Pigeon*[Vu]	*Columba torringtoni*	✓	✓	✓
Spotted Dove	*Streptopelia chinensis*	#	#	✓
Emerald Dove	*Chalcophaps indica*	✓	✓	✓

Pompadour Green Pigeon	*Treron pompadora*	✓	✓	✓
Green Imperial Pigeon	*Ducula aenea*	✓	✓	✓
White-breasted Waterhen	*Amaurornis phoenicurus*	#	#	#
Oriental Honey-buzzard	*Pernis ptilorhynchus*			#
Black-shouldered Kite	*Elanus caeruleus*		#	
Crested Serpent Eagle	*Spilornis cheela*	✓	✓	✓
Shikra	*Accipiter badius*	✓	#	
Black Eagle	*Ictinaetus malayensis*	✓	✓	✓
Changeable Hawk Eagle	*Spizaetus cirrhatus*	✓	✓	✓
Mountain Hawk Eagle	*Spizaetus nipalensis*	#	✓	
Common Kestrel	*Falco tinnunculus*		✓	
Little Egret	*Egretta garzetta*	#		
Intermediate Egret	*Mesophoyx intermedia*	#		
Indian Pond Heron	*Ardeola grayii*	#	#	
Blue-winged Leafbird	*Chloropsis cochinchinensis*	✓	#	
Golden-fronted Leafbird	*Chloropsis aurifrons*	✓	✓	✓
Sri Lanka Blue Magpie*^{Vu}	*Urocissa ornata*	✓	✓	✓
House Crow	*Corvus splendens*	#		
Large-billed Crow	*Corvus macrorhynchos*	#	✓	✓
Black-hooded Oriole	*Oriolus xanthornus*	#	#	✓
Large Cuckooshrike	*Coracina macei*	#		
Small Minivet	*Pericrocotus cinnamomeus*	✓	✓	✓
Scarlet Minivet	*Pericrocotus flammeus*	✓	✓	✓
Bar-winged Flycatcher-shrike	*Hemipus picatus*	✓	✓	✓
White-browed Fantail	*Rhipidura aureola*	✓		
White-bellied Drongo	*Dicrurus caerulescens*	✓	✓	✓
Greater Rackuet-tailed Drongo	*Dicrurus paradiseus*	✓	✓	✓
Black-naped Monarch	*Hypothymis azurea*	✓	✓	✓
Common Iora	*Aegithina tiphia*	✓	✓	✓
Spot-winged Thrush*^{NT}	*Zoothera spiloptera*	✓	✓	✓
Scaly Thrush	*Zoothera dauma*		✓	
Tickell's Blue Flycatcher	*Cyornis tickelliae*	✓	✓	✓
Grey-headed Canary Flycatcher	*Culicicapa ceylonensis*		✓	
Oriental Magpie Robin	*Copsychus saularis*	#	#	#
Indian Robin	*Saxicoloides fulicata*		#	
White-faced Starling*^{NT}	*Sturnus albofrontatus*	✓	✓	✓
Common Myna	*Acridotheres tristis*	#	#	#
Sri Lanka Myna*	*Gracula ptilogenys*	✓	✓	✓
Hill Myna	*Gracula religiosa*	✓	#	
Velvet-fronted Nuthatch	*Sitta frontalis*	✓	✓	✓
Great Tit	*Parus major*			✓
Barn Swallow	*Hirundo rustica*		#	
Pacific Swallow	*Hirundo tahitica*		#	
Red-rumped Swallow	*Hirundo daurica*	#	#	#
Black-crested Bulbul	*Pycnonotus melanicterus*	✓	✓	✓
Red-vented Bulbul	*Pycnonotus cafer*	#	#	#
White-browed Bulbul	*Pycnonotus luteolus*	#	✓	#
Yellow-browed Bulbul	*Iole indica*	✓	✓	✓
Black Bulbul	*Hypsipetes leucocephalus*	✓	✓	✓
Zitting Cisticola	*Cisticola juncidis*		#	

Grey-breasted Prinia	*Prinia hodgsonii*	#		
Jungle Prinia	*Prinia sylvatica*		#	
Ashy Prinia	*Prinia socialis*		#	
Plain Prinia	*Prinia inornata*	#	✓	
Sri Lanka White-eye*	*Zosterops ceylonensis*	✓	✓	✓
Oriental White-eye	*Zosterops palpebrosus*	✓	✓	
Common Tailorbird	*Orthotomus sutorius*	#	#	#
Ashy-headed Laughingthrush*[Vu]	*Garrulax cinereifrons*	✓	✓	✓
Brown-capped Babbler*	*Pellorneum fuscocapillum*	✓	✓	✓
Indian Scimitar Babbler	*Pomatorhinus horsfieldii*	✓	✓	✓
Tawny-bellied Babbler	*Dumetia hyperythra*		#	
Dark-fronted Babbler	*Rhopocichla atriceps*	✓	✓	✓
Orange-billed Babbler*	*Turdoides rufescens*	✓	✓	✓
Yellow-billed Babbler	*Turdoides affinis*	#	#	#
Thick-billed Flowerpecker	*Dicaeum agile*			✓
Legge's Flowerpecker*[NT]	*Dicaeum vincens*	✓	✓	✓
Pale-billed Flowerpecker	*Dicaeum erythrorynchos*	✓	✓	✓
Purple-rumped Sunbird	*Nectarinia zeylonica*	✓	✓	✓
Loten's Sunbird	*Nectarinia lotenia*	✓	#	✓
House Sparrow	*Passer domesticus*	#		#
Grey Wagtail	*Motacilla cinerea*		#	
White-rumped Munia	*Lonchura striata*	✓	✓	#
Black-throated Munia	*Lonchura kelaarti*	✓	✓	✓
Scaly-breasted Munia	*Lonchura punctulata*	#	#	#
Mammals				
Indian Pangolin	*Manis crassicaudata*[NT2]	✓		
Lesser False Vampire Bat	*Maderma spasma ceylonense*	✓		
Horseshoe Bat	*Rhinolaphus rouxi rouxi*	✓		
Slender Loris	*Loris tardigradus*[Vu2]	✓		✓
Western Toque Macaque	*Macaca sinica**[NT2]	✓	✓	✓
Purple-faced Leaf Monkey	*Trachypithecus vetulus**[Vu]	✓	✓	✓
Golden Palm Civet	*Paradoxurus zeylonensis**	✓		
Ruddy Mongoose	*Herpestes smithii*	✓		
Fishing Cat	*Prionailurus viverrinus**[NT2]		✓	
Leopard	*Panthera pardus*[En1]		✓	✓
Asian Elephant	*Elephas maximus maximus*[En1]	✓	✓	
Wild Boar	*Sus scrofa*	✓	✓	✓
Sambar Deer	*Cervus unicolor*	✓	✓	
Sri Lanka Giant Squirrel	*Ratufa macroura melanochra*[Vu2]	✓	✓	✓
Layard's striped squirrel	*Funambulus layardi*	✓	✓	✓
Dusky-striped jungle squirrel	*Funambulus sublineatus obscurus*	✓	✓	✓
Indian Crested Porcupine	*Hystrix indica*	✓	✓	✓
Reptiles				
Python	*Python molurus molurus*[NT2]	✓		
Hump-nosed Viper	*Hypnale hypnale*	✓	✓	✓
Earth Snake	*Rhinophis tricolourata*	✓		
Green-pit Viper	*Trimeresurus trigonocephala**	✓	✓	✓
Green-whip Snake	*Ahaetulla nasutus*	✓	✓	✓

Brown-Speckled Whip Snake	*Ahaetulla pulverulentus*	✓	✓	✓
Gunther's Bronze Back	*Dendrelaphis caudolineolatus*	✓		
Indian Cobra	*Naja naja*[3]	✓	✓	
Blossom Krait	*Balanophis ceylonensis***	✓		
Rough-nosed Horned Lizard	*Ceratophora aspera***	✓		
Earless Lizard	*Otocryptis wiegmanni**	✓	✓	✓
Green Garden Lizard	*Calotes calotes*	✓	✓	✓
Hump-nosed Lizard	*Lyriocephalus scutatus***	✓	✓	✓
Water Monitor	*Varanus salvator*[2]	✓		
Common Sand Lizard	*Calotes versicolour*	✓	✓	✓
Rat-snake Skink	*Mabuya carinata*	✓	✓	✓
Spotted Skink	*Mabuya macularia*	✓	✓	✓
Three-toed Snake Skink	*Nessia bertoni***	✓	✓	✓
Amphibians				
Wrinkled Frog	*Rana corrgata*	✓	✓	✓
Tree Frog	*Philautus* spp.	✓	✓	✓
Cliff Frog	*Nanophrys* sp. *(guntheri?)***	✓		
Common Toad	*Bufo melanostictus*	✓	✓	✓

Appendix II: Sinhala names for species recorded

Sinhala names for birds follow Kotagama & Fernando (1994). For mammals and reptiles, names follow Banks & Banks (1995). For reptiles not listed in Banks & Banks, names follow de Silva Wijeyeratne (in prep).

Birds	
Galloperdix bicalcarata	Lanka Haban-kukukla
Gallus lafayetii	Lanka Wali kukula
Dendrocopos nanus	Kuru Gomara-karala
Dinopium benghalense	Pita rathu Rath-kerela
Chrysocolaptes lucidus	Pita levan Maha-kerela
Megalaima zeylanica	Polos Kuttoruwa
Megalaima flavifrons	Ran nala Kottoruwa
Megalaima rubricapilla	Oluwa rathu Kottorowa
Ocyceros gingalensis	Alu Kandaththa
Harpactes fasciatus	Lohawannichchiya
Alcedo atthis	Podu mal-Pilihuduwa
Halcyon smyrnensis	Laya sudu Pilihuduwa
Merops leschenaulti	Pinguhis Binguharaya
Eudynamys scolopacea	Koha
Phaenicophaeus pyrrhocephalus	Watha rathu Malkhoa
Centropus sinensis	Ati-Kukula
Centropus chlororhynchus	Lanka bata Ati-Kukula
Loriculus beryllinus	Lanka Giramaliththa
Psittacula eupatria	Labu Girawa
Psittacula krameri	Rana Girawa
Psittacula cyanocephala	Pandu Girawa
Psittacula calthropae	Lanka alu Girawa
Collocalia unicolor	Indiyanu Kadal-thurithaya
Hirundapus giganteus	Katupenda-thurithaya
Cypsiurus balasiensis	hal-thurithaya
Apus affinis	Katiya sudu-thurithaya
Hemiprocne coronata	Silu Ruk--thurithaya
Otus bakkamoena	Kan-diga Bassa
Bubo nipalensis	Ulama
Glaucidium castanonotum	Lanka pithamabala Wana-bassa
Ninox scutulata	Dumburu Ukusu-bassa
Batrachostomus moniliger	Madi-muhuna
Columba torringtoni	Lanka Mali-goya
Streptopelia chinensis	Alu Kobeyiya
Chalcophaps indica	Neela-kobeyiya
Treron pompadora	Pompadura Batagoya
Ducula aenea	Maha Neela-Goya
Amaurornis phoenicurus	Laya sudu Korawakka
Pernis ptilorhynchus	Siluvathi Bambarukussa
Elanus caeruleus	Pathanukussa
Spilornis cheela	Sarapukussa
Accipiter badius	Kurulugoya
Ictinaetus malayensis	Kalukussa
Spizaetus cirrhatus	Kondakussa
Spizaetus nipalensis	Kandakara Bondakussa
Falco tinnunculus	Parisarikussa
Egretta garzetta	Kuda Ali-koka
Mesophoyx intermedia	Sudu Madi-koka
Ardeola grayii	Kana-koka
Chloropsis cochinchinensis	Jerdonge Kolarisiya
Chloropsis aurifrons	Ran alika Kolarisiya
Urocissa ornata	Lanka Kahibella
Corvus splendens	Colamba Kaka
Corvus macrorhynchos	Kalu Kaputa
Oriolus xanthornus	Hissa Kalu Kahakurulla
Coracina macei	Maha Kovul-saratittha
Pericrocotus cinnamomeus	Kuda Minivittha
Pericrocotus flammeus	Maha Minivittha
Hemipus picatus	Gomara kalu Saratittha
Rhipidura aureola	Sudu Avenpendamara
Dicrurus caerulescens	Podu Kauda
Dicrurus paradiseus	Kalu silu Kauda
Hypothymis azurea	Nil Radamara
Aegithina tiphia	Iorava
Zoothera spiloptera	Lanka thithpiya Thirasikaya
Zoothera dauma	Pehtigomara Thirasikaya
Cyornis tickelliae	Laya thambilivan Nil-masimara
Culicicapa ceylonensis	Hisa alu Masimara
Copsychus saularis	Polkichcha
Saxicoloides fulicata	Kalukichcha
Sturnus albofrontatus	Lanka hisa-sudu Sharikava
Acridotheres tristis	Myna
Gracula ptilogenys	Lanka Salalihiniya
Gracula religiosa	Podu salalihiniya
Sitta frontalis	Viluda alika Tyatikirttha

Parus major	Alu Tikirittha
Hirundo rustica	Wahi-liniya
Hirundo tahitica	Kandukara Wahi-liniya
Hirundo daurica	Rathu kati Wahi-lihiniya
Pycnonotus melanicterus	Kisa kalu Kondaya
Pycnonotus cafer	Kondaya
Pycnonotus luteolus	Bama-sudu Kondaya
Iole indica	Bama-kaha Galuguduwa
Hypsipetes leucocephalus	Kalu-kondaya
Cisticola juncidis	Rekhankitha Avan-raviya
Prinia hodgsonii	Frankalinge Priniya
Prinia sylvatica	Maha Priniya
Prinia socialis	Alupaha Priniya
Prinia inornata	Bama-sudu Priniya
Zosterops ceylonensis	Lanka Sithasiya
Zosterops palpebrosus	Kuda Sithasiya
Orthotomus sutorius	Battichcha
Garrulax cinereifrons	Alu-demalichcha
Pellorneum fuscocapillum	Lanka Mudun Bora-demalichcha
Pomatorhinus horsfieldii	Da-demalichcha
Dumetia hyperythra	Gela Sudu Landu-demalichcha
Rhopocichla atriceps	Hisa kalu Panduru-demalichcha
Turdoides rufescens	Rathu Demalichcha
Turdoides affinis	Peethakashi Thana-demalichcha
Dicaeum agile	Thuda mahatha Pilalichcha
Dicaeum vincen	Lanka Pilalichcha
Dicaeum erythrorynchos	Kuda Pilalichcha
Nectarinia zeylonica	Dam kati Sutikka
Nectarinia lotenia	Lotenge Sutikka
Passer domesticus	Ge Kurulla
Motacilla cinerea	Alu Halapenda
Lonchura striata	Pita sudu Wee-kurulla
Lonchura kelaarti	Kandukara Wee-kurulla
Lonchura punctulata	Thith Wee-kurulla

Mammals

Manis crassicaudata	Kaba-laya
Maderma spasma	
Rhinolaphus rouxi	
Loris tardigradus	Unahapuluva
Macaca sinica	Rilawa
Trachypithecus vetulus	Kalu-Vandhura
Paradoxurus zeylonensis	Kalawedda
Herpestes smithii	Hotamba
Prionailurus viverrinus	Handun-Diviya
Panthera pardus	Kotiya-Diviya
Elephas maximus maximus	Aliya
Sus scrofa	Wal-ura
Cervus unicolor	Gona
Ratufa macroura melanochra	Dandulena
Funambulus layardi	Lena
Funambulus sublineatus obscurus	Lena
Hystrix indica	

Reptiles

Python molurus molurus	Ran pimbura
Hypnale hypnale	Mukalan kunukatuva
Rhinophis tricolourata	
Trimeresurus trigonocephala	Pola polanga
Ahaetulla nasutus	Ahatulla
Ahaetulla pulverulentus	Henakandaya
Dendrelaphis caudolineolatus	Vari haldanda
Naja naja	Naya
Balanophis ceylonensis	
Ceratophora aspera	
Otocryptis wiegmanni	
Calotes calotes	
Lyriocephalus scutatus	
Varanus salvator	Kabaragoya
Calotes versicolour	
Mabuya Carinata	
Mabuya macularia	
Nessia bertoni	

Amphibians

Rana corugata	Gemba
Philautus spp.	Gas Gemba
Nanophrys (guntheri?)	Gemba
Bufo melanostictus	Gemba

Appendix III: Annotated checklist of bird species recorded

Key to symbols

* Endemic En Endangered Vu Vulnerable NT Near-threatened

Sri Lanka Spurfowl*
Galloperdix bicalcarata
See page 45.

Sri Lanka Junglefowl*
Gallus lafayetii
See page 45.

Brown-capped Pygmy Woodpecker
Dendrocopus nanus
Uncommon. Seen once on the main logging track through the forest at Delwala.

Lesser Yellownape
Picus chlorolophus
Common in forest at all sites. Not as vocal as the two larger forest woodpeckers, but commonly observed following mixed-species foraging flocks (usually two birds per flock). Occasionally seen in edge habitat at Delwala.

Black-rumped Flameback[1]
Dinopium benghalense
This species has a similar call to the Greater Flameback *Chrysocolaptes lucidus*, which caused some confusion when identifying woodpeckers by call. However, the species was recorded visually at each site, more commonly in edge habitat and villages than in forest. Seen occasionally in mixed-species flocks together with *C. lucidus*.

Greater Flameback[2]
Chrysocolaptes lucidus
Common in forest habitat at all sites. Often seen associating with mixed-species foraging flocks. Occasionally found in edge habitat and villages.

Brown-headed Barbet
Megalaima zeylanica
Common on the forest edge at all sites. Occasionally encountered in forest, either alone or associated with mixed-species flocks.

Yellow-fronted Barbet*
Megalaima flavifrons
See page 46.

Crimson-fronted Barbet
Megalaima rubricapilla
Uncommon at all three sites. Associated with forest and forest edge habitats, recognised by distinctive call and usually found alone or in pairs.

Sri Lanka Grey Hornbill*
Ocyceros gingalensis
See page 45.

Malabar Trogon
Harpactes fasciatus
Fairly common at all sites. A very quiet forest bird, often hard to locate. Usually seen in pairs following mixed-species foraging flocks, but occasionally observed feeding singly in the mid-storey.

Common Kingfisher
Alcedo atthis
Fairly common in Delwala village, always associated with water, not seen at the other two sites.

White-throated Kingfisher
Halcyon smyrnensis
Very common at all sites. Regularly seen perched on telegraph wires by the roadside or on trees in forest edge habitat. Never seen in forest.

[1] Commonly known as Red-backed Woodpecker.
[2] Commonly known as Crimson-backed Woodpecker.

Chestnut-headed Bee-eater
Merops leschenaulti
Common in the village at Delwala. Usually small groups seen on telegraph wires, hawking insects.

Asian Koel
Eudynamys scolopacea
Fairly common in the village at Delwala but never recorded at the forest sites.

Red-faced Malkoha*[Vu]
Phaenicophaeus pyrrhocephalus
See page 39.

Greater Coucal
Centropus sinensis
Fairly common close to villages at all sites. Not found in primary forest but seen at Kudumiriya associated with regenerated chena patches.

Green-billed Coucal*[En]
Centropus chlororhynchus
See page 38.

Indian Swiftlet
Collocalia unicolor
Common at Delwala, fairly common at Kudumiriya and Walankanda. Seen flying over edge habitats and forest, mostly in groups of at least three or four.

Brown-backed Needletail
Hirundapus giganteus
Fairly common at Delwala, uncommon at Walankanda and Kudumiriya. Seen flying over edge habitat and forest canopy in large, diffuse flocks of up to 25 individuals.

Asian Palm Swift
Cypsiurus balasiensis
Uncommon at all three sites. Seen over edge habitats and forest.

House Swift
Apus affinis
Common at Delwala and Kudumiriya; not seen at Walankanda. Recorded flying in scattered groups, often with other swift species, over edge and forest habitat.

Crested Treeswift
Hemiprocne coronata
Uncommon at all sites. Seen in forest and in scrub on forest edge. Observed perching on trees as well as flying in small groups above the canopy.

Sri Lanka Hanging Parrot*[3]
Loriculus beryllinus
See page 46.

Alexandrine Parakeet
Psittacula eupatria
Rare at all sites. At Delwala it was heard flying over the forest canopy once and was seen once on the forest edge. Recorded on one occasion in Walankanda.

Rose-ringed Parakeet
Psittacula kramerii
Seen occasionally in the village at Delwala and Walankanda, feeding on agricultural crops or in fruit trees in village gardens.

Layard's Parakeet*
Psittacula calthropae
See page 47.

Plum-headed Parakeet
Psittacula cyanocephala
Uncommon at Delwala and Walankanda. Very common on the forest edge at Walankanda, roosting in trees above cinnamon, tea and *Citronella* plantations.

Collared Scops Owl
Otus bakkamoena
Heard one night in edge habitat at Kudumiriya, but not verified visually.

Spot-bellied Eagle[NT4]
Bubo nipalensis
See page 41.

Chestnut-backed Owlet*[NT]
Glaucidium castanonotum
See page 42.

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[3] Sri Lanka (Ceylon) Lorikeet is the name given in Henry (1955) and is commonly used in Sri Lanka.
[4] Forest Eagle Owl is the name given by Henry (1955) and is in common use in Sri Lanka.

Brown Hawk Owl
Ninox scutulata
Heard twice near camp at Kudumiriya before dawn; not verified visually, but good sound recordings made.

Sri Lanka Frogmouth[NT]
Batrachostomus moniliger
See page 42.

Sri Lanka Wood-Pigeon*[Vu]
Columba torringtoni
See page 40.

Spotted Dove
Streptopelia chinensis
Very common at all sites. Seen in villages and agricultural land on the forest edge. Not found within forest, but frequently seen in *Pinus* plantations at Kudumiriya.

Emerald Dove
Chalcophaps indica
Very common in forest at Delwala; common at the other two forests. Frequently seen flying rapidly through the forest at mid-storey/understorey level, often in pairs. Call may have been initially confused with that of Green Imperial-Pigeon *Ducula aenea*. Occasionally seen in edge habitats.

Pompadour Green Pigeon
Treron pompadora
Fairly common at Delwala; uncommon at Walankanda and Kudumiriya. More often heard than seen, with a distinctive "radio-tuning" call. Associated with edge habitat more than primary rainforest.

Green Imperial Pigeon
Ducula aenea
Fairly common in forest at all sites. Also seen in villages and in edge habitat. Numbers are hard to determine as there was some confusion about its call. Most frequently seen alone or in pairs but on one occasion seven or eight birds were roosting together in Delwala village.

White-breasted Waterhen
Amaurornis phoenicurus
Commonly seen in agricultural land on the village edge at all sites, associated with paddy fields.

Oriental Honey-buzzard
Pernis ptilorhynchus
Seen once only, soaring over the forest edge at Kudumiriya.

Black-shouldered Kite
Elanus caeruleus
Seen once, perched above a paddy field on the edge of Walankanda.

Crested Serpent Eagle
Spilornis cheela
Fairly common at all sites. Recorded regularly in forest, flying within the canopy or perched in large emergent trees. Occasionally seen on forest edge. On one occasion, an aggressive interaction was seen above the forest at Delwala between a Crested Serpent-Eagle and a Black Eagle *Ictinaetus malayensis*.

Shikra
Accipiter badius
Fairly common in edge habitat at Delwala and Walankanda. One was observed raiding a white-eye (*Zosterops* sp.) nest close to Delwala village. A single sighting in the forest at Delwala.

Black Eagle
Ictinaetus malayensis
The most frequently seen raptor. Present at all sites soaring over all habitats, particularly forest, in pairs or individually. In the surveyed area around Delwala at least four individuals were present. At Walankanda three were occasionally seen together and at Kudumiriya at least one pair was present.

Changeable Hawk Eagle
Spizaetus cirrhatus
Recorded twice at Delwala, once at Walankanda and three times at Kudumiriya, soaring above the forest edge.

Mountain Hawk Eagle
Spizaetus nipalensis
Recorded once on the forest edge at Delwala and once over the forest at Walankanda.

Common Kestrel
Falco tinnunculus
Recorded twice at Walankanda, perched in a dead tree on the forest edge and flying over low canopy. Both records refer to females and may have been the same individual.

Little Egret
Egretta garzetta
Common on agricultural land close to Delwala village.

Intermediate Egret
Mesophoyx intermedia
Fairly common on agricultural land close to Delwala village.

Indian Pond-Heron
Ardeola grayii
Common, associated with paddy fields on the forest edge at Delwala and Walankanda.

Blue-winged Leafbird
Chloropsis cochinchinensis
Uncommon at Delwala and Walankanda, both in forest and edge habitats. Not seen at Kudumiriya.

Golden-fronted Leafbird
Chloropsis aurifrons
Fairly common at all sites. Seen in forest and less frequently in edge habitats.

Sri Lanka Blue Magpie*[Vu]
Urocissa ornata
See page 40.

House Crow
Corvus splendens
Very common in Delwala village.

Large-billed Crow
Corvus macrorhynchus
Uncommon in villages and forest edge habitat at all sites.

Black-hooded Oriole
Oriolus xanthornus
Common in forest edge habitat and villages at all three sites.

Large Cuckooshrike
Coracina macei
Rare, seen on just two occasions in edge habitat at Delwala.

Small Minivet
Pericrocotus cinnamomeus
Fairly common in forest edge habitat, villages and forest at all sites.

Scarlet Minivet
Pericrocotus flammeus
Common in forest and edge habitats at Delwala and Walankanda; very common at Kudumiriya. Most frequently seen foraging for insects in the canopy as part of mixed-species foraging flocks.

Bar-winged Flycatcher-shrike
Hemipus picatus
Fairly common in forest edge and disturbed forest habitat at all sites.

White-browed Fantail
Rhipidura aureola
Rare at Delwala; seen in forest and other habitats. Not observed at the other two sites.

White-bellied Drongo
Dicrurus caerulescens
Common in forest edge habitat and villages at all sites. Occasionally seen in disturbed forest but never in primary forest.

Greater Racket-tailed Drongo[5]
Dicrurus paradiseus lophorhinus
Fairly common in the forest at all sites. Almost always found in large noisy mixed-species foraging flocks with Sri Lanka Orange-billed Babblers *Turdoides rufescens* also present. Mimics vocalisations of other species. Flycatches from understorey perches. The subspecies *D. p. lophorhinus* is restricted to the wet zone whereas another subspecies, *D. paradiseus ceylonicus* is found only in the

[5] The distinctive subspecies in the south-west is known as the Crested Drongo.

dry zone. *D. p. lophorhinus* usually lack the 'Racket-tails' of *ceylonensis* (Henry 1955) but there appears to be some confusion as some *D. paradiseus* we observed in the study sites had clear Racket-tails.

Black-naped Monarch
Hypothymis azurea
Fairly common in the forest at all three sites. Less common in edge habitat.

Common Iora
Aegithina tiphia
Uncommon in forest at all sites, but fairly common in disturbed forest or on the forest edge.

Spot-winged Thrush*[NT]
Zoothera spiloptera
See page 43.

Scaly Thrush
Zoothera dauma
Rare, seen only once in the forest at Walankanda. Calls initially attributed to this species were later verified as Spot-winged Thrush *Zoothera spiloptera.*

Tickell's Blue Flycatcher
Cyornis tickelliae
Common in forest at all three sites. Occasionally seen on forest edge at Delwala.

Grey-headed Canary-flycatcher
Culicicapa ceylonensis
Common at Walankanda in forest above 1,000 m. Rarely observed outside mixed-species foraging flocks. Not seen at the other two sites.

Oriental Magpie Robin
Copsychus saularis
Common in villages near all sites; never seen in forest.

Indian Robin
Saxicoloides fulicata
Uncommon in villages and in edge habitat at Walankanda.

White-faced Starling*[NT,6]
Sturnus albofrontatus
See page 43.

Common Myna
Acridotheres tristis
Very common in villages and surrounding agricultural land. Never seen in forest. Kept as pets by villagers.

Sri Lanka Myna[7]*
Gracula ptilogenys
See page 47.

Hill Myna
Gracula religiosa
Common on forest edge and in lower forested areas at Delwala and Walankanda. Uncommon in forest above 700 m. Call similar to that of Sri Lanka Myna and some confusion occurred. Small flocks containing both species were observed in selectively logged forest at Delwala.

Velvet-fronted Nuthatch
Sitta frontalis
Fairly common in the forest at all sites. Two or three individuals present in most mixed-species flocks.

Great Tit
Parus major
Fairly common in forest at Kudumiriya, always associated with mixed-species flocks. Not seen at other sites.

Pacific Swallow
Hirundo tahitica
Fairly common at Walankanda with a group of over 30 individuals seen over the *Citronella* and *Eucalyptus* fields. Not seen at other sites.

Red-rumped Swallow
Hirundo daurica
Common close to villages in agricultural land at Walankanda and Kudumiriya; uncommon at Delwala.

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[6] Until recently known as *Sturnus senex*; correct nomenclature clarified by Mees (1997).
[7] Sri Lanka (Ceylon) Grackle is the name given in Henry (1955) and commonly used in Sri Lanka.

Black-capped Bulbul
Pycnonotus melanicterus
Common in disturbed and primary forest at all sites.

Red-vented Bulbul
Pycnonotus cafer
Common on the forest edge and in villages at all sites; never seen in forest.

White-browed Bulbul
Pycnonotus luteolus
Common at all sites; seldom seen in forest.

Yellow-browed Bulbul
Iole indica
Very common in forest at all sites.

Black Bulbul
Hypsipetes leucocephalus
Very common in forest at all sites, particularly at higher altitudes.

Zitting Cisticola
Cisticola juncidis
Fairly common on the forest edge at Walankanda; never seen in forest.

Grey-breasted Prinia
Prinia hodgsonii
Rare on the forest edge at Delwala; not seen at other sites.

Jungle Prinia
Prinia sylvatica
Uncommon on forest edge at Walankanda; not recorded at other sites.

Ashy Prinia
Prinia socialis
Fairly common on the edge at Walankanda; not recorded at other sites.

Plain Prinia
Prinia inornata
Fairly common in edge habitats at Delwala and Walankanda. One seen in disturbed forest at Walankanda.

Sri Lanka White-eye[8]*
Zosterops ceylonensis
See page 48.

Oriental White-eye*
Zosterops palpebrosus
Fairly common in the forest at Delwala and Walankanda. Not seen at Kudumiriya. Most often seen up to *c.*1,000 m. Above this altitude *Z. ceylonensis* was more common. There is a zone of altitudinal overlap where both species occur in similar numbers and even flock together.

Common Tailorbird
Orthotomus sutorius
Common on forest edge and in villages at all sites. Never recorded in forest.

Ashy-headed Laughingthrush*[Vu]
Garrulax cinereifrons
See page 41.

Brown-capped Babbler*
Pellorneum fuscocapillum
See page 49.

Indian Scimitar-Babbler
Pomatorhinus horsfieldii
Common in forest at all sites, occasionally seen in forest edge at Delwala. Distinctly an understorey bird.

Tawny-bellied Babbler
Dumetia hyperythra
Common in cinnamon and *Citronella* cultivations close to the village at Walankanda; not seen at other sites.

Dark-fronted Babbler
Rhopocichla atriceps
Very common in forest and forest edge at all sites.

Orange-billed Babbler*[9]
Turdoides rufescens
See page 49.

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[8] Hill White-eye is the name given by Henry (1955) and is commonly used in Sri Lanka.

[9] Sri Lanka Rufous Babbler is the name given in Henry (1955) and commonly used in Sri Lanka.

Yellow-billed Babbler
Turdoides affinis
Very common in villages and forest edge habitat at all sites; occasionally seen in disturbed forest at Delwala.

Thick-billed Flowerpecker
Dicaeum agile
Apparently uncommon. This species was only recorded in the forest at Kudumiriya, but its close rememblance to Pale-billed Flowerpecker *D. erythrorhynchos* means that many encounters attributed to the latter may have been *D. agile.*

Legge's Flowerpecker[10]*NT
Dicaeum vincens
See page 44.

Pale-billed Flowerpecker
Dicaeum erythrorynchos
Very common in forest and forest edge habitats at all sites (see *D. agile*).

Purple-rumped Sunbird
Nectarinia zeylonica
Common in forest and forest edge at all sites. In forest, often seen feeding on secondary shrubs, such as *Osbeckia octandra,* along logging tracks.

Loten's Sunbird
Nectarinia lotenia
Uncommon in forest at all sites. More frequently observed in villages and on the forest edge than in forest.

House Sparrow
Passer domesticus
Very common in villages at all sites. Never seen in forest.

Grey Wagtail
Motacilla cinerea
One seen in edge habitat at Walankanda.

White-rumped Munia
Lonchura striata
Common in villages around all forest sites. Most common on paddy fields or in grassland. Occasionally seen in forest edge habitat.

Black-throated Munia
Lonchura kelaarti
Uncommon in forest at all sites. Only recorded above 700 m and in forest habitat.

Scaly-breasted Munia
Lonchura punctulata
Very common in villages and in agricultural land at all sites.

[10] White-throated Flowerpecker is the name given by Kotagama & Fernando (1994) and is in common usage in Sri Lanka.

Appendix V: Biometric data

Table 5a gives information on netting effort. One 'metre-net hour' is one metre of mist-net operated for one hour; 'net encounter rate' is defined as number of individuals netted per 100 metre net hours. In total, 101 individuals of 20 species were captured.

Table 5b below gives biometric data for all birds captured. Some individuals were marked with plastic colour rings. Please contact the authors for a list of dates of capture of marked birds. All measurements are given in mm unless otherwise indicated.

Weight: spring balances were used to give weights to the nearest 0.5 g.
Wing length: wing unstraightened but flattened, measured to the nearest 0.5 mm.
Tail length: from the cloaca to the tip of the longest tail feather, measured to the nearest 0.5 mm.
Tarsus: from the depression in the angle of the intertarsal joint to the end of the tarsus with the toes carefully pressed down. Callipers used to measure to the nearest 0.5 mm.
Bill length (skull to tip): measured from the bill's union with the skull to the bill tip.
Bill length (nares to tip): measured from the distal end of the nostril to the bill tip.
Bill width: measured at the basal end of the bill behind the nostrils.

Key to symbols

D1 1st netting station at Delwala, operated 9-13 July, 9-10 August
D2 2nd netting station at Delwala, operated 14-18 July
D3 3rd netting station at Delwala, operated 10-12 August
W netting station at Walankanda, operated 30 August-3 September
\- no data collected

Table 5a Shows netting effort at each site and the number of bird species and individuals caught.

location	approximate altitude (m)	number of species	number of individuals	metre-net hours	encounter rate (per 100 net hours)
D1	300	8	10	2199	0.45
D2	730	7	10	3168	0.31
D3	600	6	34	512	6.64
W	550	15	47	2255	2.08

Table 5b biometric data for all birds caught.

species	weight (g)	wing	tarsus	tail	bill: width	bill: tip-nares	bill: skull-tip
Megalaima flavifrons	68.0	91.0	25.4	67.0	9.8	14.7	21.8
	62.0	90.0	25.2	57.0	11.5	14.2	21.5
mean	65.0	90.5	25.3	62.0	10.7	14.5	21.7
Centropus chlororhyncus	271.0	196.0	48.5	25.3	15.9	29.0	53.0
Glaucidium castanonotum	94.0	125.0	23.4	64.0	12.6	109.0	18.3
Chalcophaps indica	91.0	138.0	26.0	101.0	4.9	9.2	21.0
	87.0	136.0	24.7	92.0	5.3	10.0	20.5
	90.0	139.0	24.1	95.0	4.1	8.0	19.0
	112	146.0	23.4	89.0	2.7	10.2	20.8
	102	140.0	25.7	84.0	4.3	9.5	20.0
	115	144.0	26.1	96.0	4.8	10.6	18.3
mean	99.5	140.4	25.0	92.8	4.7	9.6	19.4

species	weight (g)	wing	tarsus	tail	bill: width	bill: tip-nares	bill: skull-tip
Dicrurus paradiseus	61.0	-	23.4	14.5	11.6	20.7	32.6
Hypothymis azurea	12.0	71	16.4	70.0	6.0	8.2	13.6
Zoothera spiloptera	61.0	94.0	34.1	78.0	7.8	13.8	21.5
	56.0	97.0	34.4	78.0	7.2	14.7	23.5
mean	58.5	95.5	34.3	78.0	7.5	14.3	22.5
Cyornis tickelliae	18.0	71.0	17.4	55.0	6.3	9.1	15.0
	16.0	71.0	17.8	50.0	7.2	10.0	15.2
	19.0	72.0	18.2	59.0	7.0	9.2	14.3
mean	17.7	71.5	17.8	54.7	6.8	9.4	14.8
Iole indica	-	84.0	19.8	73.0	6.9	12.1	20.0
	32.5	90.0	19.0	78.0	7.3	11.8	20.1
	25.0	72.0	18.6	80.0	6.4	10.0	20.0
	33.0	89.0	18.8	85.0	6.4	12.6	20.5
	32.0	86.0	17.6	78.0	7.7	17.2	19.1
	31.0	86.0	18.4	75.0	6.6	11.2	19.1
	31.0	89.0	18.3	84.0	6.7	11.7	20.2
	27.0	88.0	17.8	77.0	6.7	11.0	20.3
	35.0	92.0	19.8	79.0	6.6	13.1	20.5
	35.0	91.0	18.0	79.0	6.8	11.9	21.0
	30.0	89.0	18.9	69.0	6.3	12.4	18.4
	31.0	85.0	18.3	79.0	7.4	11.6	19.3
mean	31.1	86.8	18.6	78.0	6.8	11.8	19.9
Zosterops ceylonensis	10.0	52.0	17.4	38.0	4.15	8.1	14.5
	11.0	-	-	-	-	-	-
	11.0	53.0	-	41.0	-	-	-
	-	52.0	17.5	42.0	4.7	8.0	14.15
	8.0	52.0	16.8	38.0	4.3	8.1	14.5
	11.0	52.0	17.4	40.0	4.8	8.5	15.1
	11.0	53.0	17.5	38.0	4.7	8.7	14.2
	10.0	53.0	17.0	40.0	4.6	7.7	15.4
	11.0	55.0	17.0	42.0	4.7	8.2	15.0
	10.0	51.0	16.3	39.0	4.9	8.5	14.3
	11.0	55.0	16.9	38.0	4.8	8.2	15.9
	11.0	53.0	16.8	40.0	5.1	8.7	15.9
	12.0	50.0	16.6	39.0	4.8	7.7	14.6
	10.0	56.0	17.6	44.0	4.6	8.1	14.8
	10.0	53.0	17.2	41.0	4.9	7.7	14.8
	11.0	57.0	17.8	43.0	4.8	8.3	15.0
	10.0	56.0	17.2	43.0	4.7	8.0	14.7
	11.0	55.0	17.7	41.0	4.4	8.1	14.8
	9.0	55.0	17.1	40.0	4.7	7.8	13.2
	10.0	54.0	17.1	39.0	4.9	7.6	12.3
	13.0	55.0	17.6	41.0	4.6	8.1	13.9
	-	56.0	16.0	36.0	4.9	8.1	14.3
	10.0	54.0	17.1	41.0	4.6	8.3	14.8
	11.0	54.0	16.9	39.0	4.4	7.9	14.1
	9.0	54.0	16.7	38.0	4.8	8.1	15.4
	10.0	54.0	16.5	40.0	4.1	7.6	12.8
	10.0	56.0	17.1	39.0	4.1	8.2	14.4
	9.0	51.0	14.7	31.0	3.7	6.2	11.6
	11.0	55.0	17.2	40.0	4.2	7.5	12.6
	11.0	55.0	17.1	37.0	4.6	8.0	12.5
	-	52.0	15.9	40.0	4.7	8.4	15.5
	11.0	56.0	17.8	42.0	4.2	7.6	12.6
	14.0	56.0	17.2	41.0	3.9	8.5	14.3

	10.0	52.0	17.0	35.0	4.9	7.6	12.2
mean	10.6	53.8	17.0	39.6	4.6	8.1	14.2
species	**weight (g)**	**wing**	**tarsus**	**tail**	**bill: width**	**bill: tip-nares**	**bill: skull-tips**
Zosterops palpebrosus	10.0	52.0	30.9	37.0	4.3	6.2	12.0
Garrulax cinereifrons	83.0	110.0	36.6	94.0	7.8	15.6	26.6
	89.0	115.0	37.0	111.0	7.7	15.6	26.2
mean	86.0	112.5	36.8	102.0	7.8	15.6	26.4
Pellorneum fuscocapillum	30.0	70.0	28.7	64.0	5.6	10.0	16.7
	29.5	70.0	28.0	64.0	5.0	10.1	18.7
	27.0	65.0	27.8	58.0	5.6	9.7	17.8
	27.0	68.0	26.9	45.0	4.9	8.9	16.6
mean	28.4	68.3	27.8	46.6	5.3	9.7	17.5
Pomatorhinus horsfieldii	42.0	90.0	33.4	94.0	6.8	18.0	27.5
	41.0	87.0	31.0	85.0	6.0	19.0	28.1
	41.5	88.5	32.2	89.5	6.4	18.5	27.8
mean	40.5	88.5	32.2	89.5	6.4	18.5	27.8
Rhopocichla atriceps	17.0	58.0	22.4	45.0	5.5	8.4	14.6
	16.0	60.0	22.7	48.0	5.1	8.7	15.6
	17.0	56.0	21.3	44.0	5.6	8.2	14.9
	14.5	57.0	21.7	45.0	5.2	8.4	15.8
	17.0	60.0	22.9	46.0	4.7	8.6	15.3
	16.0	57.0	-	-	-	-	-
	18.0	55.0	21.4	47.0	4.5	7.3	14.1
	15.0	54.0	22.0	46.0	4.8	7.6	13.9
	15.0	55.0	22.8	43.0	-	-	-
	15.0	53.0	22.9	54.0	5.1	7.3	13.4
	13.0	52.0	22.7	47.0	5.0	7.6	13.6
	16.0	-	-	-	-	-	-
	14.0	61.0	21.8	46.0	4.5	8.0	15.9
	17.0	55.0	22.0	45.0	4.9	7.75	15.4
mean	15.8	56.4	22.2	46.3	5.0	8.0	14.7
Turdoides rufescens	62.0	99.0	34.4	104.0	7.2	12.3	22.2
	67.0	110.0	34.9	120.0	6.2	13.2	24.5
	69.0	109.0	35.9	121.0	6.4	13.35	23.9
	62.0	101.0	36.7	114.0	6.9	12.5	22.1
	62.0	104.0	32.7	118.0	7.0	12.0	21.6
	53.0	101.0	35.0	113.0	7.1	11.3	20.9
	73.0	106.0	34.2	120.0	6.5	12.2	21.7
	65.0	111.0	35.4	121.0	6.5	12.3	23.1
mean	64.1	105.1	34.9	116.0	6.7	12.4	22.5
Dicaeum vincens	10.0	60.0	13.2	27.0	5.5	6.6	10.5
	10.0	55.0	12.7	27.0	5.9	6.2	11.2
	9.0	60.0	13.9	27.0	5.6	6.6	9.4
mean	9.7	58.3	13.3	27.0	5.6	6.5	10.4
Nectarinia zeylonica	8.0	52.0	14.9	34.0	5.4	12.3	17.2
Lonchura striata	13.0	52.0	13.9	42.0	7.2	8.3	12.7
Lonchura kelaarti	15.0	53.0	14	41.0	7.5	9.2	13.0
	15.0	54.0	14.7	46.0	7.5	9.7	13.0
	14.0	55.0	15.3	45.0	7.1	9.5	12.8
	15.0	57.0	14.7	43.0	7.9	10	13.7
	15.0	56.0	14.4	40.0	7.1	9.6	-
mean	14.8	68.8	14.6	43.0	7.4	9.6	13.1

Appendix VI: Species sound-recorded and photographed

Sound-recordings of identified bird, amphibian and mammal calls have been deposited with the National Sound Archive (Wildlife Section), U.K., and the Field Ornithology Group of Sri Lanka. Copies of some slides have been deposited with BirdLife International.

Key to symbols

H photographed in the hand
F photographed in the field
S sound-recording made
[En] Endangered
[Vu] Vulnerable
[Nt] Near threatened
* endemic species
** endemic genus

Birds		
*Galloperdix bicalcarata**		S
*Gallus lafayetii**		S
Dinopium benghalense		S
Chrysocolaptes lucidus		S
Megalaima zeylanica		S
*Megalaima flavifrons**	H	S
*Ocyceros gingalensis**	F	S
Halcyon smyrnensis	F	
Eudynamys scolopacea		S
Centropus sinensis	F	
Centropus chlororhynchus[En]	H	S
*Loriculus beryllinus**	F	S
Psittacula krameri	F	S
Psittacula cyanocephala		S
*Psittacula calthropae**	F	S
Bubo nipalensis[NT]		S
*Glaucidium castanonotum**[NT]	H	
Ninox scutulata		S
Batrachostomus moniliger[NT]	F	
*Columba torringtoni**[Vu]	F	S
Streptopelia chinensis		S
Chalcophaps indica	H	S
Treron pompadora		S
Ducula aenea	F	S
Spilornis cheela		S
Chloropsis aurifrons		S
*Urocissa ornata**[Vu]		S
Corvus splendens		
Corvus macrorhynchos		S
Oriolus xanthornus		S
Pericrocotus cinnamomeus	F	
Pericrocotus flammeus		S
Dicrurus caerulescens	F	S
Dicrurus paradiseus	F	S
Hypothymis azurea		S
Aegithina tiphia		S
*Zoothera spiloptera**[NT]	H	S
Cyornis tickelliae	H	S
*Sturnus albofrontatus**[NT]		S
Acridotheres tristis		S
*Gracula ptilogenys**		S
Gracula religiosa		S
Sitta frontalis		S
Pycnonotus melanicterus		S
Pycnonotus cafer		S
Pycnonotus luteolus		S
Iole indica	H	S
Hypsipetes leucocephalus		S
*Zosterops ceylonensis**	FH	S
Zosterops palpebrosus	H	S
Orthotomus sutorius		S
*Garrulax cinereifrons**[Vu]	H	S
*Pellorneum fuscocapillum**	H	S
Pomatorhinus horsfieldii		S
Rhopocichla atriceps	H	S
*Turdoides rufescens**	H	S
Turdoides affinis		S
*Dicaeum vincens**[NT]	H	S
Dicaeum erythrorynchos	H	S
Nectarinia zeylonica	F	S
Lonchura striata	H	S
Lonchura kelaarti	H	
Lonchura punctulata		S

Mammals		
*Macaca sinica**		S
*Trachypithecus vetulus**		S
*Ratufa macroura melanochra**	H	

Reptiles	
*Balanophis ceylonensis***	F
Ahaetulla nasutus	F
Ahaetulla pulverulentus	F
*Ceratophora aspera***	F
Calotes calotes	F
Calotes versicolour	F
*Lyriocephalus scutatus***	FH

Amphibians		
Rana corrugata		S
Nannophrys spp. *(guntheri ?)***	H	

Appendix IV: Species recorded in mixed-species flocks

Forty-one forest bird species and two mammal species were recorded in mixed-species foraging flocks. These flocks contained from two to 20 species and often more than 100 individuals. Species included in this analysis are any 'forest birds' (see *Conventions and Abbreviations*, pp 13-14).
Moynihan (1962) introduced the concept of 'nuclear', or flock-forming, species. Such species influence the formation and movement of the flock.
We give a subjective estimation of how frequently a species joins mixed-species flocks and indicate which species we believe act as nuclear species in these flocks.

Key to symbols

NS nuclear species (after Moynihan 1962)
1 common as a member of a mixed-species flock
2 uncommon as a member of a mixed-species flock
3 rare as a member of a mixed-species flock
- a forest bird never recorded in a mixed-species flock

Birds	
*Galloperdix bicalcarata**	-
*Gallus lafayetii**	-
Picus chlorolophus	1
Dinopium benghalense	3
Chrysocolaptes lucidus	1
Megalaima zeylanica	2
*Megalaima flavifrons**	1
*Ocyceros gingalensis**	-
Harpactes fasciatus	1
*Phaenicophaeus pyrrhocephalus**[Vu]	2
*Centropus chlororhynchus**[En]	-
*Loriculus beryllinus**	-
*Psittacula calthropae**	2
Bubo nipalensis[NT]	-
Glaucidium castanonotum[NT]	2
Ninox scutulata	-
Batrachostomus moniliger[NT]	-
*Columba torringtoni**[Vu]	-
Chalcophaps indica	3
Treron pompadora	3
Ducula aenea	-
Spilornis cheela	-
Chloropsis aurifrons	3
*Urocissa ornata**[Vu]	1
Pericrocotus cinnamomeus	2
Pericrocotus flammeus	1
Dicrurus paradiseus	NS
Hypothymis azurea	1
*Zoothera spiloptera**[NT]	3
Zoothera dauma	-
Cyornis tickelliae	1
Culicicapa ceylonensis	1
*Sturnus albofrontatus**[NT]	1
*Gracula ptilogenys**	1
Gracula religiosa	2
Sitta frontalis	1
Parus major	1
Pycnonotus melanicterus	3
Iole indica	1
Hypsipetes leucocephalus	2
*Zosterops ceylonensis**	1
Zosterops palpebrosus	2
*Garrulax cinereifrons**[Vu]	1
*Pellorneum fuscocapillum**	2
Pomatorhinus horsfieldii	1
Rhopocichla atriceps	1
*Turdoides rufescens**	NS
Dicaeum agile	-
*Dicaeum vincens**[NT]	1
Dicaeum erythrorynchos	1
Nectarinia zeylonica	3
Lonchura kelaarti	3
Mammals	
Funambulus layardi	1
Funambulus sublineatus obscurus	1