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BIRDS OF SALWEEN WILDLIFE SANCTUARY, MAE HONG SON PROVINCE, THAILAND, DURING 2001–2002

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ABSTRACT

Bird occurrence and distribution were studied in Salween Wildlife Sanctuary, Mae Hong Son Province, northern Thailand, during 2001 to 2002. A total of 233 bird species have been recorded within the sanctuary, belonging to 15 orders, 46 families, and 138 genera. Of these, 191 species are resident birds, while 29 species are non-breeding winter visitors and 14 other species are migrants. In addition, 73 species are insectivorous, 10 species granivorous, 20 species frugivorous or nectivorous, 45 species carnivorous, and 58 species omnivorous. Forest surveys were carried out in the study area to complement the bird distribution data. Salween Wildlife Sanctuary contains 4 different forest types: mixed deciduous forest, dry dipterocarp forest, dry evergreen forest and riparian deciduous forest. The numbers of bird species found in deciduous forest and dry evergreen forest, (117 and 115) were higher than in the other two forest types, 90 species in dry dipterocarp forest and 87 species in riparian deciduous forest.

Keywords: Salween Wildlife Sanctuary, birds, survey, forest types

INTRODUCTION

Thailand is a country very high in genetic, species, and ecosystem diversity. The country's natural forests have been categorised into more than 10 types, which are habitats for a diverse flora and fauna. Approximately 200,000 flora and fauna species are found in Thailand, or approximately 7% of all species found in the world (MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT, 2003). According to ROUND (1988), Thailand, situated in the Indo-Chinese peninsula, supports an extremely diverse fauna and flora. It has been described as a "zoogeographic crossroads". Thailand's flora has been roughly estimated as not less than 15,000 species, while its fauna includes 292 mammal species, 962 bird species, 318 amphibian species, 606 species of freshwater fish, 1,672 species of mangrove and marine fish, and various species of invertebrates (MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT, 2003).

Over 150 years of logging in the lowland forests, coupled with the extension of hill tribe communities in the uplands, have dramatically decreased the forest areas of northern Thailand. Although logging concessions were finally banned throughout the country in 1989, careless misuse of natural resources, the greed of profiteers and illegal log poaching have continued. Loss of forest areas also means loss of habitats for wildlife, which eventually

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brings about the destruction of the biota of forest ecosystems and finally causes serious consequences to humans. The National Park, Wildlife and Plant Conservation Department has designated many protected areas as national parks and wildlife sanctuaries so that a long-term sustainable development plan can be established for natural resources and biodiversity conservation.

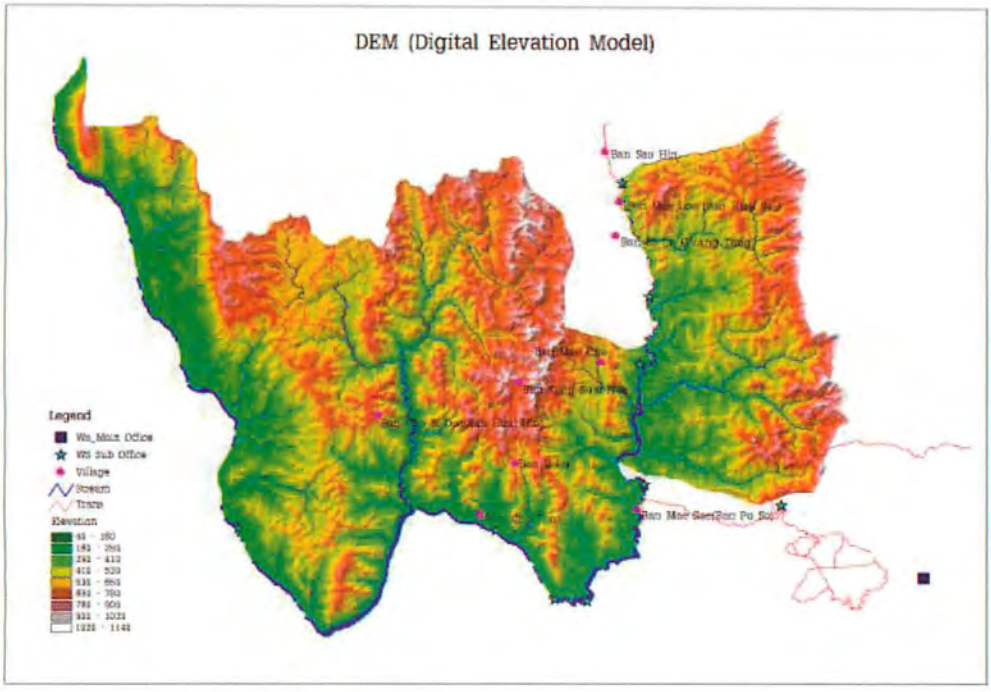
Salween Wildlife Sanctuary can be regarded as an atypically degraded forested area. During 1995–1998, many habitats in this area were damaged, mostly by illegal logging. The damage caused by log poachers resulted in destruction of some areas along the Salween riverbanks. There is an urgent need to gather as much information about forest habitats and their flora and fauna in this area as possible in order to implement effective management plans for the area.

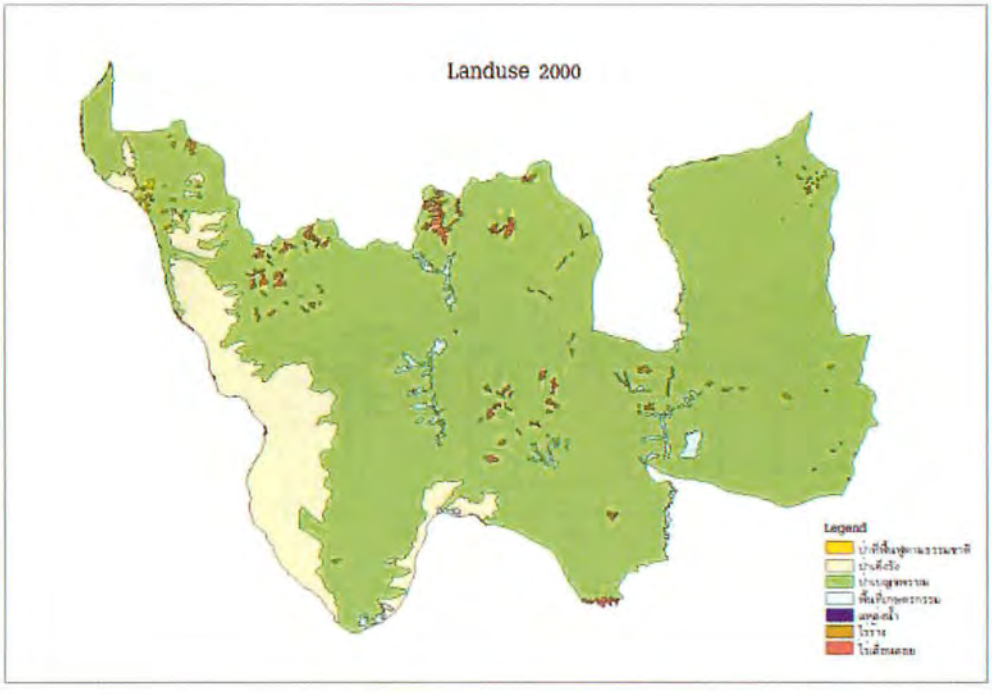
Birds, being mostly conspicuous, diurnal and rather diverse, are an important part of wildlife assessment and are useful as environmental indicators. They are also valued for reasons other than aesthetics and culture. They are important in components of food chains, and particularly susceptible to environmental changes (BAILLIE, 1991). They are therefore valuable indicators of the state of their habitats.

This study was designed to investigate the occurrences and distribution of birds, as well as to obtain information on forest habitats in the Salween Wildlife Sanctuary. In particular, we wished to study the dependence of bird species on the different forest types present. The results are expected to provide valuable information for the development of the survey techniques and for management of the protected areas.

STUDY AREA

Gazetted in August 24th, 1978, Salween Wildlife Sanctuary was the 20th protected area set aside for wildlife conservation. Lying in the Tenasserim Range, the area is an important site with diverse habitats. It is situated in Mae Sariang District, Mae Hong Son province, north-west Thailand, between the latitudes 18° 15' – 18° 35' N and longitudes 97° 21' – 97° 49' E. The sanctuary is a catchments area of the Salween basin covering 546,875 rai (875 km^2). The topography is mountainous, elevations ranging from 200 to 1,300 m (Fig. 1). The highest peak is Doi Kun Gong Mai (1,300 m). The average rainfall was 1,230 mm/ year with highest in August (243 mm) and lowest in February (5.3 mm). The mean maximum and minimum temperatures were 32.7°C and 19.8°C, respectively. The highest temperature was 38.0°C in April, and the lowest was 12.9°C in February. The average maximum relative humidity was 85.5% in August and minimum 56.1% in March (SALWEEN WILDLIFE SANCTUARY REPORT, 2000). Seven types of vegetation cover were identified by the FOREST RESEARCH CENTER (1991, 1995). They are: 1) mixed deciduous forest, 2) dry dipterocarp forest, 3) diptercarp pine forest, 4) hill evergreen forest, 5) lowland evergreen forest, 6) limestone forest, and 7) old clearings and shifting cultivation areas, ROUND (1988) stated that the forests of Salween Wildlife Sanctuary have not yet been surveyed in detail. The area consists of rolling hills of low to moderate elevation, covered by mixed-deciduous and dry dipterocarp woodlands. The lowland riverbed areas are mostly occupied by Karen people. It is situated in a loop of the Salween River forming the western boundary of the sanctuary and also the Thai–Myanmar border. Most of the terrain slopes down from north to south and west. The western border adjoining Myanmar (Burma) is approximately





Figures 1 and 2. Elevation and land use maps of Salween Wildlife Sanctuary.

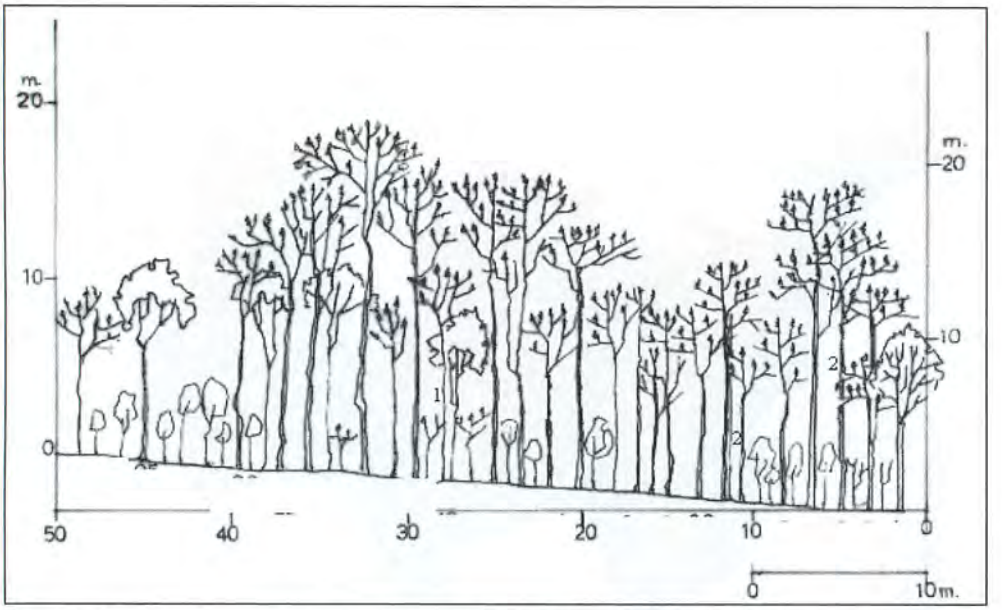


Figure 3. Forest profile representing dry dipterocarp forest (DDF) in Salween Wildlife Sanctuary. Trees are: 1, *Gluta usitata* (Wall.) Ding Hou; 2, *Dipterocarpus tuberculatus* Roxb.; 3, *Diospyros ehretioides* Wall. ex G. Don; 4, *Shorea obtusa* Wall. ex Blume; 5, *Syzygium toddlioides* (Wight) Walp.

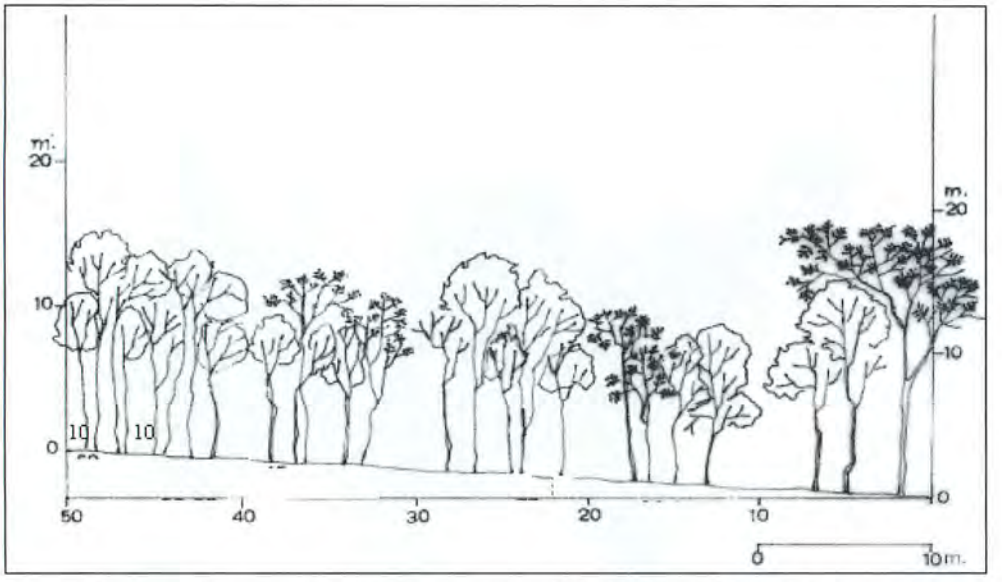


Figure 4. Forest profile representing mixed deciduous forest (MDF) in Salween Wildlife Sanctuary. Trees are: 2, *Terminelia chebula* Retz. var. *nana* Gagnep. 2 *Syzygium toddlioides* (Wight) Walp.; 3, *Croton roxburghii* N. P. Balaker; 4, *Aporusa villosa* (Wall. ex Lindl.) Bail; 5. *Hovenia dulcis* Thunb.; 6, *Xylia xylocarpa* Taub. var. *kerrii* (Craib & Hutch) I. C. Nielsen.; 7, *Stereospermum fimbriatum* (Wall. ex G. Don) A. DC. 8. *Senna garrettiana* (Craib) Irwin & Garneby; 9, *Pterospermum semisagittatum* Buch-Ham.; 10, *Litsea* sp.

120 km consisting of 65 km of Salween River (SALWEEN WILDLIFE SANCTUARY REPORT, 2000). The area is nationally important as an example of relatively undamaged wilderness of the northernmost Tenasserim Range.

METHODS

The ornithological study began in 2001. Two methods were employed to secure data on species and numbers of birds for four days every month. First, birds were visually searched for identification during 0600–1000 h and 1500–1800 h by trained staff officers of the wildlife sanctuary. Second, at the same time birds were also identified by call. In total we spent 28 hours per month searching for birds in four habitat types. Species and numbers of birds were accumulated. 8 x 42 binoculars and 20–60 x 60 telescopes were used. Birds were identified following LEKAGUL & ROUND (1991).

To evaluate habitats, surveys and inventories were carried out in the four main forest types in the sanctuary. Four plots sized 30 x 50 m were randomly laid in these forest types.

In each plot, trees with gbh >4.5 cm were identified and counted. Height, crown width and canopy thickness, and location of each tree were measured and positioned. Tree height was measured by using Haga hypsometer, while the canopy thickness was measured by the application of the Crown Cover Method (MUELLER-DOMBOIS & ELLENBERG, 1974.) Data gained from the surveys were used to produce a profile diagram for each forest type.

RESULTS

Forest Types

Seven types of forest in Salween Wildlife Sanctuary have been classified by the FOREST RESEARCH CENTER (1991, 1992). They are described below.

1. *Dry dipterocarp forest* (Fig. 2).—This forest type covers 34% of the total area and occurs from 200 to 800 m. The forest is deciduous and is dominated by trees of Family Dipterocarpaceae. Forest fires occur every dry season. Other characteristics include an open canopy and lack of bamboo and tree species such as *Dipterocarpus tuberculatus, Shorea obtusa, Shorea siamensis,* and *Terminalia alata* are very common. Dry dipterocarp forest is characterised by contiguous story and slightly open canopy. This structure enables narrow-winged birds to maneuver. The leaf shedding period may be a critical time for frugivores and nectivores. Big bang phenology of fruit production is characteristic of many trees in this type of forest.

2. *Mixed deciduous forest* (Fig. 4).—This type covers 46.5% of the total area, and is present from 200 to 650 m. It can be classified into two subtypes: deciduous with teak *(Tectona grandis),* and deciduous without teak. The upper canopy height is 25–30 m and is dominated by *Tectona grandis, Xylia xylocarpa* mixed with *Gmelina arborea, Terminalia* spp., *Spondias pinnata,* and *Quercus kerrii.* Deciduous without teak is dominated by *Xylia xylocarpa* and *Pterocarpus macrocapus.* A variety of bamboo is also characteristic of this forest type. The canopy is thick, especially in the rainy season, may impair the maneuverability of narrow-winged birds. Jungle fowl are usually associated with this type

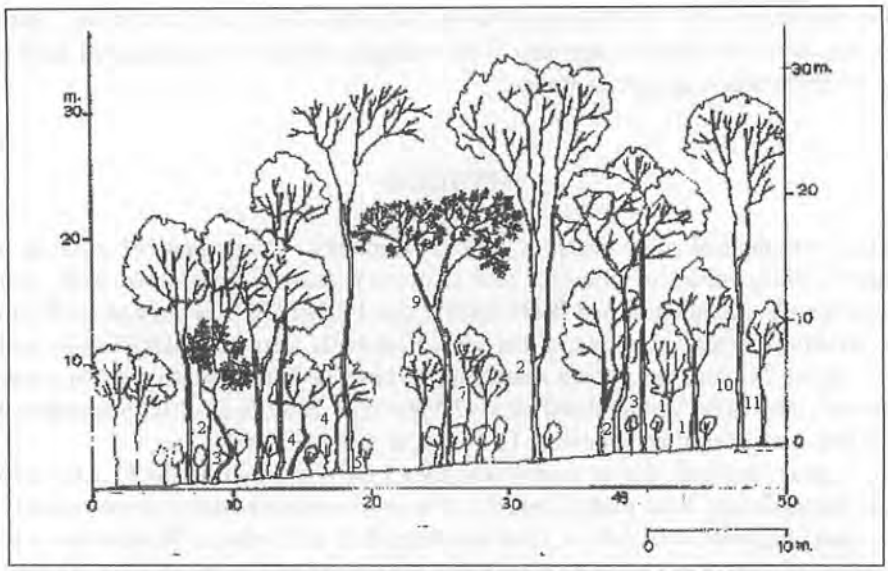


Figure 5. Forest profile representing dry evergreen forest (DEF) in Salween Wildlife Sanctuary. Trees are: 1, *Quercus* sp.; 2, *Gluta usitata* (Wall.) Ding Hou; 3, *Shorea siamensis* Miq.; 4, *Aporusa villosa* (Wall. ex Lindl.) Bail; 5, *Berrya mollis* Wall. ex Kurz; 6, *Cratoxylum formosum* (Jack) Dyer subsp. *pruniflorum* (Kurz) Gogel; 7, *Dalbergia cultrata* Graham ex Benth.; 8, *Wendlandia tinctoria* (Roxb.) DC.; 9, *Shorea roxburghii* G. Don; 10, *Shorea obtusa* Wall. ex Blume; 11, Berrya mollis Wall. ex Kurz

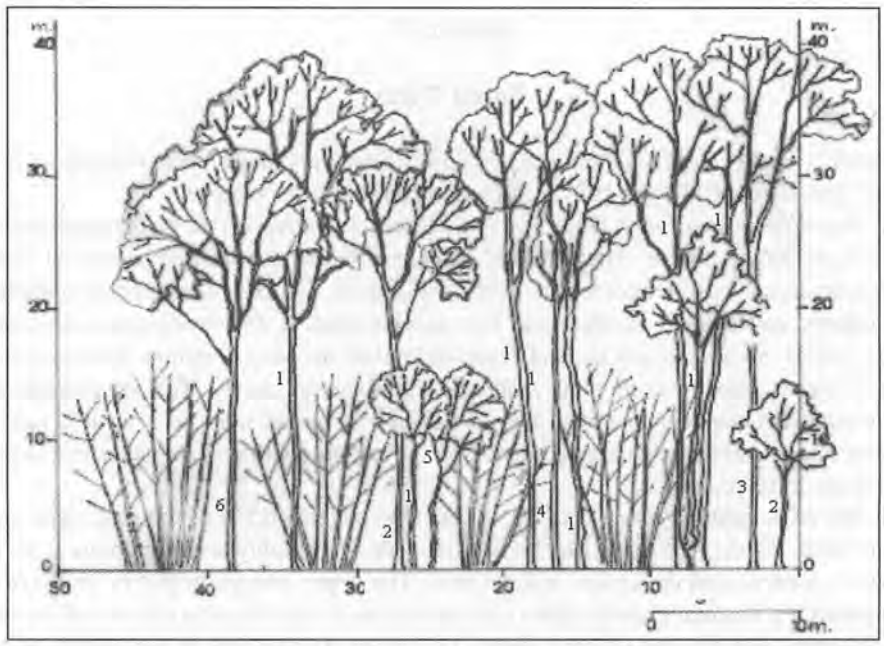


Figure 6. Forest profile representing riverine deciduous forest (RDF) in Salween Wildlife Sanctuary. Tree species are: 1, *Xylia xylocarpa* Taub. var. *kerrii* (Craib & Hutch) I. C. Nielsen; 2, *Miliusa velutina* (Dunal) Hook. f. Thomson; 3, *Tectona grandis* L.f.; 4, *Pterocarpus macrocarpus* Kurz; 5. *Millettia brandisiana* Kurz; 6, *Pterocarpus macrocarpus* Kurz.

of forest as bamboo seeds and termites are abundant. Many tree species exhibit cornucopia phenology of fruit production and are of critical importance to frugivores and nectivores.

3. *Hill evergreen forest.*—This forest type covers 5.0% of the total area, and covers the tops of the hills at 1,000-1,300 m msl, primarily along the boundary between Salween and Mae Youm Fung Kwa Wildlife Sanctuary. It is dominated by Fagaceae, including *Lithocarpus, Castanopsis,* and *Quercus,* with *Lithocarpus garrettianus, Lithocarpus sootepensis, Lithocarpus fenestratus, Quercus kingiana,* and *Betula alnoides.* In the open areas can be found shrubs in the genera *Melastoma, Osbeckia* and *Rhamnus.* A distinct contiguous layer is of special feature of this forest type in Salween Wildlife Sanctuary. Broad-winged specie of birds dominate in this forest. Many species of *Quercus* maintain cornucopia phenology of fruit production enabling frugivores and nectivores to subsist year-round. Consequently, a large number of specialists are present in this forest.

4. *Riverine Deciduous Forest* (Fig. 6).—Riverine Deciduous Forest (RDF) covers approximately 15.0% of the total area. Six species of tree are found in the Riverine Deciduous Forest. *Xylia xylocarpa* Taub var. *kerrii* Nielsen was the most important tree species in the plot. Profile of RDF is shown in Figure 5. High undergrowth and thick canopy are characteristic of this forest type. The RDF is adjacent to cultivated areas. Unlike other habitats in which trees are illegally extracted, RDF is prone to conversion to agriculture areas. Non-forest birds are frequently observed in this type. Steady state phenology of fruit production of many tree species may lure some species of frugivorous and nectivorous birds.

5. *Dry Evergreen forest.*—This forest type (Fig. 5) makes up 11% of the area occurring in humid-valleys in high areas. Although it is mainly closed-canopy, there are fewer species of Fagaceae and more spacing between trees than in hill evergreen forest. Canopy trees include *Quercus* sp., *Gluta usitata* (Wall.) Ding Hou, *Shorea siamensis* Miq., *Aporusa villosa* (Wall. ex Lindl.) Bail, *Berrya mollis* Wall. ex Kurz, *Cratoxylum formosum* (Jack) Dyer subsp. *pruniflorum* (Kurz) Gogel, *Dalbergia cultrata* Graham ex Benth, *Wendlandia tinctoria* (Roxb.) DC., *Shorea roxburghii* G. Don, *Shorea obtusa* Wall. ex Blume, *Berrya mollis* Wall. ex Kurz. Additionally, in the undergrowth can be found some Zingiberceae, *Calamus* sp, *Dryopteris amboinensis,* and *Lasia spinosa.*

6. *Old clearings and shifting cultivation areas.*—These areas cover 0.55% of the total area. This kind of habitat is caused mainly by the hill tribes and local people. The degraded areas are mostly dominated by weed species. Lalang *(Imperata cylindrica)* is dominant in dry locations, whereas *Eupatorium odoratum, Thysanolaena maxima,* and *Tithonia diversfolia* are dominant species in moist areas.

7. *Limestone forest.*—This forest type, which covers 0.01% of the total area, has small shrubs in Family Ficuseae and some grasses (Gramineae).

Dipterocarp—pine forest is similar to Dipterocarp forest in structure. The difference is that the former occurs above 600 m. Other than pines *(Pinus merkusii),* tree species include *Dipterocarpus tuberculatus, Shorea obtuse, Shorea siamensis, Dipterocarpus obtusifolius, Melanorrhoea glabra, Wendlandia tinctoria, Lithocarpus polystachyus, and Spondias pinnata.*

Diversity of Birds

Between 2001 and 2002, 233 species of birds were recorded. They belong to 15 orders, 46 families and 138 genera. Table 1 shows species, status, and habitat of all 233 species. This is equivalent to 24% of the 970 birds found in Thailand. Among these birds, 189 species were residents, while 29 species were non-breeding winter visitors, and other 14 species were migrants. Non-breeding winter visitors were proportionately greater in RDF than in any other habitats. The percent of migratory and resident birds in all habitats were similar (Table 2).

Additionally, 122 species were found in only one habitat type (Fig. 7). That is, 47 were found in only RDF, 35 in DEF, 26 in MDF and 14 in DDF. Among the 104 generalists found in more than one habitat type, 51 species were found in 2 habitats, 41 species in 3, and 12 species in 4 habitat types. It may be concluded that about half of the generalists inhabited no more than 2 types of forests.

The most common birds identified in this study belonged to 3 orders: Passeriformes, Ciconiiformes and Piciformes, with 143, 25 and 18 species, respectively. According to feeding habits, 110 species were insectivorous, 7 species were granivorous, 30 species were frugivorous or nectivorous, 38 species were carnivorous, and 48 species were omnivorous. Detailed study of their ecology should be encouraged in order to gain precise information for the management of the sanctuary. Moreover, if the relationships between the birds and forests they use are studied and analyzed, bird communities can also be used as the potential indicators for the condition of the forest.

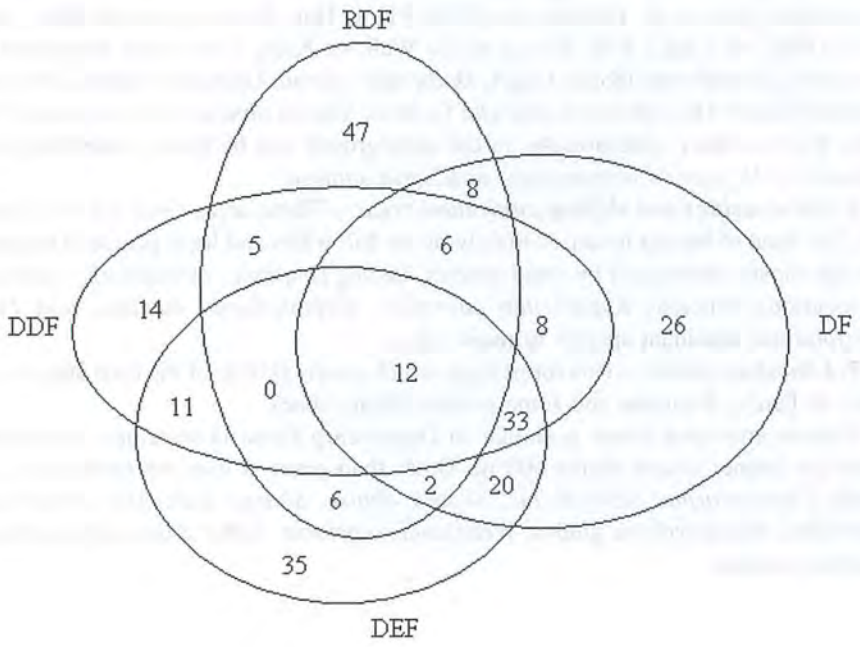


Figure 7. Numbers of species found in each habitat.

Table 1. List of birds recorded in Salween Wildlife Sanctuary during 2001–2002. R = resident; N = non-breeding winter visitor and M = migrant birds. RDF = Rivrine deciduous forest, MDF = Mixed deciduous forset, DDF = Dry deciduous forest and DEF = Dry evergreen forest.

Family	Species	Status	Habitat Types			
			RDF	MDF	DDF	DEF
Phasianidae	1. Chinese Francolin *(Francolinus pintadeanus)*	R		x		
	2. Red Jungle Fowl *(Gallus gallus)*	R		x		x
	3. Kalij Pheasant. *(Lophura leucomelanos)*	R		x		x
	4. Silver Pheasant *(Lophura nycthemera)*	R				x
Turnicidae	5. Yellow-legged Buttonquail *(Turnix tanki)*	R	x			
Picidae	6. Speckled Piculet *(Picumnus innominatus)*	R		x	x	x
	7. White-browed Piculet *(Sasia ochracea)*	R		x	x	x
	8. Grey-capped Woodpecker *(Dendrocopos canicapillus)*	R		x	x	x
	9. Lesser Yellownape *(Picus chlorolophus)*	R				x
	10. Greater Yellownape *(Picus flavinucha)*	R		x	x	x
	11. Laced Woodpecker *(Picus vittatus)*	R		x		x
	12. Black-headed Woodpecker *(Picus erythropygia)*	R			x	
	13. Grey-headed Woodpecker *(Picus canus)*	R				x
	14. Greater Flameback *(Chrysocolaptes lucidus)*	R		x	x	
	15. Bamboo Woodpecker *(Gecinulus viridis)*	R		x		
	16. Bay Woodpecker *(Blythipicus pyrrhotis)*	N				x
Megalaimidae	17. Great Barbet *(Megaliama virens)*	R		x	x	x
	18. Lineated Barbet *(Megaliama lineata)*	R	x		x	
	19. Golden-throated Barbet *(Megaliama franklinii)*	R				x
	20. Blue-throated Barbet *(Megaliama asiatica)*	R	x	x	x	x
	21. Blue-eared Barbet *(Megaliama australis)*	R				x
	22. Coppersmith Barbet *(Megaliama haemacephala)*	R		x	x	
Bucerotidae	23. Oriental Pied Hornbill *(Anthracoceros albirostris)*	R				x
	24. Great Hornbill *(Buceros bicornis)*	R				x
Upupidae	25. Common Hoopoe *(Upupa epops)*	R				x
Trogonidae	26. Orange-breasted Trogon *(Harpactes oreskios)*	R			x	
	27. Red-headed Trogon *(Harpactes erythrocephalus)*	R				x
Coraciidae	28. Indian Roller *(Coracius benghalensis)**	R	x			
	29. Dollarbird *(Eurystomus orientalis)*	R	x		x	
Alcedinidae	30. Common Kingfisher *(Alcelo atthis)**	N	x			x
	31. Blue-eared Kingfisher *(Alcedo meninting)**	R	x			
Halcyonidae	32. Banded Kingfisher *(Lacedo pulchella)**	R		x		
	33. Stork-billed Kingfisher *(Halcyon capensis)**	R		x		
	34. White-throated Kingfisher *(Halcyon smyrnensis)**	R	x	x	x	
	35. Black-capped Kingfisher *(Halcyon pileata)**	M	x			
Cerylidae	36. Crested Kingfisher *(Megceryle lugubris)**	R	x			
	37. Pied Kingfisher *(Ceryle rudis)**	R		x	x	x

Table 1 Continues

Family	Species	Status	Habitat Types			
			RDF	MDF	DDF	DEF
Meropidae	38. Blue-bearded Bee-eater *(Nyctyornis athertoni)*	R	x	x		
	39. Green Bee-eater *(Merops orientali)*	R	x			x
	40. Chestnut-headed Bee-eater *(Merops leschenaulti)*	R	x	x	x	x
Cuculidae	41. Eurasian Cuckoo *(Cuculus canorus)*	N	x			
	42. Banded Bay Cuckoo *(Cacomantis sonneratii)*	R		x		
	43. Plaintive Cuckoo *(Cacomantis merulinus)*	R	x	x	x	
	44. Asian Emerald Cuckoo *(Chrysococcyx maculatus)*	R	x	x		x
	45. Violet Cuckoo *(Chrysococcyx xanthorhynchus)*	R		x		
	46. Drongo Cuckoo *(Surniculus lugubris)*	R		x		x
	47. Green-bellied Malkoha *(Phaenicophaeus tristis)*	R		x	x	x
Centropodidae	48. Greater Coucal *(Centropus sinensis)*	R	x	x		
	49. Lesser Coucal *(Centropus bengalensis)*	R	x			
Psittacidae	50. Lesser Coucal *(Loriculus vernalis)*	R		x		
	51. Alexandrine Parakeet *(Psittacula eupatria)*	R		x		
	52. Grey-headed Parakeet *(Psittacula finschii)*	R	x			
Apodidae	53. Himalayan Swiftlet *(Collocalia brevirostris)*	R		x	x	x
	54. Brown-backed Needletail *(Hirundapus giganteus)*	R	x			
	55. Asian Palm Swift *(Cypsiurus balasiensis)*	R	x		x	
	56. Fork-tailed Swift *(Apus pacificus)*	N	x			
	57. House Swift *(Apus affinis)**	R	x			
Hemiprocnidae	58. Crested Treewift *(Hemiprpcne coronata)*	R	x	x	x	x
Tytonidae	59. Barn Owl *(Tyto alba)*	R	x			
	60. Oriental Bay Owl *(Phodilus badius)*	R	x			
Strigidae	61. Collared Scops Owl *(Otus bakkamoena)*	R		x		
	62. Asian Barred Owlet *(Glaucidium cuculoides)*	R		x	x	x
	63. Spotted Owl *(Athene brama)*	R	x			
Eurostopodidae	64. Great Eared Nightjar *(Eurostopotus macrotis)*	R			x	
Caprimulgidae	65. Large-tailed Nightjar *(Capimulgus macrurus)*	R			x	x
Columbidae	66. Oriental Turtle Dove *(Streptopelia orientalis)*	R			x	
	67. Spotted Dove *(Streptopelia chinensis)*	R	x	x		
	68. Red Collared Dove *(Streptopelia tranquebarica)*	R				x
	69. Emerald Dove *(Chalcophaps indica)*	R		x		x
	70. Thick-billed Green Pigeon *(Treron curvirostra)*	R	x	x		
	71. Yellow-footed Green Pigeon *(Treron phoenicoptera)*	R	x			
Rallidae	72. Yellow-footed Green Pigeon *(Amauronis phoenicurus)**	R	x			
Scolopacidae	73. Common Sandpiper *(Actitis hypoleucos)**	N	x			
Charadriidae	74. Little Ringed Plover *(Charadrius dubius)**	N	x			
	75. Northern Lapwing *(Vanellus vanellus)**	N	x			
	76. River Lapwing *(Vanellus duvaucelii)**	R	x			
	77. Grey-headed Lapwing *(Vanellus cinereus)**	N	x			

Table 1 Continues

Family	Species	Status	Habitat Types			
			RDF	MDF	DDF	DEF
	78. Red-wattled Lapwing *(Vanellus indicu)**	R	x			
Glareolidae	79. Small Pratincole *(Glareola lacteal)**	R	x			
Laridae	80. River Tern *(Sterna aurantia)**	R	x			
Accipitridae	81. Black Baza *(Avicedae leuphotes)*	R	x			
	82. Black-shouldered Kite *(Elanus caeruleus)*	R	x			
	83. Black Kite *(Milvus migrans)*	M	x			
	84. Crested Serpent Eagle *(Spilornis cheela)*	R	x	x	x	x
	85. Shikra *(Accipiter badius)*	R	x	x	x	
	86. Besra *(Accipiter virgatus)*	R	x			
	87. Rufous-winged Buzzard *(Butastur liventer)*	R			x	
	88. Mountain Hawk Eagle *(Spizaetus nipalensis)*	R			x	x
	89. Grey-faced Buzzard *(Butastur indicus)*	N	x			
	90. Black Eagle *(Ictinaetus malayensis)*	R				x
	91. Booted Eagle *(Hieraaetus pennatus)*	N		x		
Falconidae	92. White-rumped Falcon *(Polihierax insignis)*	R	x			
	93. Collared Falconet *(Microhierax caerulescens)*	R		x		x
	94. Oriental Hobby *(Falco severus)*	R		x		
Ardeidae	95. Little Egret *(Egretta garzetta)**	N	x			
	96. Great Egret *(Casmerodius albus)**	N	x			
Eurylaimidae	97. Dusky Broadbill *(Corydon sumatranus)*	R		x	x	
	98. Silver-breasted Broadbill *(Serilophus lunatus)*	R		x		x
Irenidae	99. Asian Fsiry Bluebird *(Irena puella)*	R		x		x
	100. Blue-winged Leafbird *(Chloropsis cochinchinensis)*	R		x	x	x
	101. Golden-fronted Leafbird *(Chloropsis aurifrons)*	R	x	x	x	
Laniidae	102. Brown Shrike *(Lanius cristatus)*	N		x	x	x
	103. Burmese Shrike *(Lanius collurioides)*	N			x	
	104. Long-tailed Shrike *(Lanius schach)*	R	x			
Corvidae	105. Eurasian Jay *(Garrulus glandarius)*	R			x	x
	106. Red-billed Blue Magpie *(Urocissa erythrorhyncha)*	R		x	x	
	107. Common Green Magpie *(Cissa chinensis)*	R		x		x
	108. Rufous Treepie *(Dendrocitta vagabunda)*	R		x		x
	109. Grey Treepie *(Dendrocitta formosae)*	R			x	x
	110. Large-billed Crow *(Corvus macrorhynchos)**	R		x	x	x
	111. Black-naped Oriole *(Oriolus chinensis)*	N				x
	112. Slender-billed Oriole *(Oriolus tenuirostris)*	N			x	x
	113. Black-hooded Oriole *(Oriolus xanthornus)*	R	x	x	x	
	114. Maroon Oriole *(Oriolus traillii)*	R				x
	115. Large Cuckooshrike *(Coracina macei)*	R			x	x
	116. Black-winged Cuckoo-shirke *(Coracina melaschista)*	R		x		x
	117. Rosy Minivet *(Pericrocotus roseus)*	M			x	x
	118. Ashy Minivet *(Pericrocotus divaricatus)**	N	x			x
	119. Small Minivet *(Pericrocotus cinnamomeus)*	R			x	
	120. Long-tailed Minivet *(Pericrocotus ethologus)*	R			x	

Table 1 Continues

Family	Species	Status	Habitat Types			
			RDF	MDF	DDF	DEF
	121. Short-billed Minivet *(Pericrocotus brevirostris)*	R			x	
	122. Scarlet Minivet *(Pericrocotus flammeus)*	R	x	x	x	x
	123. Bar-winged Flycatcher-shrike *(Hemipus picatus)*	R		x	x	x
	124. White-throated Fantail *(Rhipidura albicollis)*	R		x		x
	125. White-browed Fantail *(Rhipidura aureola)*	R		x	x	
	126. Black Drongo *(Dicrurus macrocercus)*	R	x		x	
	127. Ashy Drongo *(Dicrurus leucophaeus)*	R	x	x	x	x
	128. Bronzed Drongo *(Dicrurus aeneus)*	R		x	x	x
	129. Lesser Racket-tailed Drongo *(Dicrurus remifer)*	R				x
	130. Spangled Drongo *(Dicrurus hottentottus)*	R	x		x	
	131. Greater Racket-tailed Drongo *(Dicrurus paradiseus)*	R	x	x	x	x
	132. Black-naped Monarch *(Hypothymis azurea)*	R		x	x	x
	133. Common Iora *(Aegithina tiphia)*	R		x	x	x
	134. Great Iora *(Aegithina lafesnayei)*	R		x		
	135. Large Woodshrike *(Tephrodornis gularis)*	R		x		
	136. Common Woodshrike *(Tephrodornis pondicerianus)*	R				x
Muscicapidae	137. Chestnut-bellied Rock Thrush *(Monticola rufiventris)*	M				x
	138. Blue Rock Thrush *(Monticola solitarius)*	N			x	
	139. Blue Whistling Thrush *(Myiophonus caeruleus)*	R	x			x
	140. Scaly Thrush *(Zoothera dauma)*	NxR			x	x
	141. Eyebrowed Thrush *(Turdus obscurus)*	M				x
	142. Asian Brown Flycatcher *(Muscicapa dauurica)*	N			x	
	143. Red-throated Flycatcher *(Ficedula parva)*	N		x	x	x
	144. Verditer Flycatcher *(Eumyias thalassina)*	R	x	x		x
	145. Large Niltava *(Niltava grandis)*	R				x
	146. Hill Blue Flycatcher *(Cyornis banyumas)*	R		x	x	x
	147. Tickell's Blue Flycatcher *(Cyornis tickelliae)*	N		x		
	148. Grey-headed Flycatcher *(Culicicapa ceylonensis)*	R	x	x	x	x
	149. Oriental Magpie Robin *(Copsychus saularis)**	R	x			
	150. White-rumped Shama *(Copsychus malabaricus)*	R		x	x	
	151. Black-backed Forktail *(Enicurus immaculatus)*	R	x			x
	152. Slaty-backed Forktail *(Enicurus schistaceus)*	R	x			
	153. White-crowned Forktail *(Enicurus leschenaulti)*	R		x		x
Sturnidae	154. Grey Bushchat *(Saxicola ferrea)*	M				x
	155. Chestnut-tailed Starling *(Sturnus malabaricus)*	R				x
	156. Common Myna *(Acridotheres tristis)*	R	x			
	157. White-vented Myna *(Acridotheres cinereus)**	R	x			
	158. Hill Myna *(Gracula religiosa)*	R	x			
Sittidae	159. Chestnut-vented Nuthatch *(Sitta nagaensis)*	R				x
	160. Chestnut-bellied Nuthatch *(Sitta castanea)*	R			x	
	161. Velvet-fronted Nuthatch *(Sitta frontalis)*	R	x	x	x	x
	162. Giant Nuthatch *(Sitta magna)*	R				x
Paridae	163. Great Tit *(Parus major)*	R			x	x
	164. Sultan Tit. *(Melanochlora sultanae)*	R		x		
Hirundinidae	165. Wire-tailed Swallow *(Hirundo rustica)**	N	x			

Table 1 Continues

Family	Species	Status	Habitat Types			
			RDF	MDF	DDF	DEF
	166. Wire-tailed Swallow *(Hirundo smithii)*	R	x			
	167. Red-rumped Swallow *(Hirundo daurica)*	R		x	x	x
Pycnonotidae	168. Black-headed Bulbul *(Pycnonotus atriceps)*	R	x	x		
	169. Black-crested Bulbul *(Pycnonotus melanicterus)*	R	x	x	x	x
	170. Red-whiskered Bulbul *(Pycnonotus jocosus)*	R	x	x	x	
	171. Sooty-headed Bulbul *(Pycnonotus aurigaster)*	R	x	x	x	x
	172. Stripe-throated Bulbul *(Pycnonotus finlaysoni)*	R		x		
	173. Flavescent Bulbul *(Pycnonotus flavescens)*	R		x	x	x
	174. Streak-eared Bulbul *(Pycnonotus blanfordi)**	R		x		
	175. Grey-eyed Bulbul *(Iole propinqua)*	R		x	x	x
	176. Mountain Bulbul *(Hypsipetes mcclellandii)*	R				x
	177. Black bulbul *(Hypsipetes madagascariensis)*	R				x
Cisticolidae	178. Bright-capped Cisticola *(Cicticola exilis)*	R	x			
	179. Hill Prinia *(Prinia atrogularis)*	R				x
	180. Rufescent Prinia *(Prinia rufescens)*	R		x	x	x
	181. Plain Prinia *(Prinia inornata)*	R		x		
Zosteropidae	182. Chestnut-flanded White-eye *(Zosterops erythropleurus)*	M		x		
	183. Oriental White-eye *(Zosterops palpebrosus)*	R		x	x	x
	184. Japanese White-eye *(Zosterops japonicus)*	M		x		
Sylviidae	185. Chestnut-headed Tesia *(Tesis castaneocoronata)*	R				x
	186. Common Tailorbird *(Orthotomus sutorius)*	R		x	x	x
	187. Dark-necked Tailorbird *(Orthotomus atrogularis)*	R	x	x		
	188. Dusky Warbler *(Phylloscopus fuscatus)*	N	x			
	189. Yellow-browed Warbler *(Phylloscopus inornatus)*	N		x	x	x
	190. Arctic Warbler *(Phylloscopus borealis)*	M		x		x
	191. Pale-legged Leaf Warbler *(Phylloscopus tenellipes)*	N		x		x
	192. Eastern Crowned Warbler *(Phylloscopus coronatus)*	M			x	
	193. Blyth's Leaf Warbler *(Phylloscopus reguloides)*	M				x
	194. Golden-spectacled Warbler *(Seicercus burkii)*	N		x		
	195. Yellow-bellied Warbler *(Abroscopus supercilliaris)*	R		x		
	196. White-crested Laughingthrush *(Garrulax leucolophus)*	R	x	x		
	197. Lesser Necklaced Laughingthrush *(Garrulax monileger)*	R		x		x
	198. Greater Necklaced Laughingthrush *(Garrulax pectoralis)*	R			x	x
	199. White-necked Laughingthrush *(Garrulax strepitans)*	R				x
	200. Black-throated Laughingthrush *(Garrulax chinensis)*	R		x		x
	201. Buff-breasted Babbler *(Pellorneum tickelli)*	R		x	x	x
	202. Puff-throated Babbler *(Pellorneum ruficeps)*	R		x	x	x
	203. Whith-browed Scimitar Babbler *(Pomatorhinus schisticeps)*	R		x	x	x
	204. Rufous-fronted Babbler *(Stachyris rufifrons)*	R		x	x	x
	205. Grey-throated Babbler *(Stachyris nigriceps)*	R			x	
	206. Striped Tit Babbler *(Macronous gularis)*	R	x	x	x	x
	207. White-browed Babbler *(Pteruthius flaviscapis)*	R		x	x	x
	208. Brown-cheeked Fulvetta *(Alcippe poioicephala)*	R		x	x	x
	209. Grey-cheeked Fulvetta *(Alcippe morrisonia)*	R				x
	210. White-bellied Yuhina *(Yuhina zantholeuca)*	R				x

Table 1 Continues

Family	Species	Status	Habitat Types			
			RDF	MDF	DDF	DEF
	211. Rufous-backed Sibia *(Heterophasia annectens)*	R				x
	212. Black-headed Sibia *(Heterophasia melanoleuca)*	R				x
	213. Long-tailed Sibia *(Heterophasia picaoides)*	R				x
Nectariniidae	214. Thick-billed Flowerpecker *(Dicaeum agile)*	R		x		x
	215. Yellow-vented Flowerpecker *(Dicaeum chrysorrheum)*	R		x		
	216. Plain Flowerpecker *(Dicaeum concolor)*	R		x	x	x
	217. Scarlet-backed Flowerpecker *(Dicaeum cruentatum)**	R		x		x
	218. Ruby-cheeked Sunbird (Anthretes singalensis)	R		x	x	x
	219. olive-backed Sunbird *(Nectarinia jugularis)*	R		x	x	
	220. Purple Sunbird *(Nectarinia asiatica)*	R		x	x	
	221. Blck-throated Sunbird *(Aethopyga saturata)*	R				x
	222. Little Spiderhunter *(Arachnothera longirostra)*	R		x		
	223. Streaked Spiderhunter *(Arachnothera magna)*	R		x		x
Passeridae	224. Eurasian Tree Sparrow *(Passer montanus)**	R	x			
	225. Forest-Wagtail *(Dendronanthus indicus)*	N	x			x
	226. White Wagtail *(Motacilla alba)*	N	x			
	227. Grey Wagtail *(Motacilla cinerea)*	N	x	x		
	228. Richard's Pipi *(Anthus richardi)*	R	x			
	229. Olive-backed Pipit *(Anthus hodgsoni)*	M			x	x
	230. Red-throated Pipit *(Anthus cervinus)**	M			x	
	231. White-rumped Munia *(Lonchura striata)*	R	x			
	232. Scaly-breasted Munia *(Lonchura punctulata)*	R	x			
Fringillidae	233. Common Rosefinch *(Carpodacus erythrinus)*	M		x		

* indicates species of non-forest birds

Table 2. Number of species of birds in all habitat types. Numbers in parenthesies are percentages. M = migrant, N =non-breeding winter visitor, R = resident.

Forest Types	M	N	N&R	R	Total
DEF	7 (5.9%)	10 (8.4%)	1 (0.9%)	101 (84.9%)	119
DDF	4 (4.5%)	7 (7.9%)	1 (1.1%)	77 (86.5%)	89
DF	4 (3.5%)	8 (7.0%)	0	103 (89.6%)	115
RDF	2 (2.3%)	16 (18.7%)	0	68 (79.1%)	86

DISCUSSION

The first report of birds in Salween was done during preparation of a Master Plan at the end of 1990's. At that time, 122 species had been identified (RFD, 1991). The present study has added another 111 species, and additional species are likely to be added in the future. Researchers and organizations concerned with the conservation of birds are encouraged to further investigate the forests in Salween WS.

Salween Wildlife Sanctuary has more diverse habitats for birds than most other protected areas. In comparision, a well-known and popular site for bird-watching, Doi Inthanon National Park, contains 364 species of birds (RFD, 1992). In other northern protected areas, surveys have found 197 species in Mae Ping NP (RFD, 1989), 360 species in Doi Suthep-Pui NP (RFD, 1989), 117 species in Sri Lanna NP (RFD, 2002), 172 species in Nam Tok Mae Surin NP (RFD, 2001a), and 255 species in Lum Nam Pai WS (RFD, 2001b). The figure of 233 in Salween Wildlife Sanctuary signifies the importance of this site in the conservation of birds in the country. With its diversified habitats, half of the bird species were found in only a single habitat type. Each habitat may contain specific attributes suitable for the requirements of only some species of birds. Those species that were found in several habitat types could be termed habitat generalists, while those found in only a single type of habitat could be called habitat specialists: A total of 122 species were specialists and 111 generalists. Specialists may be more susceptible to habitat change. The extremes of micro-climate in MDF and DDF may partly be responsible for the small numbers of specialists.

Loss or degradation of a habitat may lower the importance of the area. For example, conversion of a fraction area in RDF to agricultural may decrease the birds in the RDF by 50%. The 43 species found only in RDF will be seriously affected. On the other hand, maintaining habitats as they are may be a top priority option for the conservation of birds in Thailand. Unlike Doi Intanon NP and Khao Yai NP which are easily accessible to large numbers of tourists every year, Salween WS is situated in the frontier and is only slightly disturbed by tourists. Use of areas as a human asylum may set a negative impact not only to birds but also to its habitats. It is generally believed that, forests in the tropical areas, when disturbed, can't recover to their original condition (GOMEZ-POMPA *ET AL*, 1972, IUCN 1986; ODA, 1991). Care must be taken when setting any destructive activity in the area because many species of birds are found in only a single habitat.

Of the 233 species of birds identified, 30 were non-forest birds such as water birds, open-country birds or birds around human dwellings. These birds indicate that the areas have experienced considerable human encroachment, which has resulted in additional types of habitats. In theory, slight disturbance may enhance the diversity of a community but serious disturbance may decrease it. A general rule of thumb says that loss of a single species may effect up to 10–30 other species in the community (RAVEN, 1976) and about 10% of the species may be lost if one-half of the habitat area disappears (WILSON, 1992). This percentage will increase, however, if whole habitats disappear. Wildlife sanctuaries and national parks are the last strongholds for many animals and plants. In the future, these areas may become source areas, from which animals may disperse when more habitat regenerates.

Migratory birds made up a small proportion in four habitat types compared with non-breeding winter visitors. RDF is a very important habitat for migratory birds, accounting

for 22% of the total species presented. This is probably because the RDF is relatively open habitat in both vertical and horizontal dimensions, due probably to slash and burn activities and timber extraction. Long distance migratory birds are usually those that are narrow-winged and fast flying, which require open habitats. RDF may meet their requirements. In addition, RDF is the habitat containing the most species (specialists) found in only one habitat. Further study should be encouraged in this special habitat.

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