This year (2010) has been declared as the International Year of Biodiversity (IYB) to boost the awareness about biodiversity and its conservation. At this auspicious time, it is very important to know what biodiversity actually means. International Union for Conservation of Nature (IUCN) defined biodiversity as a term to describe the variety of life on earth. It is the wide variety of ecosystems and living organisms: animals, plants, their habitats and their genes. Rapid urbanization, unsustainable consumption of natural resources and destruction of wildlife are directing biodiversity under great threat. Loss of biodiversity is a serious irreversible phenomenon. While extinction of species is a natural culmination, anthropogenic activities have increased the rate of extinction by at least a thousand fold, possibly several thousand times than the natural rate\(^1\). With this scenario, challenge before the ecologist/conservationists is to identify the areas that immediate need conservation. British ecologist Norman Myers introduced biodiversity hotspots concept to address this dilemma faced by the conservationists\(^5\). Biodiversity hotspots are those regions of the terrestrial ecosystem which are highly rich with endemic species. Presently, there are total 34 biodiversity hotspots all over the world. Each of this hotspot has already lost at least 70 percent of its original natural vegetation. More than 50 percent of the plant species and 42 percent of all terrestrial vertebrate species are endemic to these hotspots\(^6\).

Among the hotspots identified so far, 3 hotspots are extended within Indian sub-continent. These three Asia-Pacific hotspots are namely, Himalayan region, Indo-Burma region and Western Ghats- Sri Lanka regions. In the present article an attempt has been made to demonstrate the present status of endemic birds of these three hotspots with special emphasis on human impact on biodiversity loss and to identify the single hotspot that deserves maximum attention and priority from conservation point of view.

Brief description of the three hotspot regions under study : Indo – Burma region : The Indo–Burma hotspot extends to east of Ganges – Brahmaputra lowland of tropical Asia. It poses the area of 2,373,000 km\(^2\) including the Himalayan chain and the associated foothills in Nepal, Bhutan and India. This hotspot contains the Lower Mekong catchment. It starts from eastern Bangladesh and

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1* Dept. of Geology, National Institute of Technology, Durgapur-731209, West Bengal, India. E-mail: sruti_karmakar@yahoo.co.in
2 Dept. of Zoology, Vidyasagar University, Midnapore -721102, West Bengal, India. E-mail: tanmaybhattacharya@yahoo.com
3 Dept. of Design, Indian Institute of Technology, Guwahati-781039, Assam, India. E-mail: karmakar.sougata@gmail.com

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Species extinction is the main disaster of biodiversity. Protection of bio-diversity and prevention of extinction of endemic species are the greatest challenge to conservationists. Three biodiversity hotspots of Indian sub-continent e.g., Himalayan, Indo-Burma and Western Ghats-Sri Lanka regions are of specific importance from endemism of aves species. Present article attempts to investigate recent status of the aves species in those hotspots and identifying the hotspot which deserves maximum attention and priority from conservation point of view.
then stretches across north–eastern India, south of the Brahmaputra River to encompass nearly all of Myanmar, part of southern and western Yunnan Province in China.  

Nearly 1,266 bird species are found in Indo–Burma hotspot. Among them 64 are endemic. It has also 5 endemic bird genera, each represented by a single species. Golden-crested myna (*Ampeliceps coronatus*), short-tailed scimitar-babbler (*Jabouilleia danjoui*) and wedge-billed wren-babbler (*Sphenoicichla humei*) are few example of such endemic bird genera.  

Bird Life International (BLI) has identified 8 endemic bird areas (EBAs) which fall either partially or entirely within this hotspot. Threatened endangered (EN) bird species in these EBAs include white-eared night-heron (*Gorsachius magnificus*), seen in southeastern China and north-eastern Vietnam, Edwards’s pheasant (*Lophura edwardsi*) of the wet evergreen forests in the Annamese Lowlands of Vietnam, orange-necked partridge (*Arborophila davidii*) of the South Vietnamese Lowlands, and grey-crowned crocias (*Crocias langbianis*) of Vietnam’s Da Lat Plateau. Here, it is worthy to mention that Gurney’s pitta (*Pitta gurneyi*), a lowland evergreen forest bird endemic to Peninsular Thailand and adjacent parts of southern Myanmar, is critically endangered (CR) by dramatic decline during the twentieth century due to extensive habitat loss.  

Indo-Burma hotspot has been facing a serious problem of biodiversity declining over the years because of the resource exploitation and habitat loss. It is one of the places where people started agriculture first. It has a long history of using fire to clear land for agricultural purposes and other needs.

Aquatic ecosystems are badly affected here by intense development pressure. Mangroves are converted in to shrimp aquacultural ponds. On the other hand, large area of lowland forest has been replaced by tree plantations (teak, rubber, oil palm) while coffee, tea, vegetable crops and sugarcane plantations are threatening montane and hill forests. Inter-tidal mudflats have been severely cleared with mangrove or by intense fishing with lines of stack nets which badly affected their value as feeding habit for migratory water-birds and other species. Rapid population growth and economic development is also responsible for overexploitation of natural resources in this hotspot. Like other hotspots of Southeast Asia, the wildlife trade, mainly for food and traditional medicine markets in China, is an acute problem for biodiversity conservation. Other threats to forests include logging, mining for gems and ore, firewood collection, and charcoal production.

**Himalayan region** : Himalayan region which includes northern Pakistan, Nepal, Bhutan, the north-western states of India is stretched as an arc over 3000 km. It covers nearly 750,000 km². This region holds most of the highest mountain peaks of the world and mountain range has been divided in to two regions - Eastern Himalaya and Western Himalaya.  

About 977 bird species are found in this hotspot. Among them only 15 are endemic. Critically endangered Himalayan quail (*Ophrysia superciliosa*) represents an endemic genus of this region.

Bird Life International has identified 4 EBAs which overlap partially or fully with the Himalaya hotspot. Eastern Himalaya EBA overlaps with part of the Indo-Burma Hotspot. It has nearly 20 endemic species, including 4 species that are fully endemic to the Himalayas. Chestnut-breasted partridge (*Arborophila mandellii*, VU), rusty-throated wren babbler (*Spelaeornis badeigularis*, VU), white-throated tit (*Aegithalos niveogularis*) and orange bullfinch (*Pyrrhula aurantiaca*) are available here. The Western Himalayan EBA has 11 endemic species e.g., Himalayan quail (*Ophrysia superciliosa*), Cheer Pheasant (*Catreus wallichii*, VU) and Western tragopan (*Tragopan melanocephalus*, VU).

Other important avian species of Himalayan hotspot include the white-winged duck (*Cairina scutulata*, EN), the endemic white-bellied heron (*Ardea insignis*, EN), and the Bengal florican (*Houbaropsis bengalensis*, EN). The number of total aves species, endemic aves species and endemic threatened aves species are mentioned in table 1.

Mountains of the Himalayas are the natural habitat of the people for thousands years. Due to anthropogenic activities Himalaya region have lost its biodiversity to a large extent. Increasing demand of natural resources attracted people towards this region and this leads to huge immigration from the outside.

<table>
<thead>
<tr>
<th>Enigmatic species</th>
<th>Numbers</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gurney’s pitta</td>
<td>19</td>
<td>CR</td>
</tr>
<tr>
<td>Himalayan quail</td>
<td>15</td>
<td>EN</td>
</tr>
<tr>
<td>Cheer Pheasant</td>
<td>11</td>
<td>VU</td>
</tr>
<tr>
<td>Western tragopan</td>
<td>8</td>
<td>EN</td>
</tr>
<tr>
<td>White-winged duck</td>
<td>5</td>
<td>VU</td>
</tr>
<tr>
<td>White-bellied heron</td>
<td>7</td>
<td>VU</td>
</tr>
<tr>
<td>Bengal florican</td>
<td>9</td>
<td>EN</td>
</tr>
</tbody>
</table>

*Table 1: Numbers and Status of Enigmatic species in Himalayan Hotspot.*
Table 1. Aves species of three hotspots under study

<table>
<thead>
<tr>
<th>Hotspot</th>
<th>No. of aves species (Total)</th>
<th>No. of endemic aves species</th>
<th>No. endemic threatened aves species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indo-Burma</td>
<td>1,266</td>
<td>64</td>
<td>18</td>
</tr>
<tr>
<td>Himalaya</td>
<td>977</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>Western Ghats and Sri Lanka</td>
<td>458</td>
<td>35</td>
<td>10</td>
</tr>
</tbody>
</table>

In Himalaya hotspot, steadily increasing population has led to extensive clearing of forests and grassland for cultivation and logging. In the summer month land is also cleared for livestock. Moreover, use of fire for land clearing poses an additional threat to forest land. The transformation of forests and grasslands for agriculture and settlement purpose has brought large-scale deforestation and habitat fragmentation in Nepal and in the Indian region of Sikkim, Derjeeling and Assam. In Himalaya hotspot, nearly 50 million people are present in this hotspot overall, at a density of 260 people per km².

Fuel-wood collection, hunting of animals, uprooting of flora with medicinal values, overgrazing of grass lands by cattle in lowlands and alpine forests, unplanned and poorly managed tourism are major threats for Himalayan hotspot. Other threats to this ecosystem include mining, the construction of roads and large dams, and pollution due to the various anthropogenic activities.

Western Ghats and Sri Lanka region: The Western Ghats of south-western India and the highlands of south-western Sri Lanka are separated by 400 km distance. They have similarity in their geology, climate and evolutionary history. The Western Ghats, consists of Malabar Plains and the chain of mountains running parallel to India’s western coast about 30 to 50 km inland.

Sri Lanka is a continental island separated from southern India by the 20 meter-deep Palk Strait. The island, some 67,654 km² in size, has been repeatedly connected with India between successive interglacials, most recently until about 7,000 years ago by a land bridge up to about 140 km wide.

About 458 known bird species are present in this region, among which 35 species are endemic. Above 20 species are endemic to Sri Lanka. Both the Western Ghats and the island of Sri Lanka have been selected as EBAs by Bird Life International.

Among endemic species, 10 are considered threatened, including the green-billed coucal (Centropus chlororhynchos, VU), the Sri Lanka whistling thrush (Myiophonus blighi, EN) and rufous-breasted laughingthrush (Garrulax cachinnans, EN). The hotspot also holds several widespread threatened waterbird species, including the spot-billed pelican (Pelecanus philippensis, VU) and the lesser adjutant (Leptoptilos javanicus, VU). Another threatened species, the Kashmir flycatcher (Ficedula subrubra, VU), breeds in the Himalayas and winters in the Western Ghats and in Sri Lanka. The number of total aves species, endemic aves species and endemic threatened aves species of this hotspot are mentioned in table 1.

The biodiversity of these regions are badly affected by the anthropogenic reasons. Among different hotspots, population density is found to be maximal in Sri Lanka. Nearly 50 million people are present in this hotspot overall, at a density of 260 people per km².

In Western Ghats, forests have been selectively logged and highly fragmented. These have been converted to agricultural land for plantations of tea, coffee, rubber, oil palm, teak, eucalyptus, wattle etc and are also destroyed for building reservoirs, roads and railways. Encroachment into protected areas helped to reduce the extent of forests. Moreover, grazing causes severe erosion on previously forested slopes.

Poaching and extraction of forest products (timber, firewood and medicinal plants) are severe threat in almost all forest and play a significant role to habitat fragmentation and edge effects. Unlimited use of agrochemicals in these areas poses a serious problem to ecosystems. Finally, invasive species mainly to aquatic ecosystems faces a growing threat.

Comparative study of Aves specieses in three hotspots: It is observed that maximum number of endemic bird species (64) exists in Indo-Burma region. The number of endemic bird species in Himalaya area and Western Ghats-Sri Lanka are 15 and 35, respectively. From table 1, it is evident that total number of aves species declines from Indo-Burma to Western Ghats-Sri Lanka. Primary reason for the variation of total number of aves species is the huge variation in the coverage area of these three hotspots. If the extents of these hotspots are looked into, we find that Indo-Burma, Himalaya and Western Ghat-Sri Lanka areas cover 2,373,000 km², 750,000 km² and 160,000 km², respectively.

Density of aves population in the three hotspots under study is found to be 0.005/ km² in Indo-Burma, 0.001/ km² in Himalaya and 0.003/ km² in Western Ghat-Sri Lanka, respectively. Although extent of Himalaya region is more than Western Ghats-Sri Lanka region but the density of aves population in Himalayan hotspot is much lower in...
comparison. Indo-Burma region is characterized by distinct seasonal weather patterns: the dry, northeast monsoon in winter months and moistureful, rainy southwest monsoon. Seasonal variations in weather direct wide diversity of ecosystems in this hotspot. Here, ecosystem includes mixed wet evergreen, dry evergreen, deciduous, and montane forests. There are also patches of shrublands and woodlands on karst limestone outcrops. These tremendous variations in ecosystem of Indo-Burma hotspots may be considered as an important factor for higher population density of aves species here.

If the percentage of endemism is measured, Western Ghat–Sri Lanka area is with highest value (7.6%) as seen from fig.1. The wide variation of rainfall patterns in the Western Ghats, coupled with the regional complex geography, produces a great variety of vegetation and ecosystem. Vegetations include scrub forests in the low-lying rain-shadow areas and the plains, deciduous and tropical rainforests up to about 1,500 meters, and a unique mosaic of montane forests and rolling grasslands above 1,500 meters. In Sri Lankan biodiversity hotspot, dry evergreen forests are found all over the dry zone and the dipterocarp-dominated rainforests are seen in the lowlands of the wet zone and some 220 km² of tropical montane cloud forest still persist in the central hills, which rise to a maximum altitude of 2,524 meters. Hence, it is very clear that typical weather patterns and simultaneous enriched biodiversity form long past could be the predisposing reason of higher endemism of aves species in this area.

Maximum number of endemic threatened bird species is found in Indo–Burma area (fig. 3) but the percentage of endemic threatened bird species is highest in Himalaya region among the three hotspots in question (fig.4). Remaining habitat in the Himalaya is patchy and less than 25 percent of its original vegetations. Human interference (clearing of forests and grasslands for cultivation and widespread logging) in the hotspot has led to extensive
destruction of natural resources. As was mentioned earlier, the conversion of forests and grasslands for agriculture and shelter has led to large-scale deforestation and habitat fragmentation in Nepal, and in the adjacent states of India. Biodiversity Action Plan (2002) indicated that environmental deterioration was also going on due to unplanned and poorly managed tourism. More over, anthropogenic activities including mining, construction of roads and large dams and pollution are great threats for integrity of ecosystem and biodiversity. Number of endemic birds in Himalayan hotspots is only 15 where as 8 of them have become threatened species due to habitat loss and other anthropogenic activities (hunting, use of pesticide in agriculture etc.). Brooks et al. (1997) studied the relation between extinction of aves species and the extent of deforestation in the insular South-east Asia. They found that the number of extinctions predicted from deforestation and the numbers of aves species actually threatened were strikingly similar. They concluded that extent of deforestation can be considered as the predictor of the number of threatened birds in a region. The same logic is also applicable for Himalayan hotspot where higher extent of deforestation and human interference is the probable cause of highest percentage of endemic threatened aves species than other two hotspots.

**Conclusion:** After comparative studies of the three hotspots from bird (aves species) conservation point of view, it seems to be very difficult to identify a single hotspot which deserves maximum conservation priorities for aves species. It may be concluded that priority should be given to the Western Ghat–Sri Lanka for the maximum percentage of endemic threatened aves species other than two hotspots.

**References**