Basic Course in Ornithology
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Lecture -3
Diversity and Classification Part 2

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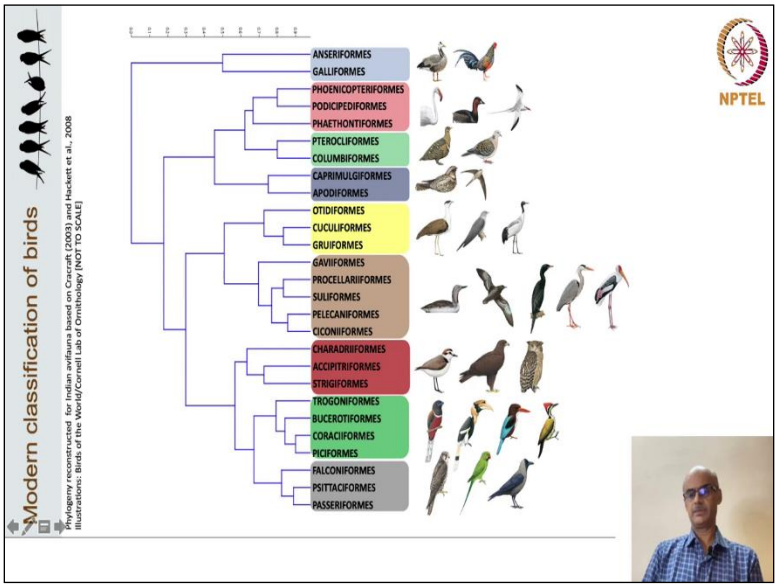

Hello viewers, welcome back to the Part 2 of this session on avian diversity and classification. So, now that we have learned the basic principles of avian taxonomy, we will now see how Indian birds are currently classified as per modern systems. What you see here is the dendrogram of avian orders reconstructed based on their putative evolutionary relationships as sourced out from a couple of recent publications mainly one from Joel Cracraft 2003 in Howard and Moore's fourth edition. And another recent one is from Hackett et al 2008 in Science. These two sources give out a good overview of the modern classification of the orders.

So, the first clade comprising Anseriformes and Galliformes is the basal to all the other extant birds. Anseriformes includes ducks, geese and swans - a majority of which are winter visitors to India. Galliformes includes what are generally known as game birds, like the fowl-like terrestrial birds that include quails, partridges, francolins, spurfowl, pheasants and also the peafowl – the National Bird of India.

The next glade is composed of three orders - Phoenicopteriformes of flamingos that feed largely in brackish waters and Podicipediformes with grebes small to medium size fresh water birds that often dive into waters you know for foraging. The third group in this clade is the Phaethontiformes formed by tropicbirds, small pelagic birds with long tail streamers and often seen along the sea coast immediately after the tropical storms.

Then comes the doves and pigeons and sandgrouse forming a clade. Sandgrouses of the order Pterocliformes are medium sized birds with visibly, you know, perceptibly chunky bodies and longish tails. They are typically found in semi-arid tracts and are known to commute long distances in search of water sources in huge flocks. Of course, doves and pigeons, another, as sister taxa to the sandgrouse, are very well known group of birds and some species especially the Rock pigeons have been domesticated extensively for a very long time.

Then, nightjars of Caprimulgiformes and swifts of Apodiformes are the insectivorous groups of birds often treated in a single order. Some authorities treat them as a single order as Caprimulgiformes or some authorities split them into two, though they are extremely closely related to each other. Nightjars, as the name suggests, are primarily nocturnal insectivores and swifts are tiny aerial insectivores some of which are known to nest in deep dark caves using echolocation.

And swifts are also known for their facultative torpor, you know, ability to get into a physiological inactivity phase during harsh winters. So, the next clade is composed of cranes, bustard and cuckoos. So, cranes and rails of the order Gruiformes are medium to large birds while rails and crakes are confined to well vegetated wetlands. Cranes are partial to wet grasslands and some of the cranes are long distance migrants too.

Bustards and floricans of the order Otidiformes are birds of semi-arid open grasslands and they are perhaps the most threatened or endangered groups among the Indian avifauna. For example, the Great Indian Bustard of which the picture is shown here, is an iconic species of India now

confined only to north-western Indian desert and semi-arid tracts. It has only about 120 individuals that live today.

And cuckoos are canopy-living birds, which are known for their brood parasitic behavior and has been much celebrated in our mythology and literature. The next clade is a fairly large one mostly of water birds and also the sea birds sometimes also called pelagic birds. So, the first one is the order Gaviiformes of loons and are sometimes called divers. They are large grebe-like sea birds known for their diving foraging behaviour in offshore waters.

Then, order Procellariiformes represents the typical tube-nosed sea birds like shearwaters, petrels, and storm-petrels. So, they do have a tube-like structure just over their upper mandible - upper bill which actually exudes the excess salt since they feed on marine organisms - fishes and marine organisms. They need to excrete the excess salt. That is why they are called tube-nosed seabirds.

They spend most part of their lives over the offshore waters and they are descending to land only for breeding for a very short time. And this clade also has typical fish-eating birds like cormorants, darters and boobies belonging to the order Suliformes and order Pelecaniformes that has large-bodied waterbirds like pelicans, herons, egrets, ibises and bitterns. Interestingly, storks of the order Ciconiiformes whose taxonomic position was debated much over the few decades have now been found to be actually closely related to this particular clade.

The next clade includes three very dissimilar looking taxa: waders, raptors and owls. So, the order Charadriiformes is formed by the typical shorebirds or waders including plovers, sandpipers, snipes, stilts, and godwits. So, you often find them foraging by wading through the shallow waters along the edges of the water bodies, freshwater bodies and sometimes even the coastal lagoons and mudflats, that is why they are called as waders and they are very migratory, most of them are long distance migrants.

Then the raptors of the order Accipitriformes are very well-known birds being the carnivores among the avian fauna and they are the top apex of the food chain. And owls or Strigiformes, they are another monophyletic group which are mostly known for their nocturnality and they are also

sometimes clumped with raptors, colloquially speaking, as nocturnal raptors. The next clade consists of woodpeckers, and a group of woodland avifauna earlier put together under the larger Order Coraciiformes like trogons, the birds of the evergreen forests and kingfishers of the wooded wetlands, bee-eaters and hornbills the Old World frugivores; and hornbills are very popular, known for their bizarre nesting behaviour where the females get incarcerated inside a tree cavity and then females come out only after the hatching of the chicks. And woodpeckers and barbets comprise the Order Piciformes. So, along with Piciformes and other three Orders, they form the larger clade.

The last of these clades includes falcons, parakeets and passerines or songbirds. Very recently, falcons were found to be unrelated to other raptors and they are actually found to be sister-taxa to parakeets. Ecological divergence perhaps drives these disparate food habits. This clade also comprises the order Passeriformes of songbirds or perching birds the largest groups of birds with over 60 percent of the world's avifauna actually falling under Passeriformes.

They are marked by very unique perch mechanism on their legs. So, it is a musculature which actually helps them to perch very tightly when they lower their body and heterodactyl feet -the hallux behind and three toes in front and the presence of well-developed syringeal muscles - that is why sometimes they are also called songbirds. Most of the common birds and urban birds and birds in agro-ecosystem that we see every day actually belong to the Passeriformes or these so-called songbirds or passerines - the perching birds.

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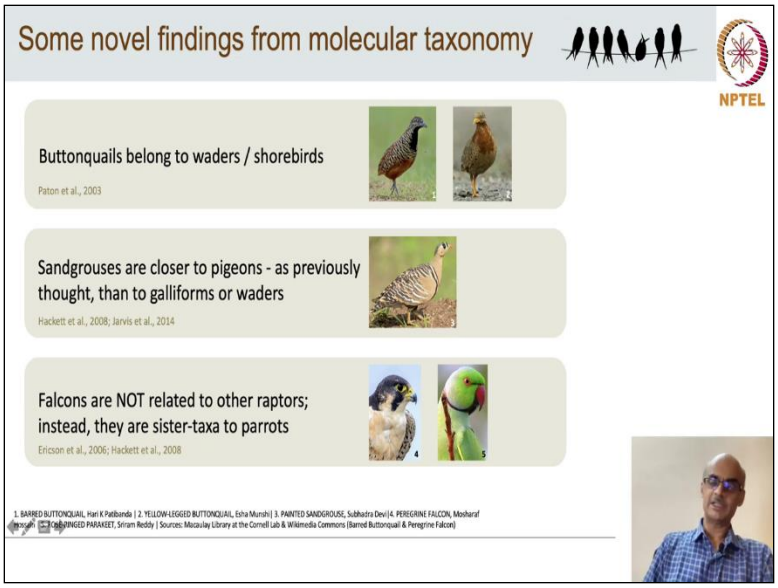

We will now see some of the novel findings from the molecular taxonomy. So, traditionally we have the morphological taxonomy and comparative anatomy to classify birds; but in last three decades, the molecular taxonomy have thrown up several new findings. So, we will see some of them which pertain with particular reference to Indian avifauna.

Now the first major thing is that of grebes and flamingos. And though grebes and flamingos were suspected by some authors to be closely related, the molecular signatures have strongly demonstrated a very close relationship; though, you know, they morphologically are very, very distinct. And storks as I said, they are finally found to be basal to the large-bodied waterbirds in the that clade, which is shared by both Ciconiiformes and the Pelecaniformes.

And very interestingly among the raptors - bearded vulture or lammergeier which we find in the Indian subcontinent, along the Himalayas and Egyptian vulture which can be found along the mainland India are not true vultures. But they are very close to the honey-buzzards and buzzards the other raptors, but perhaps they developed their scavenging behaviour as, you know, convergent behaviour as a process of convergence.

Then come the buttonquail; for a very long time, buttonquail's taxonomic position was hotly debated. Actually, they look like quail but they were put under the Gruiformes, with the cranes,

rails and crakes. Because they possess three toes, the hind toe ‘hallux’ is absent in buttonquails. But the molecular taxonomy clearly reveals that actually buttonquails are basal to all the other waders or shorebirds.

Though buttonquails are not exactly wetland birds, they are actually birds of the open dry grasslands. Next comes the sandgrouse; sandgrouses… they do look like some sort of intermediate form between game birds, fowl and pigeon. So, they were variously classified close to the wildfowl or close to the waders. but they always been put along with the pigeons because of their drinking water behaviour.

But now molecular evidence clearly proved that sandgrouse are actually sister taxa to pigeons and doves. Then come the falcons, as I said earlier, falcons are not related to other raptors, instead they are sister taxa to parrots. Well, the only similarity that we can see is the shape of their bill, but otherwise ecologically and behaviorally they are very different.

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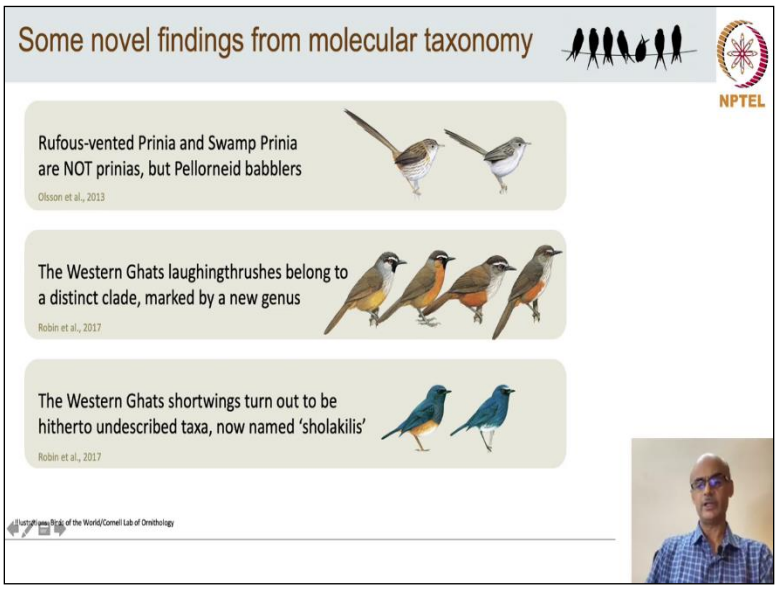

Among the passerines. See there are eight species of Shrike-babblers in the Indian subcontinent; they are actually the Oriental birds. So, for a long time, they were considered as babblers because they typically behave like babblers along the Himalayan forests but later they have now been found

to be belong to the New World family of vireos. So, what you see here the first picture is that of Green shrike-babbler, the second one is that actually the New World vireo - the Hutton's vireo.

So, they look quite similar to the vireos but nobody really suspected that they could actually belong to the same clade. This in fact created a lot of flutter among the biogeographers in the Indian subcontinent because vireos are New World family and they never had any members from the Old World and shrike-babblers seem to be the connecting link between the New World and the Old World.

So, perhaps it is very interesting to know the origin and radiation. So, the hypothesis is that vireos perhaps originated from the Old World; they then colonized the New World, but then they became extinct from the Old World. But the offshoot of that is shrike-babblers became adaptive through adaptive convergence they actually looked like other babblers.

And very interestingly, white-eyes - very common birds of the hill gardens, hilly regions and gardens. They were along with yuhinas, belong to the babbler clade. Because white-eyes are always treated along with sunbirds, flowerpeckers and others because white-eyes are also largely nectarivorous birds though they do take insects and fruits sometimes. So, yuhinas the second picture that you see here; yuhinas are always considered as babblers.

But the molecular phylogeny reveals that both yuhinas and white-eyes belong to the same family of white-eye family Zosteropidae; but then again the White-eyes belong to the actual babbler clade.

And Sylvia warblers a long distance migrant in winter; they are very common particularly Lesser whitethroat a very common winter visitor to most parts of India. So, again Sylvia warblers are actually not warblers but they are babblers. So, that is another interesting arrangement of what we call as the superfamily Sylvioidea.

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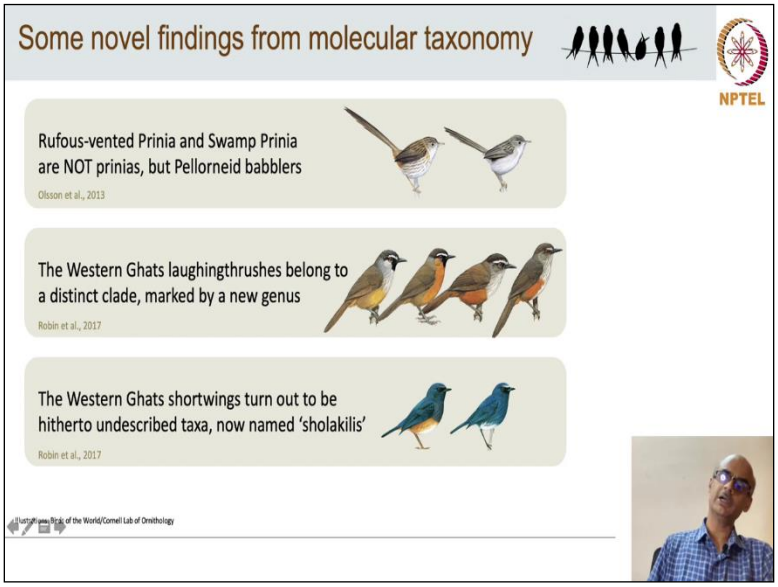

Then prinia, see prinias are actually another of Passeriformes; insectivorous passerines with very long tail with black and white tips on the tail and prinias generally reside in shrubs and grasslands and reeds. There were two prinias: Rufous-vented prinia in the Indus plains and Swamp prinia in the Assam plains - Brahmaputra floodplains. They were found to be actually not prinias though they look exactly like other prinias and they behave like prinias; but they were apparently found as babblers belonging to the what we call as ground-babblers of the family Pellorneidae. Actually, in fact, they are much closer to our Puff-throated babbler which is very common in the forests of the peninsular India.

This is again very interesting finding especially, by Robin et al. - the Western Ghats Laughing thrushes. See, laughingthrushes are a group of babblers; which, within the Indian subcontinent especially they are very diverse along the Himalayas with more than 20 or 25 species of laughing thrushes and they occur in flocks.

And they are called laughingthrushes because they actually make very cacophony of calls and laughters, laughter like cackles. We have four species of laughingthrushes along the Western Ghats. In fact, there are three species but now they were found to be actually four species. They were considered as the remnants of the laughingthrush radiation from the north-east.

But Robin et al found through molecular phylogeny that they actually form a very distinct clade within the laughing thrushes and babblers family. And so, they erected a new genus *Montecincla* for them actually.

And same Robin et al also studied these Western Ghats shortwings. See, there are two, in fact, they're earlier one, but now two species of Shortwings are there along the Western Ghats -Nilgiri shortwing and the White-bellied shortwing.

So, shortwings are actually closer to babblers and they are kind of babblers intermediate between babblers and chats and robins. These Shortwings are quite common along the eastern Himalaya; there are five to six species of short wings along the Himalayas and there were two in the Western Ghats. But Rasmussen when she studied the skins and vocalizations, tentatively put the shortwings as under blue robins.

When our Indian ornithologist Robin and his team did the molecular phylogeny, they found that actually Western Ghats shortwings are completely unique and hitherto undescribed taxa. In fact, nobody really suspected that they could actually form completely new bird taxa. So, they had to give a new name for that and they gave the name Sholakili; and in Malayalam, the sholakili is the local name in the distribution range because they are found typically in the high-altitude evergreen shola forests of the Western Ghats.

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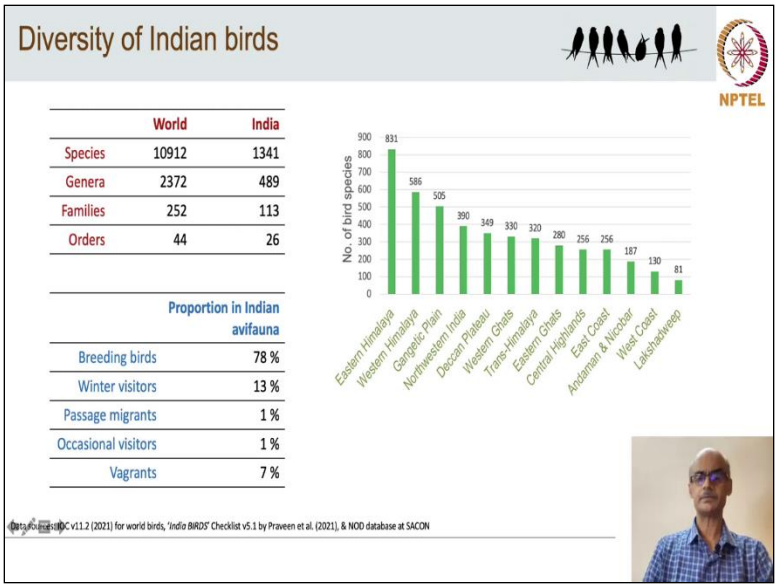

So, those are the novel findings but we now will look at the diversity of Indian birds. In the world, all over the world are10,000 species of birds of which 1,300 occur in India. Almost, you know, 12% of the world's avifauna are found in India; in fact, India tops ninth in the rank in terms of number of bird species. And these 1300 species of India are represented by 489 genera under 113 families and 26 Orders sometimes 27 orders if you separate Swifts and Nightjars to separate orders.

Among these Indian avifauna, almost 78% are actually breeding birds meaning that they actually breed or nest within Indian limits. But remember that most of these birds that breed especially along the Himalayas and the northern Indian Gangetic Plains, they do also winter in the southern India. So, if you look at the actual number of species that breed and that migrate, it differs between northern and southern India.

But when we take India as a whole, 78% of them are actually breeding birds and 13% of the winter visitors. So, this means that this 13% of the birds are the long-distance migrants from Europe, central Asia, eastern Asia and very rarely even the middle east and the central Asia as well. So, 1% is the passage migrant like Rufous-tailed rock-thrush or even Amur falcon. They are the passage migrants; they just pass through the Indian subcontinents though a few individuals might overstay here or overwinter here but mostly they pass through India. And there are 1% that occasionally visit mostly by the seabirds and pelagic birds and these 7% are vagrants. Vagrants

are actually stragglers in the sense that there are historically there might be three, you know maximum three or four records let us say three records over the last 50 years then we would call them as vagrants.

And since birds can fly so it is very natural to expect some individuals of the species losing its way or just might random by randomly they might end up here and sometimes even ship assisted vagrants are also there especially for the water birds and sea birds. So, if you look at the biogeographic region-wise naturally Eastern Himalaya has the highest diversity of birds like almost 831 species followed by the Western Himalaya 586 species and Gangetic Plains of 505 species. And of course, the Lakshadweep being very small in size have only 81 species recorded from these regions.

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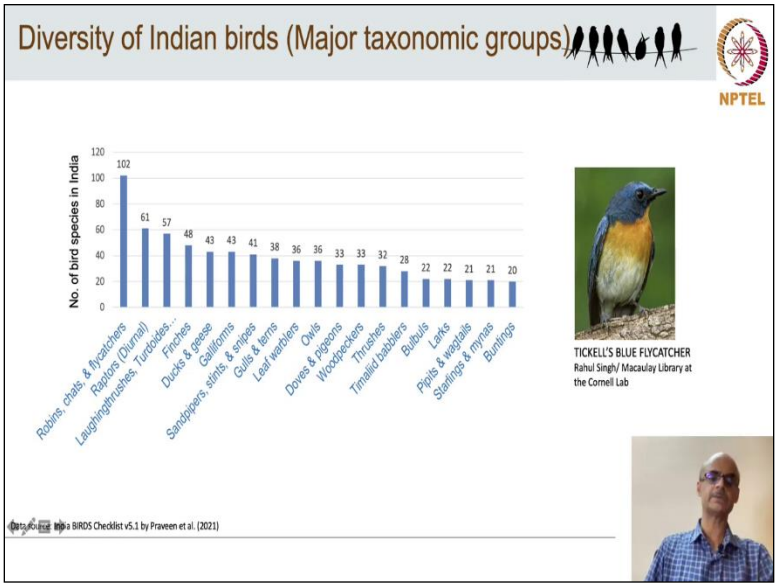

So, if you look at the major taxonomic group-wise it is what we call the family Muscicapidae; it contains robins, chats and flycatchers. It is a large family under the passerine, it is a large songbird family in India with over 100 species followed by Raptors - 61 species of raptors and 57 species of laughingthrushes and *Turdoides* babblers. And so, this graph shows perhaps the top 20 or 25 groups of birds with the highest number of species.

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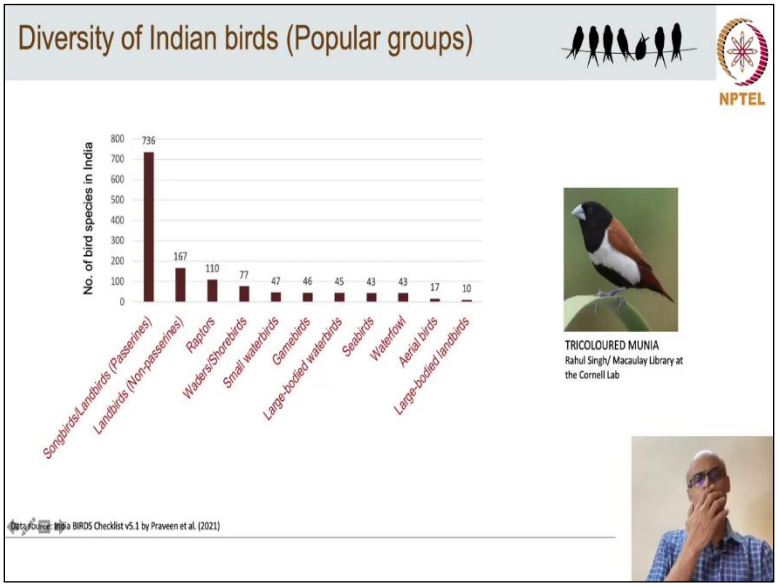

And if you look at the popular groups… that is, the earlier classification was very taxonomy-wise but if you look popular group it is the song bird or land birds which form the largest part of Indian avifauna. Almost 736 species out of 1300 actually belong to song birds or the land birds what we call as passerines -followed by non-passerine land birds 167 species like hornbills, woodpeckers, bee-eaters, rollers, kingfishers.

And raptors… 110 species of raptors; here, raptors include both diurnal and nocturnal raptors like owls. Then waders, we have 77 species of waders and 47 species of small-bodied waterbirds like grebes and also rails and crakes. Then game birds, the fowl-like birds like partridges, quails, they have 46 species. And large-bodied waterbirds like egrets, herons and storks, they have 45 species we have in India and 43 species of seabirds are there in our Indian seas, you know, Arabian sea, Bay of Bengal and Indian Ocean. So, 43 are the ducks and geese and 17 species of aerial birds mainly composed of swifts and swallows. And of course then there are only 10 species of the large-bodied land birds that include birds like cranes, bustards and you know other large-bodied land birds.

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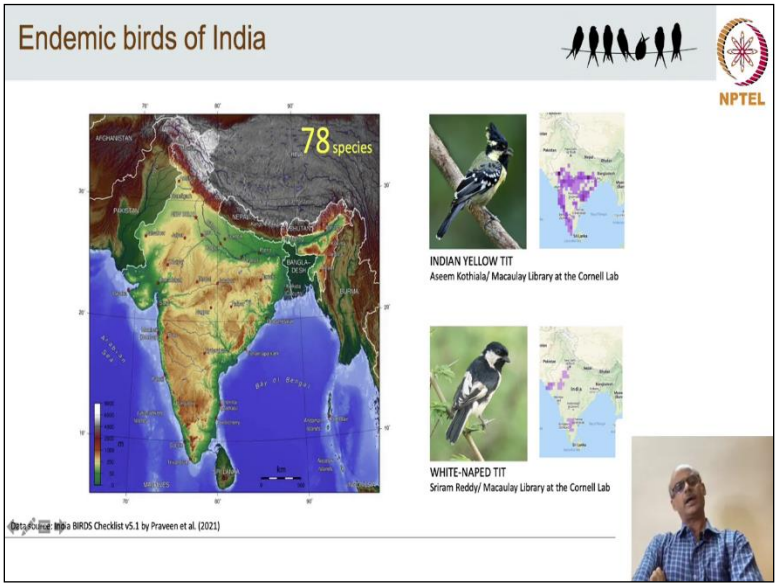

So, we have 1300 species of bird 1341 to be more precise as per Praveen et al's latest estimate. So, out of these 1341 species of Indian birds, 78 species are actually endemic to India. In the sense the political boundaries of India. Of course, the endemism is a concept that is really applicable to a biogeographic region or a distinct geological or geographic unit like an island or a particular mountain chain; like birds endemic to the Western Ghats or something like that.

But often we also use this concept for the political boundaries. if you look at the political boundaries of India, we have 78 species which are endemic to India that means that they are not found anywhere else in the world; they are found only within the Indian limits. Like for example, there are two species of tits shown here: Indian yellow tit which has a very wide range but within the Indian limits like the south western and central and eastern India. On the contrary, we have White-naped tit which has extremely localized distributions in the northwestern and southern India. So, both the species are endemic to India though their distribution ranges differ vastly in size. Among these 78 species these are the split-up of these 78 species as per the biogeographic regions. The highest number of endemic species are naturally found in Andaman and Nicobar islands because Andaman and Nicobar islands are very isolated for a very long time.

So, their endemism is likely to be much higher. So, the 29 species are endemic to Andaman and Nicobar followed by Eastern Himalaya that is 19 species, and also the Western Ghats 27 species,

27 species are actually the Western Ghats. And Western Himalaya has 10 species in contrast to Eastern Himalayas just 19 species among the endemics and of course Assam Plains has four species and there are other biogeographical units that have one species each like Indus Plain, Central India like Forest owlet, southern Andhra Pradesh with Jerdon's courser and South Deccan with Yellow throated bulbul.

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So, before we finish this talk, there are a couple of questions for you to just to think over. The first is that, as I said that there are 78 species of birds endemic to India. Right? So, but even if you exclude the Andaman and Nicobar 29 species that means only 49 only almost 50 species in the Indian mainland are actually endemic to India; that is pretty very low in number compared to the 1300 species that are known to occur in the mainland India.

So, out of 1300 species only 50 species are actually endemic to the mainland India. So, why are they so few endemics in the mainland India? Yeah, just think over it; there are quite a few hypotheses and theories that have been prescribed. But it still eludes a single definite answer to these things but it will be interesting to know about your views as well. And the second question that I want you to think over is why are there no endemic species on Lakshadweep islands?

We saw that Andaman and Nicobar islands have 29 species that are endemic because you know these islands are isolated and so they could pave way for a lot of endemism. But in the same logic Lakshadweep islands which are also isolated, but why they did not have a single endemic bird? Just you can think over these things, thank you.

So, if you have any questions or if you have any clarifications that you require or questions please feel free to write to me at rajah.jp@gmail.com, thank you very much.