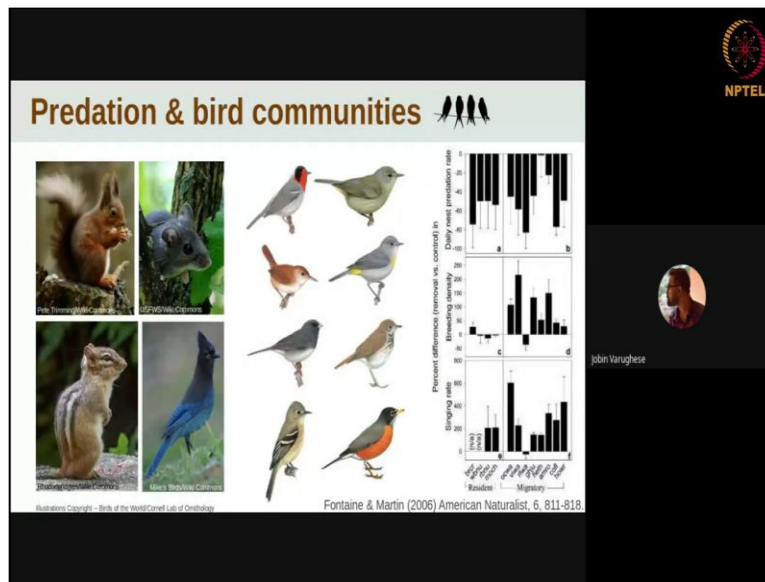


**Basic Course in Ornithology**  
**Dr Mousumi Ghosh (NCF)**  
**and**  
**Dr. Umesh Srinivasan**  
**Indian Institute of Science- Bangalore**

**Lecture 37**  
**Week 7**  
**Interactive Session – Bird Communities**

So, these questions are I mean taken from the video directly. So, I will just read it out and tell you the study and so, the person is trying to understand the graphs that have been presented in the your presentation image. So, this is this is one of the graphs that is from Fontaine and Martin 2006. **(Refer Slide Time: 00:33)**



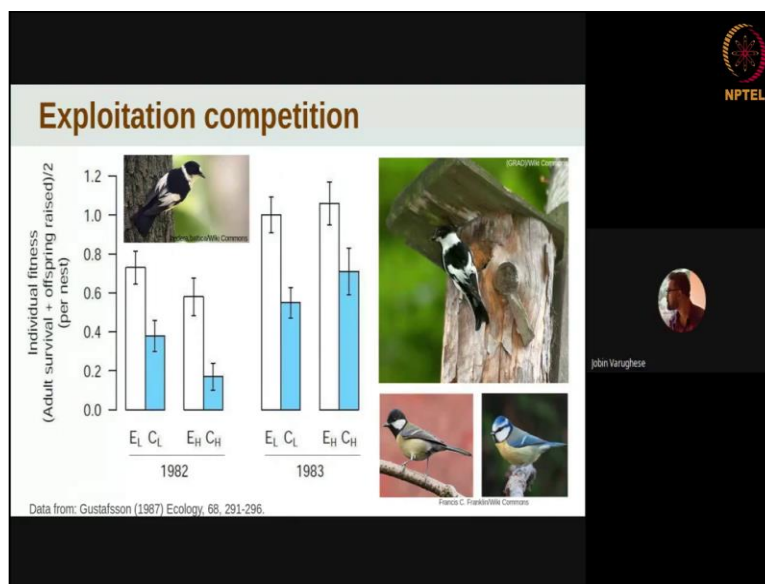
And she is trying, they are trying to ask if why breeding density in three cases out of four is negative for resident birds. Yes. at the bottom, yes so, this is I think she is talking about this this graph yes yeah the graph c. So, this is not the predation rates relative to the control or the predation density relative to the control. So, the control is where these nest predators are present. And the so, that is that is the baseline is zero.

So, what is the breeding density when these nest predators are present. And what is the breeding density when nest predators are absent. So in c, there are three species where the breeding density is actually lower, when the predators are removed than when predators present. Now overall, this

study shows that bird communities can be influenced by predation and bird communities can respond to predation by deciding whether to nest in particular places, by deciding to breed in particular places and by deciding whether to sing, how loud to sing and how often to sing. But in this case there are three species that are residents, their densities are actually lowered in the absence of predators.

But if you look at the size of the error bars around those, unfortunately the error bar is also in black and the R itself is also in black. So, if you look at those errors, they are actually overlapping zero which means actually there is no evidence for an effect. And so, for these three species that are slightly below zero, actually statistically, there is no evidence that the **batteries** are actually lower. So, this is it.

**(Refer Slide Time: 03:33)**



So, the next question is from Gustafsson 1987 paper. She is asking, why is the fitness more in 1983 than 1982 for both the presence and absence of Tits, Right. So, this paper is the competition paper yeah just fine paper which is basically excluding these two species of Tits from nest boxes and looking at the can you hear me there are lots of messages in the chat saying that my voice is not clear, it is slightly unstable.

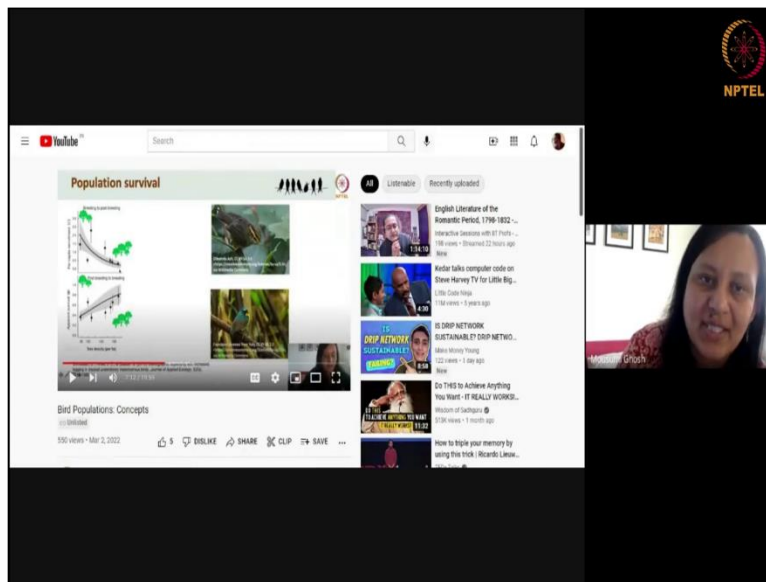
Can you keep the mic closer to your mouth probably, well is this better yeah this is better I think yeah okay sorry about that. So, you can see that the patterns in both these years are identical. So,

the qualitative patterns between 1982 and 1983 are identical. The reason why there is a slight variation and why 1983 has slightly higher fitness than 1982 could be because 1983 in general was a better year for resources and so you know the more resources than we are 1982.

So, there is this year-to-year variability in the availability of resources also. It is not as in every year the number of eggs produced by a breeding pair remains the same that the number of nestlings produced possibly produced by a breeding pair is going to remain the same. So, there is this year-to-year minor variation in fitness or offspring production. And so, 1983 happened to be a slightly better year than 1992 and that is well within normal variability in reproductive success.

But the take-home message from this graph is basically that when you exclude these competitors that are exploitatively competing for the same resource. You do actually see an increase in the fitness of the Collared flycatcher. So, the next question is from the Hoi and Winkler 1994 paper about the dome and the cup open cup nest study.

**(Refer Slide Time: 05:33)**



So, the person is asking warbler with the dome and open cup nest was the study done with changing the number of domed nests keeping openness the same. So, the number of domed nests remains the same. The number of open cup nests changes. So, the domed cup is in white bars (hang on I am sorry it looks like there is some echo here I am just going to look at the settings over here. Is this better if the less effort this way, not exactly but what about this? Can you can you say

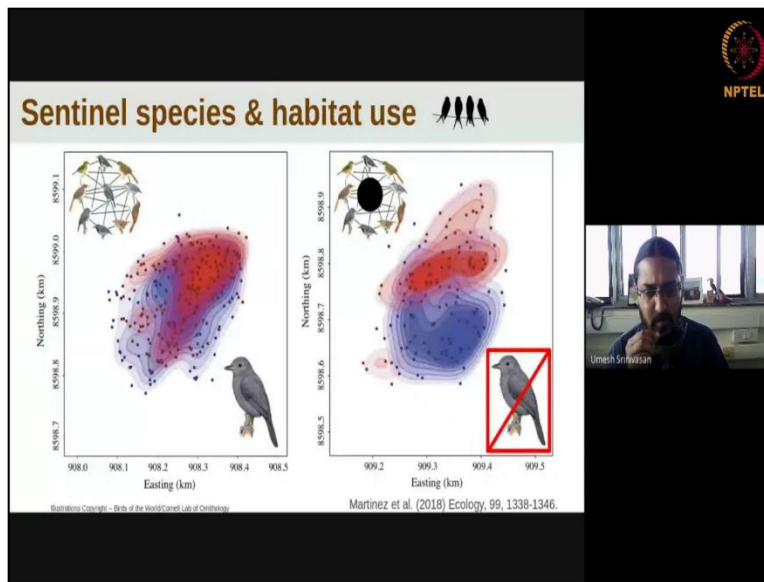
something again? Is there less echo this way? Yeah, this is better less of echoes okay sorry about that there is some problem with the settings over here on my end)

So, if you look at the domed cup nests, domed cup represents by the open bars and the open cup nests by the gray bars. The number of open cup and domed cup is represented at the bottom of each of these stack of bars. To the right the hyphen is the number of open cup nests. So, the number of domed cup nests is the same in all these treatments and the number of open cup nests is increased from 0 to 6 to 12 to 18. And what this is showing here is that even though the number of domed cup (domed nests) remains constant.

If you increase the number of open cup nests artificially, the rates of predation on the domed nests go up. So, the fact that there are higher numbers of open cup nests means that the level of predation on domed nests will also go up, even though the number of domed nests remains the same and that is because the higher number of open cup nests might attract predators to have an and the same predator that also feeds on the also credits of the domed nests.

So, if you increase the number of open cup nests the predator of both the domed nest and the open cup nests also increases their either their abundance or their activity and therefore the predation on the domed nest also increases even though the number of domed nests remains this year all right. So, the next question is about mixed flock and how the foraging rate increases. So, the person is asking, are they using or are they availing the same food source like the pray are they availing the same source of food?

**(Refer Slide Time: 09:05)**



Let me just move to that slide is it this one. So, yeah I mean. So, basically, they are asking if the food source is the same in the mixed flock situation. Before I answer that Manjari has a follow-up question on apparent competition which was the fitness of the predators which was the snake increased with the increase in the number of open cup nests was that study? So, Manjari, no that was not studied in this case.

So, we do not know whether the thickness of the common enemy which is the plastic that mediates that apparent composition also increased in this case. Coming to the question about food resources among species in mixed species bird flocks. It is not as if all the species in a mixed species bird flock are eating the same kind of food. They are all insectivorous birds are basically eating arthropods including things like spiders, there are a lot of species in mixed species bird flocks that actually feed on insects or spiders that are in the vegetation or in the foliage.

So, these are insects that are sitting on leaves or sitting on plates or sitting at the trunks of trees. There are other species in mixed flocks that are not feeding on these kinds of Arthropods, they are feeding on insects in flight. So, birds like Drongos, birds like Flycatchers they are part of the flock but they are eating insects that are in flight. So, there is some partitioning of resources there is some difference in the kinds of resources that species in mixed flocks are eating.

I have a follow-up question from Sriram, on what is the significance of the study of more open cup nests since the number of open nests closed is not really controllable does this factor help in constellation or is it just to study the behaviour? So, Sriram, actually in this case, the number of open versus closeness was controlled by the researchers. So, they actually added open cup nests right. So, this was to study behaviour, this was to study apparent competition, this was to study how the common enemy of two species mediates their impacts on each other.

How does the abundance of and how does the increase in the abundance of species a result in a change in the abundance of species b while a and b both share the same predator in this case. So, it was just to study behaviour. However, a nest augmentation, you know, adding nest boxes and so on is a very common form of conservation intervention, especially, where the species are **created**. And we want to increase the densities people putting out nest boxes is a very very common conservation intervention.

Manjari has a follow-up on the sentinel species and habitat use study which is on the screen right now is in the sentinel species and habit use is elaborate which is indicated by the red region and the blue region, certainly you have two cases Manjari. You have a case in the left where the sentinel species has not been removed. So, that is a controlled situation. You have a case of the right where the sentinel species which is this Antshrike which is the center of the flock which is the most central important species in the flock has been removed.

Red is showing you areas. Look at the right side first. Red is showing you areas where the mixed flock foraged in the presence of the sentinel species. So, you are looking at the habitat from the top, you are looking at it (at a map) from the top and you're saying that red is the area where the flock foraged in the presence of the sentinel species. Blue is the area with the flock foraged in the absence of the sentinel species.

So, once the sentinel species has been removed and left aside for 3 days. So, you remove the sentinel species keep it aside for three days in a cage and release it back. But in those three days, on the left side what you are seeing is a flock that has not been manipulated. So, basically you are seeing on the right side you will see three days removal of the sentinel species and see what is

happening. On the right side you are monitoring the flock in the same way, but you are saying you are keeping the sentinel species.

So, in those three days when the sentinel species is actually still there which is the control, what is the area where the flock is foraging, you can see is a huge overlap between the blue areas right. So, basically that is a control. So, in this experimental setup what is happening is that they have a control where they do not remove the sentinel species and the flock continues to forage in the same locations day after day if there is if you remove the sentinel species on the right side.

The changes the location the changes are kind of forest that is tending to foraging more intense forests to avoid predators okay. I think the next question is for Mousumi. Okay. I will stop sharing my screen, yeah. So, again this is from the video directly. I am having one last question here Jobin from Niharika. Niharika asked if there are any fixed identified bird assemblages, if yes, where can we get them. Generally, Niharika, the definition of assemblage is the set of species of a particular taxonomic group that is found in a particular place at a particular time.

Now, at any location, you are going to see changes in the habitat. Those changes in the habitat could be natural or it could be man-made. But you know, so, bird assemblages are changing over time and it would be very rare to find an assemblage where the abundances of the species in the assemblages are not changing are not fluctuating and so on. So, it is unlikely that there are any fixed bird assemblages in that you only have these species and there will be no other species.

And you will only have these species that these population densities but by and large we can say that there is a rainforest bird assemblage you know that consists of species like you know like the Great Hornbill and so on or Great racket-tailed Drongo .and the number of other species. You can see there is a desert or a scrub dry arid land bird assemblage which are Great Indian Bustard, numbers of Larks and so on. So, by and large what you can do is you can say that there are sets of species that are unique to certain habitats. So, that is that is to the extent, thank you very much I will stop presenting now, all right.

So, for the I mean this is from the discussion forum I think Mousumi could answer this question. So, basically the question is about the paper that Mousumi was presenting in for population survival. I think Umash's paper itself. Yeah, I saw the questions and I was wondering if Umesh would want to answer those questions. All right. So, shall I will just spell out the question first. Mousumi could you share the screen. Yeah sure.

I will just come in here just give me a second, I am having some trouble. So, sorry. I am not able to share it for some reason. Ma'am, just a minute. Okay, do I have to disconnect? You have to make co-host. Ma'am, you are using Mac or Windows. I am having Mac. Okay. Check in the setting privacy you have to give some access. Yeah, just check ones whether that is given access for the gmail but if you could tell me which paper this is I can pull up the graph here yeah. So, this is a paper and demographic superiority with increased logging, I will tell you the figure number. Oh yes. So, there are two questions one is in with reference to figure one and the other figure two yeah.

So, Jobin can you tell us a question. Jobin. Sorry, I was muted. So, the person is asking the question with the difference between the log and the unlog forest and she is asking why the birds or at this point why are we not considering emigrating individuals and do not the words immigrate during this period and she is wanting to have a little more explanation about that. Yeah, is she sorry I think she is referring to the post breeding to breeding interval.

**(Refer Slide Time: 20:39)**



In figure 1 no, it says probability of surviving  $\phi$  is probability of surviving and not emigrating. Correct. So,  $\phi$ , which is apparent survival is the probability that a particular individual bird survives and stays in the same location from one year to the next. So, when we go out and we estimate survival rates and births, we cannot really tell whether the bird has died or whether it is permanently moved away from that patch.

So, if you catch a bird in one at a particular point in time and then you do not catch it after that if you do not basically recapture it after that. You don't know whether bird died and you don't know whether it moved away to some other location where you are not studying the population. So, you cannot separate what is called mortality or death and permanent immigration that is bird moving away permanently. So, typically we estimate apparent survival which is the probability the bird survives and stays on the same side and this is what that this graph is showing that which is that as tree density increases that is logging intensity reduces.

So, the higher the density of trees, the lower the intensity of logging, the greater the survival from one year to the other okay. So, related to the same very similar to the last question is uh this question where she is asking during breeding season, the birds preferred selectively log forest while post-breeding season they preferred thicker forests or the denser forest. So, she is asking for a reason behind this preference.

It is actually not hands-free, I do not should I just use the computer audio you mean. So, is this better? Yeah. Okay. So, the birds are not actually preferring one habitat to breed in another habitat these are resident birds they stay on the same territory throughout the year. They stay on the same territory in summer and in winter. So, it is not as if in summer then all these birds are going to breed in log forest and then in winter all these birds are moving to another habitat. It is just that in log forest, the birds that are breeding have higher number of offspring.

So, they have a higher number of offspring are being produced in log forest whereas in primary forest the number of offspring of birds that have territories on primary forest is lower than in log forest. Okay. Mousumi there is one more question for you. Okay. So, this is bird population concepts like uh. So, the person is asking out of all the density dependent factors one of them is stress. So, can you give an example of that.

All right, actually, sorry, I meant environmental stress and in that slide, if you notice, I had listed quite a few density dependent factors including disease, competition for resources, predation. So, all of them like the factors such as competition for resources, predation etc which can influence birth rates and death rates or when especially when they negatively impact the population growth they are referred to as stress.

So, ideally in that slide I should have just put it in parenthesis, sorry for the confusion, yeah okay. So, right now we are out of questions. No there is one more in the chat box, shall I read it for I am not sure who it is but niche and you I think it is for Umesh, yeah. So, how is exploitation competition different from interference competition and if in interference competition the niche for foraging is increasing would not that also increase the survival in experimental part where one species is removed as we see in the exploitation competition., Yes thanks Jobin.

So, in exploitation competition, two species are competing for the same resource but there is no direct interaction between the two species. So, let us say, I put out you know a tray of fruits in my balcony and in the morning, pigeons come and eat fruits and at night, bats come and eat the fruit. So, the pigeons or the bats never meet but if the pigeons come and eat all the fruit then the bats have nothing for them.

So, the presence of the pigeon is the reducing fitness of bats. So, that is instances of exploitation competition where there are two species sharing the same resources but there are no direct interactions between those two species. In interference competition, there is actually usually aggression. So, if I have a species a and there is another species b and both of us feed on the same resource in interference competition I will interfere.

I will actually prevent species b from access to those resources. So, I will either actively interfere to prevent the other species from accessing the resource. So, that is the difference between difference between interference and exploitation competition. KV has a question about studying emigration and immigration, it is not easy you are right but we will have a session on studying bird populations and techniques to study bird populations later on.

And I am sure some of your questions then will be answered. Anirudh has a question saying how much greater are the rates of predation on species in a mixed flock hunting flock in the sentinel's absence. I am sorry about this sound by really one minute. Okay, how much greater are the rates of predation on species in a mixed hunting flock maybe sentinel's absence? I am not sure that anybody has quantified that.

But basically, what happens is like you saw with the Martinez paper. Martinez study, where if you remove the sentinel from the flock, the flock actually changes its behaviour. So, if the sentinel is present, the flock fields and using fields in a very loose way but the flock forages in areas where they would not ordinarily follows, which are you know areas with high visibility for predators for example.

And the absence of the sentinel, the flock forages in areas that are more dense where visibility for predators is lower. Whether anybody has quantified differences in predation rates, I am not sure, but I think there will be a session of mixed flocks where some of those questions might be answered. A follow-up question from Govind which is why do bird populations become greater in log forest than primary forest would it be the other way around.

You know you are absolutely right and this is when we did this study. I myself was scratching my head and I was thinking you know what I expected was that the primary forest would be an ideal habitat for these species, log forest if in log forest species will do value as in survival value would be lower, reproductive value will be lower and so on. It is slightly a complicated answer, one potential answer is that there are certain species that actually do well in a secondary forest, forest that is what is called succession.

So, some species do well in those kinds habitat whereas other species do well in those habitats. Look at all species we were able to study 6 small very very common species and they showed these strengths. But if you look at other species that are larger, other species that that require certain what are called micro habitats within primary forest. Their survival rates, their reproduction rates actually fall quite drastically in log forest.

The other reason is that there is climate change that is happening in these areas and it is quite possible that as temperatures change, these relationships might actually overturn. They might they might actually become very different from what we saw for that particular study period. So, the answer is potentially quite complicated, but you are right. It was it was quite a surprise to for us to see patterns like this.

But the short answer is that across species traits are different, some species are larger some species are smaller some species require certain habitats other species again are generalists, they can survive in a large variety of habitats. And so the generalists tend to do better than forest register and the specialist thing to lose out in those cases. Manjari has a question which is when an assembly or a guild is defined by a researcher is this standardized and then recognized by other researchers.

So, if I were to say, here is the assemblage of rainforest bird species. I would think by and large most researchers would agree. Because these are species that are found only in rainforest they require warm wet conditions they are not found in any other kind of habitat. So, I think if you define an assemblage as let us say a desert assemblage or a rainforest assemblage or you know dry deciduous forest bird assemblage.

Overall, I am very sure most researchers would agree that this set of species makes up this kind of assemblage, the guilds might be slightly more loosely defined across. So, if I was to say, this is a species that is an insectivorous bird. So, that is a dietary guild. So, if you look at diet guilds you have insectivorous birds feeding on arthropods fructose birds feeding on fruit, omnivorous birds that feed on a variety of things. Vertebrates birds feeding on other vertebrates.

So, you know for example if I said all eagles are carnivorous birds I do not think anybody would have a problem with that. But you know if I said that species is insectivorous and it ate a little bit of you know fruit then somebody else might say you know it is actually not insectivorous and it is omnivorous. So, there are these my you know not disagreements but small differences in the way in which birds are classified into guilds like dietary guilds or you know for example if you said low elevation species mid elevation species, higher elevation species those are elevation species.

I might say that low elevation goes from zero meters to 900 meters somebody else might classify it as zero meters to one thousand one hundred meters. So, there are these small differences but by and large, I do not think there would be any disagreement in what a particular assemblage or what a particular guild is. Deepak Gujral, I think this is a question on keystone predation and broken cascades which is that there is a discussion about reproducing leopards in India.

Do you think this might lead to a top control tropic cascade effect on birds over time which is the reverse to the Barro Colorado Islands. So, in that case, in the Barro Colorado Island case, it was the removal of the jaguar that led to the extinction of ground nesting birds. This is a very difficult question to answer would that be a reverse tropic cascade right. So, if you reintroduce leopards would there be ground nesting birds actually coming back because the meso predators are kept under control like you know things like jackals

or other small cats maybe. I honestly I do not know. I can tentatively give you an answer which is that the levels of specialization of birds in the Amazon in the Neotropics is very, very high. So, these ground nesting birds are extremely specialized and very, very vulnerable, in fact, there is a

lot of literature that has come out very, very recently showing that ground foraging and ground nesting insectivorous birds are the most vulnerable guild to extinction

when it comes to habitat fragmentation, when it comes to climate change when it comes to all these things. I am not sure that the degree of specialization of bird is that stop in India or in the old world tropics. For example, in areas that had leopards previously and now do not have leopards, because they have been hunted out or for other reasons. We have not seen any birds going locally extinct, I think. Generally, those words have managed to persist.

So, my answer is I do not know, but I can you know come up with hypotheses that could be tested in the future. That is for you Mousumi yeah. So, regarding discrete and continuous population growth rates, I one is not more accurate than the other but of course it is tougher to measure continuous growth rate because you have to take many and more frequent measurements of the population to arrive at that.

Regarding, what is better it would depend on the species that or organism that you are studying. For instance, say for example, if you are studying bacterial growth rate which grows really fast, you will be measuring it much more frequently and it might make more sense to compute or estimate continuous growth rate. But say for example, if you are studying birds or say tigers, they have specific breeding seasons.

And so and you might be taking measurements at discrete time points incorporating information about when they breed. So, in case of most natural populations of large organisms, this is what we measure the discrete population growth rate ( $\lambda$ ). Naresh has a question. So, what I think the problem is when I plug this in it goes into this microphone which is not very good and when I remove it my speakers are not working.

So, I am just plugging and removing the as and when I need to hear and speak. So, sentinel and habitat views. So, in a big species talking again like Devica I was saying in the chat there is going to be a separate session on mixed species work flocks after this in the coming week. A sentinel

species is complex species bird flocks are groups of species that uh associate with each other they feed together they move together.

They are very tightly knit networks of interacting species that the form are very, very cohesive units. In these mixed flocks the secondary species the role of the sentinel species is to provide cohesion in this mixed flocks by doing one very important thing. The sentinel species is usually a fly catching species usually species that feeds on uh insects that are in flight. And because the sentinel species is feeding on things that are like it has to keep constantly scanning its environment.

To look in the air for instance that applied. What that does is makes the separate species also very good at detecting predators. So, its sentinel species are amongst the first to give alarm calls against predators of other birds in the flock. So, the presence of the sentinel species means that a lot of the time that is spent looking out for predators by other species in the flock is no longer required.

So, if I am a species and I have a sentinel species with me looking out for predators, I can concentrate more on searching for food. So, that is the role of the secondary species here is to reduce the burden of time spent looking for predators and allowing the other species of the flock to forage more efficiently. So, when you remove the sentinel species, what is happening is now that these birds need to spend a lot more time.

Either they need to spend a lot more time looking out for predators which means they have less time available for feeding or they need to move to habitats that are dense enough to make it difficult for predators to find them. So, that is what the sentinel species and habitat use is, where the sentinel species allows the other species of the flock to use those habitats that they ordinarily would have used because in the absence of the sentinel species there would be much denser habitat.

Because they need to escape from predation in the sentinel species not providing them with an early warning system. Okay. So, this is the reintroduction of the Cheetah not the leopard. Again, you know semi-arid is these open grasslands and Cheetah is native too. Okay, I don't know but it is true that there are lots of ground nesting birds in these grasslands. I think certainly a possibility

and I think it would be make a great study, you know once the cheetah comes in to look at you know patterns of activity of these other meso predators like Jackals and so on.

Whether those change and if those change, you know what happens you know you could put up camera traps near nests and see whether you know the rates at which nests are destroyed by these meso predators actually changes or not and what that means for the re-emergence of populations of these ground nesting birds but we do not know. Could it be possible that the presence of birds and primary forest is less visible that in log forest sampling would be difficult in dense areas?

Great question! actually we deal with that by estimating something called detection probability. So, you know, if I went to a primary forest and I went into a log forest, obviously the vegetation structure is very important. The probability that I see a particular bird, can be very different in primary forest very different log forest. So, let us say I go to the primary forest and I see 20% of the birds and I go to log forest and I see 50% of the birds.

And I come back and my the actual number of birds that I have seen is 10 in primary forest and 10 in log forest and actually the number of birds in primary forest is actually far higher because I have seen only 20% of the birds but there will be a separate session on estimating populations while accounting for this variable called detection probability. So, when we do these studies, we are not just comparing raw numbers.

We are actually using techniques that allow us to estimate the proportion of birds that we have missed and therefore giving us much better estimates of things like population size and things like savannah. Robin asked, which type of assemblage based on habitat of birds are most things in India. I think in terms of immediate threat to extinction, it would be grassland birds both alluvial grasslands which at the foot hills of the Himalayas, the birds basically that is very good for agriculture right.

So, large parts of those grassland have wet grassland habitats have been replaced by agriculture replaced especially rice and the populations of species like Bengal Florican, Black crested-parrotbill **swampidia**, marsh paddler have plummeted they are all you know very tiny fragmented



populations of .. at immediate risk would be alluvial grasslands as well as the arid grasslands in India's north west which have been threatened again by agriculture.

By also stopping of systems like Argo pastoral, I do not want to get in to that I do not have time to get into that. But there are other assemblages in India that are at risk for example our species in the western ghats and our species in the Himalayas are very very temperature sensitive. They are adapted to a very narrow range of temperatures and what happens especially in the eastern Himalayas and the western ghats is the climate change happening, birds are being forced to move upwards in mountains just to remain in the same climatic area that they are used to.

So, their temperature niche and what is happening in other parts of the world like the Andes is that these birds move up reach the tops of these mountains and there is nowhere left to go, that is it locally extinct. And so immediate threats from land use change and the loss of habitat definitely it could be grassland birds. From longer term threats that we might not be able to control like climate change and just warming happening and these birds moving up and running out of habitat definitely even the birds in the mountain but there will be such a long term.

How the big species choose a center in the one then this is a core evolved relationship, they are actually not waking up in the morning and saying you know which one do, I go with. It is a relationship between species that has evolved over time and as you know evolution will select for those particular relationships that are mutually beneficial to each other. So, for example millions of years ago, if bird a associated with bird b and was not getting too much benefit out of that and bird a associate with bird c and there were some benefits there, then the association between a and c would be selected.

And so this could be something hardwired you know. So, if I am a Brown cheeked-fulvetta, I will associate with a Greater raked-tailed Drongo. So, you know, I wake up in the morning and I listen to the call of the Greater raked-tailed Drongo and associate. If I bring in another sentinel, let us say I go to the eastern Himalayas catch the sentinel and bring it to the western parts, I doubt that the Brown cheeked-fulvetta is going to say, all right, now I have another one here, shall I associate with this, it is probably hardwired in the brain of the Brown cheeked-fulvetta.

All right, I am going to listen for the call of the Greater racket-tailed Drongo and associate with that. There is mass decline in the particular species of Nicobar Megapod declining without known facts. How much is the study frequency and how can it be conserve? Again, I think this is the question better suited to the conservation section of the of this course, where we will look at different forms of rarity. And we will be looking at the case studies that focus on certain bird species.

And how people have studied them and how people have taken measures to ensure that they remain you know their populations remain viable. So, I mean if you could just wait for a few weeks, I think your question will be answered. Rishitha has a question there are a few papers by a chief scientist like Dr Shankar Ramon and bird species diversity and abundance in rainforest particularly decreased in studies specialist degrees in learning or ongoing restoration projects where a generalists are found in abundance in open areas thereby increasing the number of species there is no observation.

Rishitha, you are absolutely right! Our metric of success or conservation success cannot be maximizing species riches. So, if I look at two habitats and I say species habitat a has 20 species habitat b has 10 species does not mean that habitat a is more worthy of conservation but I say more worthy I mean from the point of view that conservation always has limited amount of funds and other resources to play with.

So, you have to put your efforts in one of these two places of course a very hypothetical scenario but if these 20 species were widely you know spread across the globe and they had large population sizes and these 10 species were rainforest specialists that were extremely rare located in only a few parts of the world then obviously it would be these ten species and the area in which they found that is worth saving.

And this is related to the concepts of environmental and demographic stochasticity which again we will come and get into when we talk about word conservation. So, so yeah, I agree with you

Rishitha. Amrit has another question about how the population of migrants in any particular time and location will affect the residents feeding on the same food. So, there have been studies in South America where they have looked at.

So, you have residents right, there all year long and suddenly for six months of the year you have got another species suddenly you know landing up over there. Often, the movement of these species is tied to the amount of resources available. So, in these areas where there are residents, the migrants will also come in at a time when there is a boom in the amount of food and so it seems that there is not much competition.

And when the amount of resources comes down here, the amount of resources are going up somewhere else and the migrants just move to the other part of their range advantage of that. Govind has a question Malabar hornbill being threatened what issues are they facing specifically compared to others in the Western Ghats. Again, you know we will be having a quite detailed session on conservation.

But, it is a large bird, large bird tend to be much more threatened and much more vulnerable to any kind of what we call global change you know habitat fragmentation, habitat loss so on and so forth. So, the main causes of threats to Western Ghats birds are you know habitat loss obviously, climate change that might cause them to move up these habitats that they cannot colonize the upper elevations of the western ghats, basically Shola grassland and forest birds coming to those habitat are not going to live in grassland so they run out of habitat.

So of course, at the higher elevation shola grassland being exotic tree species and so on. Is there any particular about Malabar hornbill, on the top of my head, I can only think of larger body size being a trait that causes species to be vulnerable to extinction but that could be also true of a species like the Great hornbill or the White bellied-treepie and you know other species like that. But we can deal with we can discuss all this when we talk about conservation.

I think there is a raised hand, should we take questions from the I mean without the chatbox? I am taking question that are only in the chatbox. I think so. So, Noor, if you want to ask a question, I

think it is better to write it in the chat box. Aslam, could you type your question with the chat box please. Yeah, we have question on amensalism. So, if you look at two species interactions, you can classify them in many ways you know like a two species both of which have a positive attraction.

In that each other that is a mutualism or a symbiosis, if two species both have negative impacts on each other that is competition. Amensalism is a case where one species has a negative impact on another species but this species that is having a negative impact on their species neither benefits nor loses from the interaction. So, let us say I am an elephant and I am walking through you know the forest and there is this ground nesting bird and I step on the nest, as I stepped, the birds loss,

the birds lost reproductive success (it is lost out offspring), for me as an elephant it makes absolutely no difference. Right? I have not gained anything from that interaction, I have not lost anything from that interaction. So, that is the example of a amensalism. About falcon migration last year almost everywhere in Maharashtra earlier, I do not know anything about this. Mousumi? I guess, I think it is just because people are looking out for the species more it is out.

The information is available all over media, I think that is why it is just detected I feel that detections have increased possibly. I guess there is just been so, much more interest in bird watching and Amur falcon in particular, people are actually looking for it now earlier they were. Narcondam island is populated with 1800 resident in the lake, Narcondam hornbills, how would a big flock of competitive species will affect those endemic residents.

I am not sure, I don't understand the question. Do you mean that you suddenly have a number of other species coming onto the Narcondam? Is there any reason to expect that? The record is quite far off right and it is not easy to get to and there are a large number of frugivorous bird species on Narcondam already, you know birds like the hill minas but they are all co-existing with the Narcondam hornbill.

Now, if you brought in another two thousand birds that fed at the same rate as Narcondam hornbill, it probably could be yes complete and then populations in theory would predict that populations

of Narcondam hornbill should come down. In fact, there is this theory of competitive exclusion as well, which is very very influential in community ecology which says that no two species that share the same niche can coexist. Because one will drive the other extinction, one will basically out-compete the other.

So, if according to the theory of competitive exclusion, if you brought in you know 3000 some other horn bill that was superior competitive with Narcondam hornbill then it would over time drive the Narcondam hornbill for extinction, but I do not see why that would happen it would require us doing something.