Wildlife Conservation
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Lecture – 29
Reintroduction and outbreeding

[FL] A short while back Tigers were captured from Kanha Tiger reserve in Madhya Pradesh and Bandhavgarh Tiger reserve in Madhya Pradesh taken to Satkosia Tiger reserve of Odisha and released there. Now, why would we do such a thing?

In this lecture we are going to look at re introductions and out breeding and will see what are the scenarios in which we need to move these animals from one place to another place and what are the considerations that are required when we are doing such an activity.

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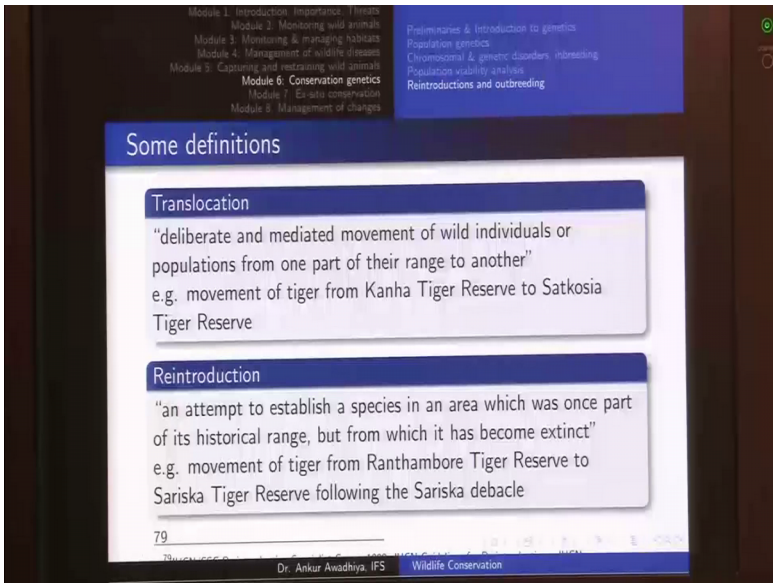

So, let us begin with some definitions, the first one is translocation; deliberate and mediated movement of wild individuals or populations from one part of their range to another example, movement of Tiger from Kanha Tiger reserve to Satkosia Tiger reserve.

So, essentially whenever we are doing a deliberate movement of wild animals, wild individuals or populations from one part of the range to another we call it translocation.

So, translocation is basically movement of animals from one place to another. Next is the reintroduction, an attempt to establish a species in an area which was once part of it is historical range, but from which it has become extinct. Example, movement of Tiger from Ranthambore Tiger reserve into Sariska Tiger reserve following the Sariska debacle.

Now, the crisis of something that you are going to discuss on our eighth module, but essentially what had happened was that in a Tiger reserve in Rajasthan that was by the name of Sariska Tiger reserve all the Tigers for hunted out by porches.

Now, Sariska happened to be a place that was a range area of the Tigers. So, Tigers were naturally found there, but then this area after the loss of all the Tigers it became categorized as a historical range because it was earlier range, but there are no longer any Tigers so, will call it is historical range.

Now, reintroduction is an attempt to establish a species on an area that was earlier historical range in which there are no more animals present. Now, why do we do such a thing because, if we know that certain area was a historical range then it means that this area was suitable or is still suitable for the survival of this particular species.

So, this is a good area in which we could establish a population of the animals and so, we try to reintroduced the animals. So, reintroduce because it was earlier there now it is extinct so, now, we are introducing it once again into the system so, this is known as reintroduction.

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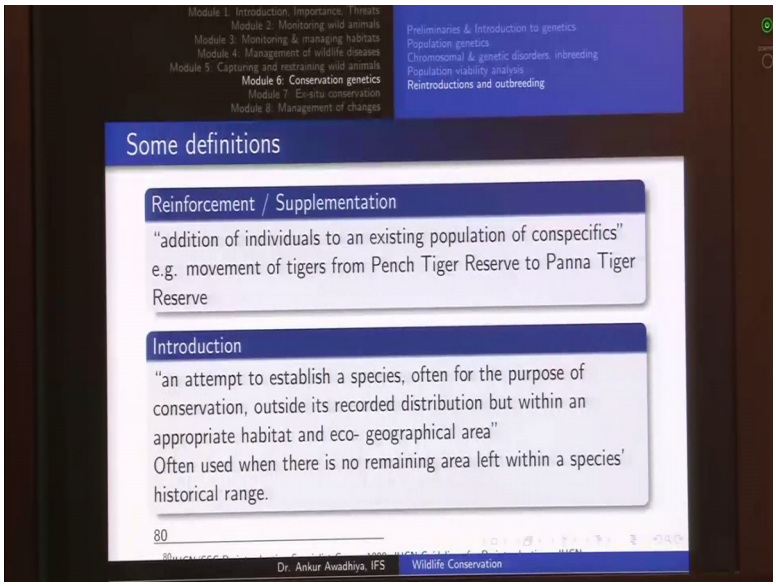

Next, we have the reinforcement or supplementation. So, in the case of supplementation we have an addition of individuals to an existing population of conspecific. So, conspecific means that you already have a population of the same species, but you are now trying to add more individuals into this population example, movement of Tigers from Pench Tiger reserve to Panna Tiger reserve.

So, we already had our population of Tigers in the Panna Tiger reserve, but the population was less. So, we tried to reinforce that population to supplement that population, we brought in more Tigers from Pench Tiger reserve into the Panna Tiger reserve so, that the population in Panna Tiger reserve could grow up.

And the fourth thing is introduction, an attempt to establish a species obtained for the purpose of conservation outside it is recorded distribution, but within an appropriate habitat and equal geographical area. And this is often used when there is no remaining area left within a specious historical range.

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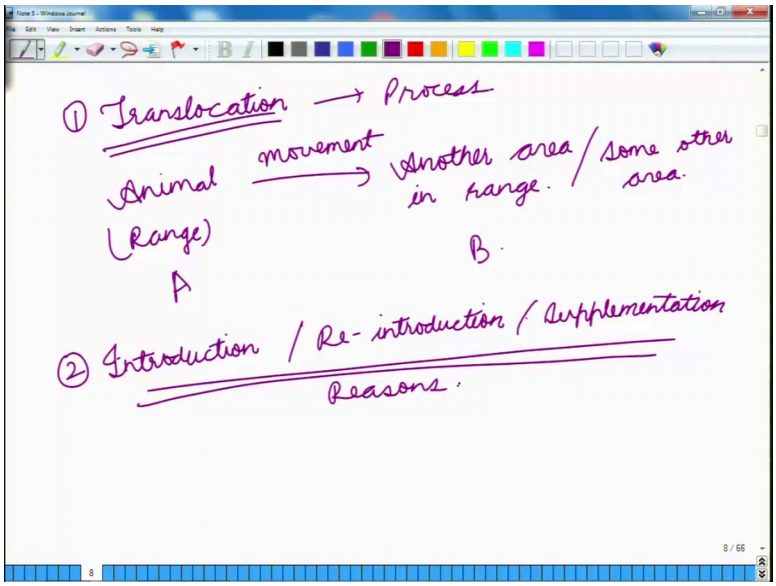

So, physically what we are doing in all 4 of these is that in the case of translocation, you have an animal in it is range, you are taking it, you are moving it to another area in range or essentially or say some other area. So, basically when we say translocation you can just remember that it is movement of an animal or the population of animals from place A to place B so, this is called place A to place B, in this at the moment will be translocation. Now, this translocation can be done for introduction or reintroduction or supplementation. So, translocation is the process and these are the 3 reasons so, let us call it a process and these are the reasons why we are doing this translocation.

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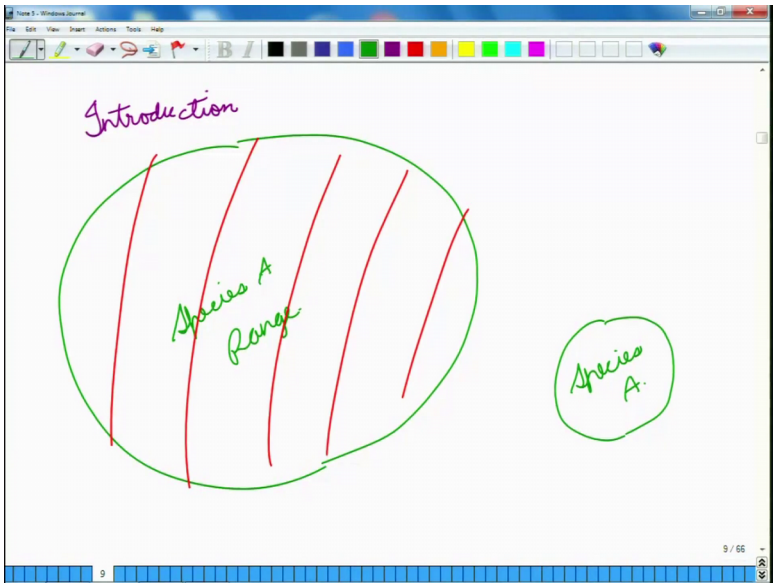

Now, if you look at these reasons in more detail so, let us look at introduction. So, essentially you had this big area that was earlier a range for a species. So, let us call it a species A range, now this was a historical range and this is the most extensive range that this species ever occupied, but then later on it so, happened that all of this portion was then taken away say for farming or say for other developmental activities or say for partial land and.

So, now, all of these area is now gone. So, in the case of introduction what will do? Is that will take some other area that is outside of the historical range, but it has suitable conditions and then will try to bring the members of this species and to this area. So, now we have species A in this area, but then this area was never naturally or historically arrange for this species. Now, an example could be say we have to equatorial rain forest in Kerala. Now, in state of Kerala in the equatorial rainforest suppose we have some species of frogs that are found in that area.

Now, if the forests are under a huge anthropogenic pressure. So, people want to get into those forest and people want to chop off those trees and may be convert it into some other land use. So, in that case all of it is historical rain because it was an endemic species to Kerala. So, all of it is historical natural rain would be gone.

So, we could look for a place that has a similar climate. Now, a place with a similar climate would be in the north eastern part of the country. So, let us say that that there is a small patch in Assam now, that small patch in Assam never had this species of frog, but then we have calculated that the soil types of both the areas are same, the climate of both of these areas are the same and the other species that are found in both of these areas and nearly the similar. So, we have those tall equatorial rainforest trees that are found in Assam as well.

So, then we could take some of these animals from Kerala and then put them into the state of Assam into a designated area. So, this activity in which we are taking out an animal from it is range and then placing it into an area that was never it is historical natural range. So, that we can establish another population there or because it is original habitual is now been taken away because of some other purposes such a process will be known as introduction. Introduction because the animal is been introduced there for the first time, it was never present there before.

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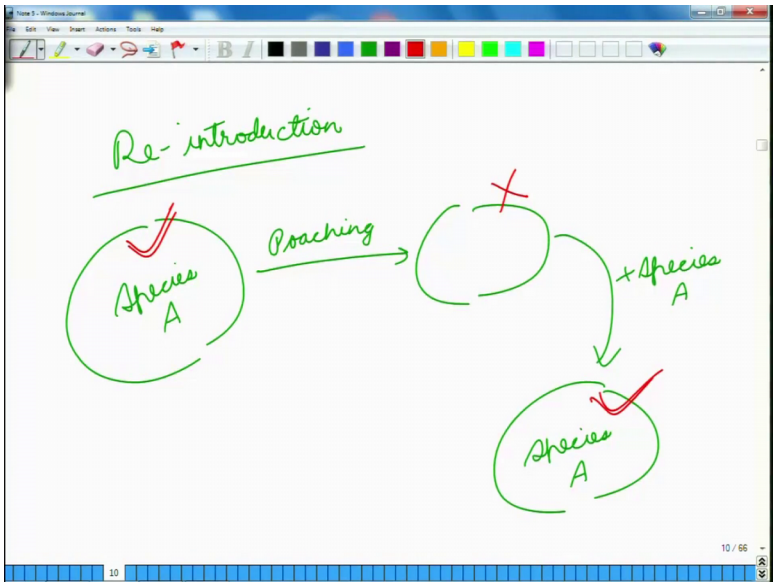

The second thing is reintroduction. So, in the case of reintroduction you have an area that has species A. Now, it was naturally found in this area, but then say there were some activities approaching and so now, you have this area that is no devoid of species A. So, you bring species A from some other area so, that you again have species A in the same range or the same habitat.

So, such a process will be known as the reintroduction because, it is reintroduction because this species was already there in some historical time. Now, it is no longer present and so, you are reintroducing it in this area so, this is reintroduction.

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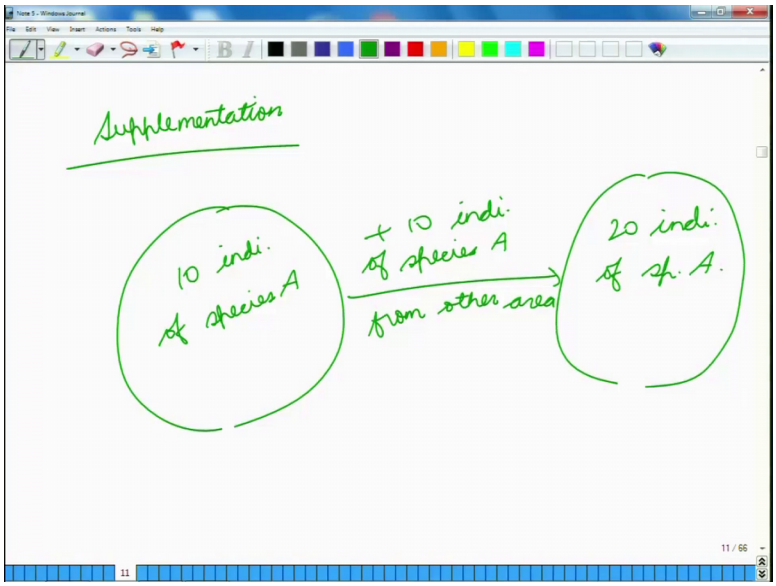

And third is supplementation, now supplementation as the name suggest so, you have this area in which you had say 10 individuals of species A. So, you add 10 individuals of species A from other area. So, that now in the same area you have got 20 individuals of species A. Now, when we are doing such an activity we are just trying to bolster the number of individuals that are there in this small area. We attend to supplement individuals and to this area and so, this is known as supplementation.

Now, it is easy to understand why we are doing an introduction because there is no other area left for this species. It is also so easy to understand why you are doing a reintroduction because, this place is not devoid of the angles. But, then why do we want to do supplementation of an area? Or even in the case of reintroduction when you are adding species A into this area then probably in the first instance you added say 2 Tigers into this area or 2 individuals of species they.

So, now you have 2 individuals and then later on you add 6 more so, that you have now 8 individuals of species A. So, in the case of reintroduction why do not we stop at the one individual or say a pair of individual? So, you have a male and female why do we do that? Why do we reintroduce quite a substantial number of individuals maybe in different stages?

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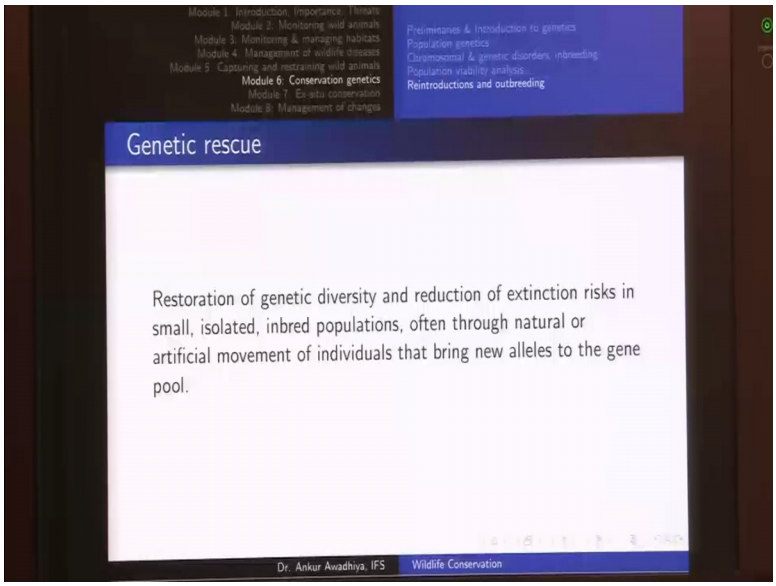

So, here we are talking about the concept of genetic rescue. So, if you have a very small population and most of the individuals get become related to each other we might start thing the impacts of inbreeding that we discussed in a previous lecture. Now, genetic rescue is the restoration of genetic diversity and reduction of extension risk in a small isolated inbred populations often through natural or artificial movement of individual that bring in new ales to the gene pool. So, we understood the extension risk and the previous lecture of population viability analysis.

So, in this case what we are trying to do is that they if there is a small isolated and inbred population. So, in this case there is a huge amount of extension risk that is present with this population. Because, there is a very little amount of genetic diversity there is a high amount of inbreeding depression and maybe a number of recessive diseases are showing up or any other infections that pop up into this population clear up very easy. So, because of it we have a huge amount of extension risk.

Now, we are trying to reduce this extension risk by restoration of genetic diversity. So, we want to increase the amount of genetic diversity that is there in this small population. And how do we do that? We could either go for a natural movement of a individuals or an artificial movement of individuals through translocation so, that we have new alleles in the gene pool.

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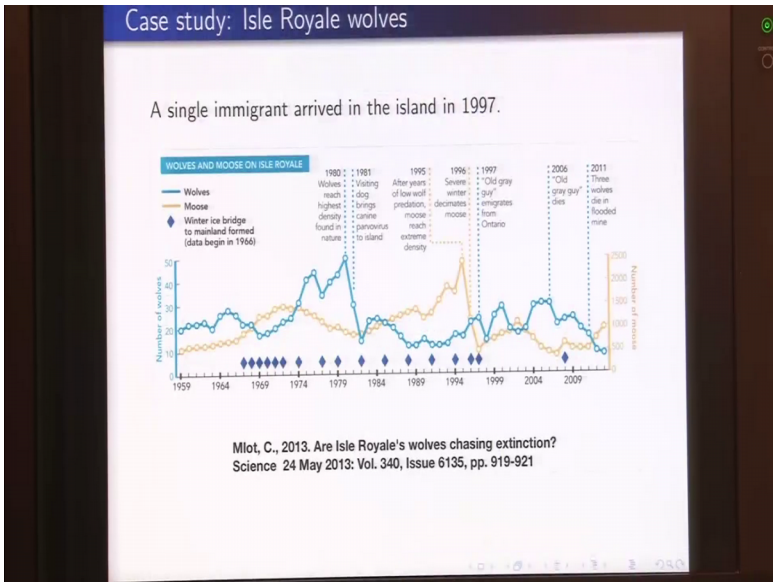

Now, national movement of animals is something that we saw before in the case of the case study of the Isle Royale wolves. So, in this case the wolf population was strongly inbred, but then in 1997 one individual came in. So, in the period before 1997 so, say in the last 15 or 20 years we were seeing a huge amount of inbreeding depression in the population and a large number of recessive disorders in the population. But, then once we had this one new guy that came in we started seeing a massive deduction in the genetic disorders that were seen in this population.

So, this one individual just by bringing new alleles into the population and it was able to provide a genetic rescue of this is a small population. So, this population was as smallest see around 10 individuals. So, there with these 10 individuals which were highly related and just one new individual that came in was able to provide a good amount of genetic rescue by increasing the amount of variety that was there in the gene pool.

In case this natural movement is not possible or as not feasible in a short period of time we could go for a translocation of animals. So, for instance in the case of say Panna Tiger reserve, if we had a small population of Tigers there then it is possible that some other Tiger from Bandhavgarh may have come into the Panna Tiger reserve while it was dispersing out. But, then that would have taken a very long period of time when in that period a Panna population would have become further inbred. So, to rescue that we just

broughten more individuals from the Pench Tiger reserve so, such an activity would tell us why a translocation is important.

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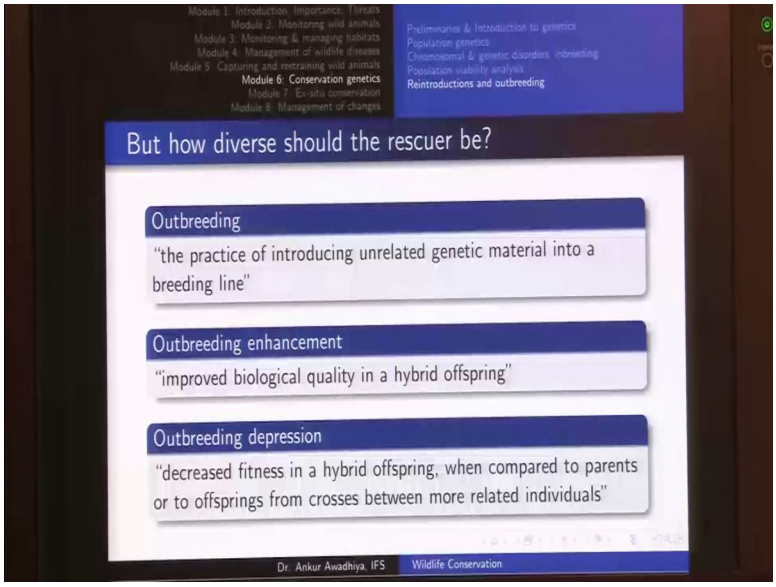

But, then when you are bringing in an individual from outside population how diverse should the rescuer be? So, here we come to the concept of out breeding. So, in breeding is bad, but then out breeding can also be bad. So, out breeding is the practice of introducing unrelated genetic material into a breeding line. Now, when you are bringing in unrelated genetic material so, which means you are bringing in individuals that are different from your population it could have 2 impact it could have the impact of out breeding enhancement or out breeding depression.

Now, out breeding enhancement means improve biological quality in a hybrid offspring. Now, why would you observe an improved biological quality in a hybrid offspring? Say your all your populations were having say some genetic disease some recessive disorders that was rampantly available in the whole of the population. Now, if you have an out breeding with a new genetic material individual then the amount of recessive genes that are present in the individual would go down.

Because, your unrelated individual would be bringing in some new alleles which may be dominant and then that would bring down the impacts of the recessive alleles that are already present in the population. So, that phenomenon was why the name of out

breeding enhancement and it is also known as hybrid vigor. So, this is very commonly seen in the case of plants.

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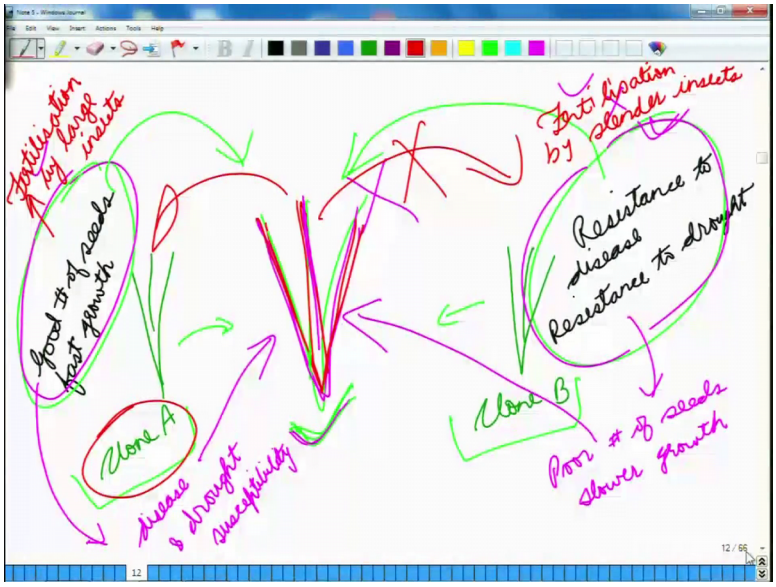

So, for instance if you have a clone of maize that grows to say this height. So, you have 2 clones, this is clone A, this is clone B. Now, all the individuals in clone A have been grown by inbreeding amongst different individuals of this plant of maize. So, that we had some desired characteristics. So, probably this clone A shows good number of seeds and probably of fast growth.

And in the case of clone B probably it has resistance to disease and also resistance to draught. And now if we breed both of these together then the progeny that comes up, it would have say both of these good qualities. So, it would have good number of seeds, it would have faster growth, it would have also resistance to diseases and resistance to draughts. So, essentially any individuals of clone B did not have these good qualities, any in individuals of clone A did not have these good qualities, but then this hybrid has both the good qualities inside it.

So, this is something that would go by the name of out breeding enhancement or hybrid vigor. And in most of the situations we have also observed that that these out breed individuals they also have greater amount of resistance to diseases they also have a say physically a very magnificent body, they are also in most cases they grow taller and they have other such properties.

So, these things go by the name of out breeding enhancement because of some amount of genetic rescue that is happening, but then there is also another thing that could happen which is out breeding depression, which is decreased fitness in a hybrid off a spring when compared to parents auto offsprings from process that are between more related individuals. Now, you could ask that we can understand why an out breeding enhancement would occur because, we are getting good qualities from both the parents. But, then in the case of out breeding depression why would that happened? Will that could happen because you are getting bad qualities from both the parents.

So, it is also possible that in the case of our hybrid individual this individual does not get good qualities from here, it gets the bad qualities from here and it gets the bad qualities from here. So, in this case these individuals of clone B, they had also the properties of poor number of seeds and slower growth.

And these individuals of clone A were having the property of disease and drought susceptibility. Now, it is also possible that when we talk about this hybrid offspring it gets these bad qualities from here and it gets this bad qualities from here in which case it will be unfit or less fit as compared to both the parents.

So, this is what is out breeding depression at decrease fitness in the in the hybrid offspring when compared to the parents or to the offsprings from crosses between more related individuals. Because, in the case of the parents here so, these parents were having these 2 good properties, but then this hybrid offspring that came up it did not have any of the good properties from anywhere. It had it came up with his all the bad quality.

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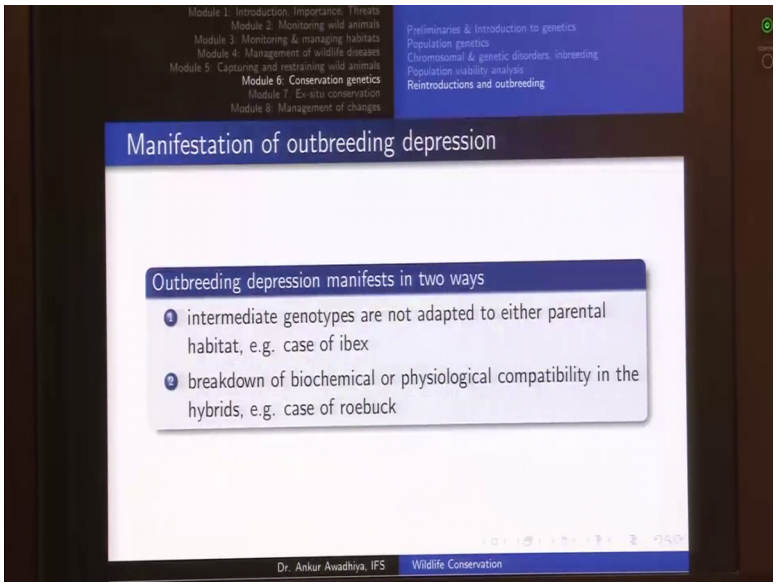

Now, in case of wildlife out breeding depression many phase in 2 main base, one is that you have intermediate genotypes that are not adopted to either parental habited or they could be could be a breakdown of biochemical of physiological compatibility in the hybrids. So, for instance coming back to the door to the to the drawing board when we say that the intermediate genotype is not adopted to either parental habitat. What we are saying here is that in the case of are clone A, it was growing in those areas that did not have diseases and which did not have drought. Now, this individual that comes up clone A was also grown in areas which required faster growth because it had more number of competitors say wheats in that area.

Now, you clone B was grown in those areas where it did not have any competition, but it had quite a number of diseases and it was also in an area that was suffering from drought. Now, this individual that comes up this offspring, it is susceptible to disease it is susceptible to draught, it gets those qualities from clone A. So, you cannot place it in an area that as clone B because, it not be able to survive because, it does not have those good qualities.

Similarly, it has poor number of seeds and slower growth from A and B. So, it will not be able to survive in the habitat of period A. So, what we are saying here is that you have intermediate genotypes that not adopted to either parental habitat or it could also happen that when we are talking about the breakdown of biochemical and physiological

compatibility in the hybrids. Then it is possible that these hybrids that come up so, probably in this area we were having seeds fertilization by large insects.

So, it required a larger size of a flowers and probably in this case we had fertilization by slender insects. So, these were; so, these were insects that were more thin. So, in the case of hybrid it comes of with the flower. So, in the first case we required those flower that would like this big. So, in that case you required flower so, should be big so, that larger size insects in get inside. On the other hand in the second case you required flower that will long and that will slender so, that your insects were you will to get inside.

Now, it is possible that in the case of the hybrid it does not have smaller flower, it does not have a larger flower, it has flower that a intermediate. So, in the case of these intermediate flower it is possible that your larger size insects or not able to get inside an at the same time your slender insects are the not able to get inside. So, that would lead to sum amount of biochemical or physiological compatibility between the incompatibility between the hybrids.

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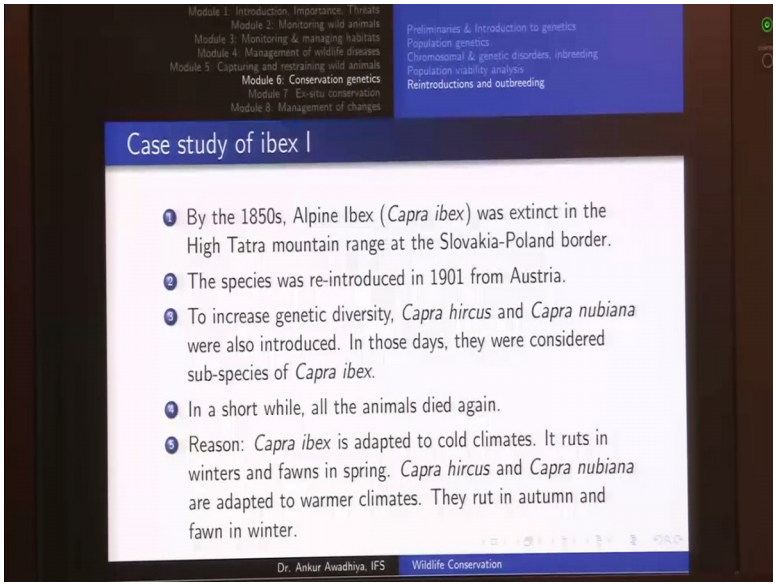

Now, let us look at 2 case studies, the first case studies that of ibex. Now ibex is a goat like wild animal and by the 1850's alpine ibex that goes by the specific name of Capra ibex was extinct in the high Tatra mountain range at this Slovakia Poland border. So, it was a goat that was found in the high mountain.

Now, this species was reintroduced in 1901 from Austria, but the number of specimen that we could get from Austria was less. So, to increase the genetic diversity because people thought that we have less number of individuals they will be more amount of inbreeding depression so, let us increase the genetic diversity.

So, what they did was they also brought an individual's of Capra hircus and Capra nubiana species that were introduced. Now, in those days it was believed that Capra ibex is a goat that is found in the alpine areas and these are also the same species. They are just the sub species of the same goat that are found in more hot air regions.

So, what happened was that in a short while all the animals died again. Now, what was the reason in the case Capra ibex, in the case of these animals that grow in very cold areas. So, you do not want to have fawning or childbirth in the very cold climates because, in those times we would be having very high amounts of snow storm that are going that are coming in that area.

So, because the offsprings are they are more susceptible to cold so, would die off. In the cold climates we had that this species was rutting in winters. So, it was meeting in winters and it was giving out the offsprings and in spring the other 2 sub species at that time or species now they come from more warmer areas.

So, they have meeting in the autumn season and the fawn in winter because they are coming from very hot areas. So, the winter areas are the winter times are more pleasant so, they want to have offsprings in the winter season. So, you have these species from the cold climates that should give out their offsprings in the spring season and these species that should have the offsprings in the winter season.

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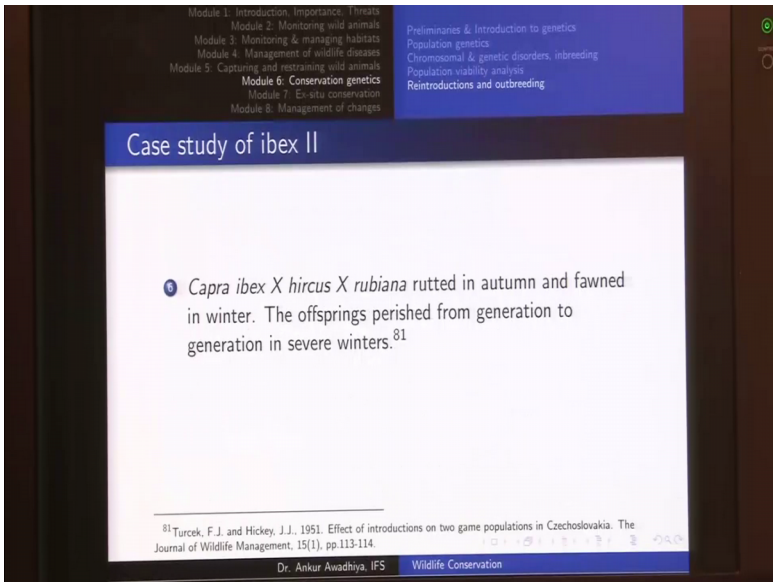

Now, what happened was that when we consider these crosses?So, Capra ibex cross with hircus or with nubiana it rut it in autumn and it found in winter. So, now, remember where were these species getting introduced and reintroduce they were getting reintroduced in the high Tatra mountains which are very cold areas and when you had these individuals recurs and nubiana into that area. So, the hybrids give out their kids in those times where when this area was suffering from a very cool climate because, they were already because in their original climate they were having kids in the colder times.

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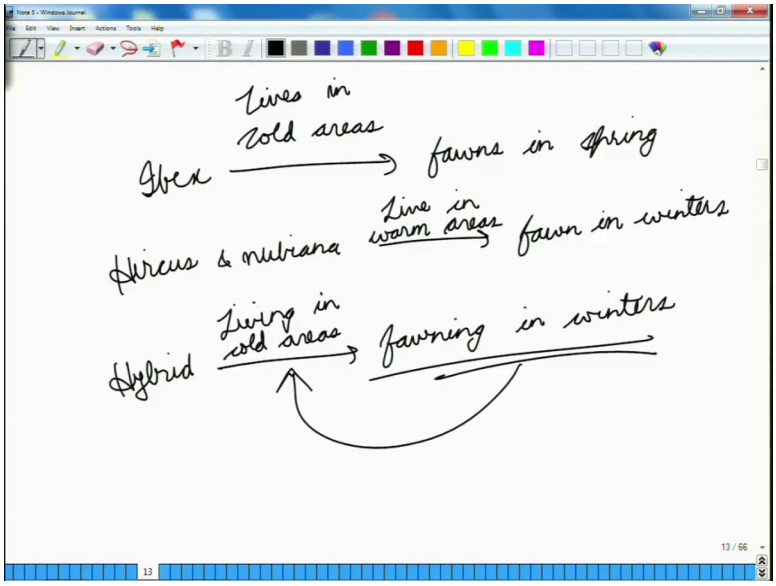

So, basically what we are saying here is that you have an ibex. Now, ibex lives in cold areas so, it forms in spring. Then you have hircus and nubiana they live in warm areas and so, they fawn in winters. Now, in the case of the hybrid we had it living in cold areas and falling in winters. So, when the offsprings came out in winters and it was already a very cold area.

So, all the offsprings died out that out so the offsprings perished from generation to generation in the sewer winters and ultimately with did not have a single individual left. So, this is an example of out breeding depression.

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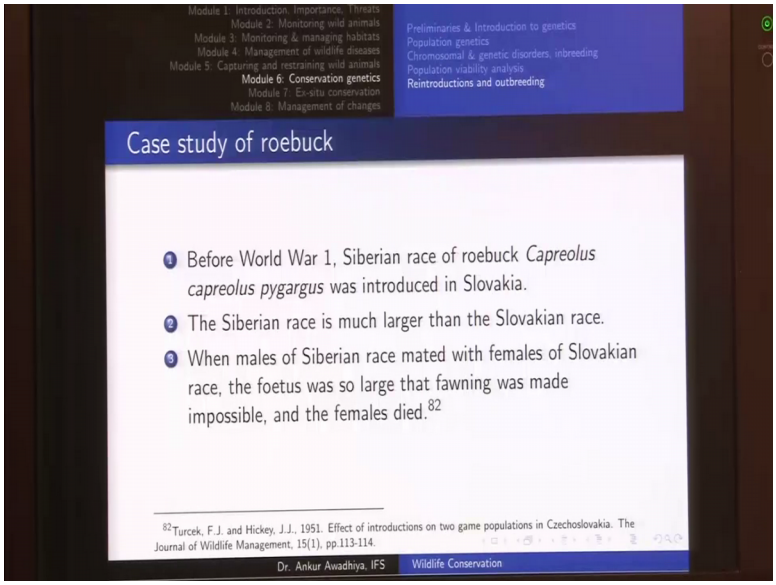

The second example is that of roebuck, now roebuck is also a de like species a very similar to earth somebody. Now, before first world what the Siberian days of roebuck cabriolet us Capriola was introduced in Slovakia. Now, Slovakia also had this roebuck population, but the roebucks of Slovakia were smaller in size and the Siberian race is much larger than the Slovakian race. So, when you had males of the Siberian race that mated it with females of the so, we can race the foetus that was produced was so, large that it could not come out of the orifice of the female.

And so, ultimately the foetus died within the body of the mother and the mother also died subsequently. So, no fawning was made was possible and all the females died. So, this is a case of physiological in compatibility between 2 of these races. So, these are the examples of out breeding depression, but now we will look at some more general terms.

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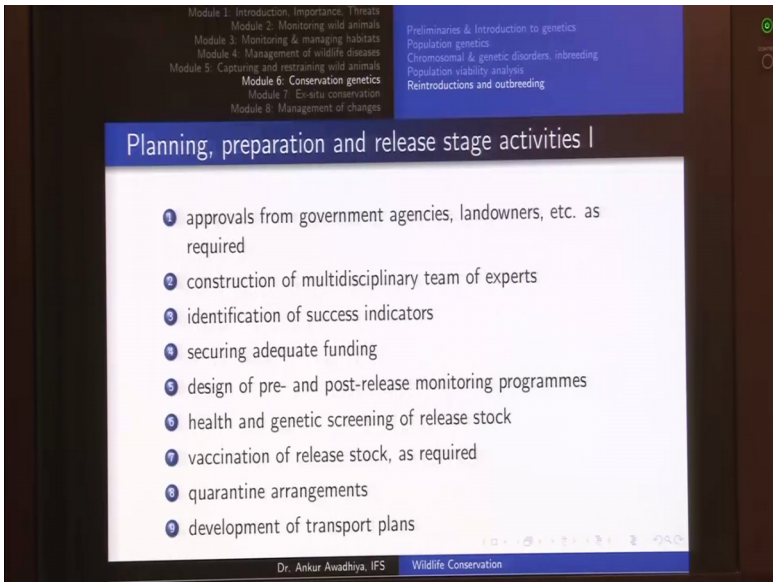

If you have decided that you want to translocate some individuals or a group of individuals from one area to another area what are the planning requirements for this reintroduction? So, what are the planning preparation and release stage activities? So, when is that you need to have all the approvals. So, as we saw in our chapter on the legal aspects then you need to have multidisciplinary team of a experts. Because, this team of expert should know not only animal husbandry, but also should consider the cases of transportation of these animals, the cases of immobilization of these animals and the feeding of these animals and so on.

Then identification of success indicators, securing adequate funding, design of pre and post release monitoring programs so, prerelease monitoring program would mean you need to monitor the animals before they are being released and after they are release is also you need to monitor them without doing fine or not. Health and genetic screening of the release talk, vaccination of the release talk as required so that you did not bring in any diseases from one area to another area. Quarantine arrangements as will saw an are lectures on disease monitoring development of transport plans. So, that this transportation of course, in a very short time.

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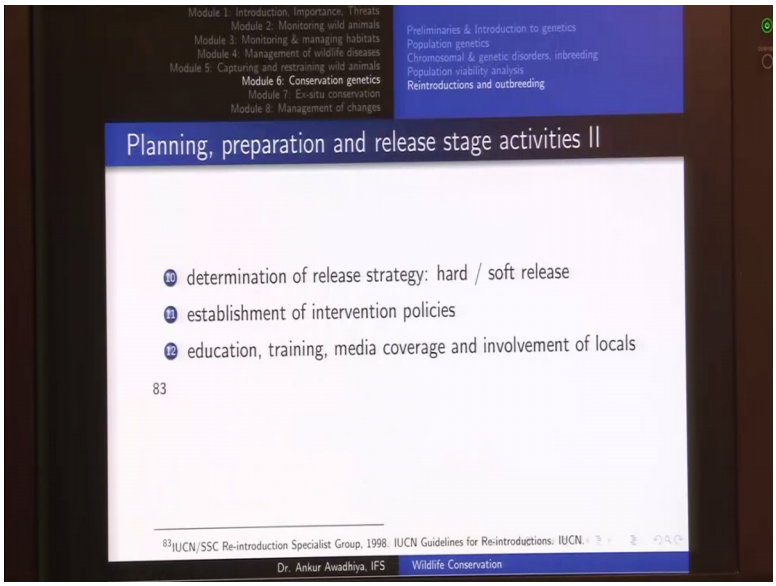

And without causing much trouble do the animals determination of release strategy without you want to go for a hard release or a soft release. Now, what is the difference?

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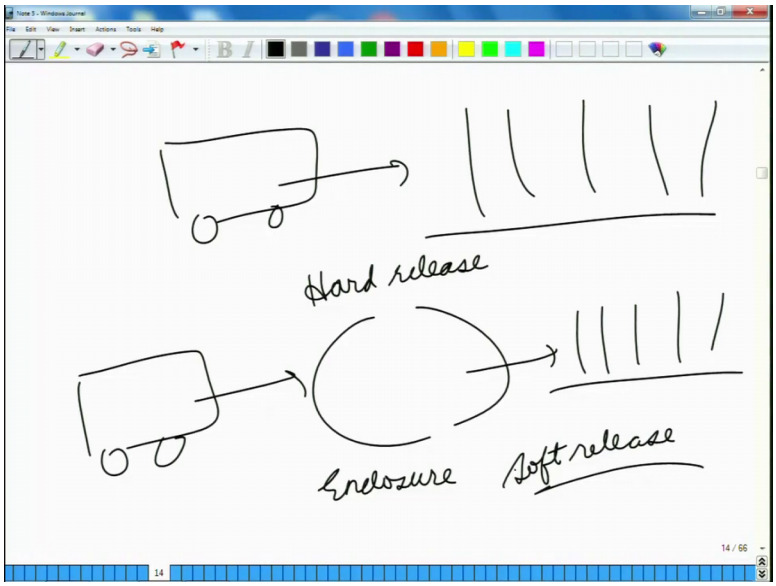

So, you have a truck and you brought in animals into an area and you left them in the new forest. So, this is a strategy that goes by the name of hard release. In the case of soft release you have these animals, you bring them into an enclosure you keep them in enclosure for some time and then you release it them into the forest. So, this thing goes by the name of soft release.

Now, both have their own pros and cons. Now, in the case of animals that have been chemically immobilized we generally prefer to put them into an enclosure for some time so, as to be able to monitor whether the impacts of the drugs have gone off. So, essentially if you had you say anar cutting into these animals we need to be sure that these animals are not showing any of the impacts of narcotic drugs.

And so, we will keep them in an enclosure for some time, will observe them for some time and then will release them. Hard release on the other hand is used mostly in the case of animals that have been captured physically. So, for example, in the case of animals that we captured using a boma technique so, boma technique was a mass captured technique that we saw anyone of the previous lectures.

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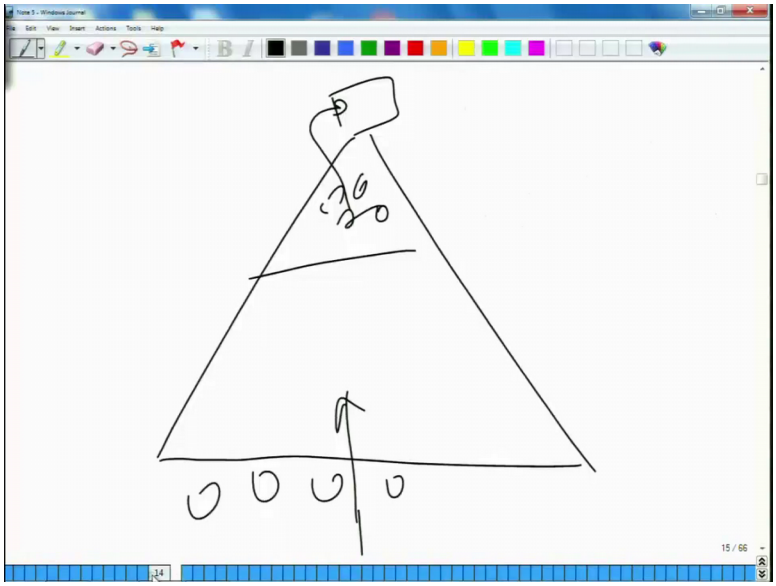

And in that we create a large sized funnel into the forest area using plastic sheets and then we drive all the animals into this funnel. Once these animals are inside we close these gates, then we drive them further when they have all come into this area with close these gats and then there are some tracks waiting here and all these animals move as a herd into this truck and then they are transferred to another place.

So, because this animals have been moved have herd to reduce the amount of captain (Refer Time: 31:48) this in these animals we may go for a hard release. So, in this case will directly bring this truck into the other forest will release all these animals. But, do

you want to go for a hard release or do you want to go for a soft release? Is something that is very important during the planning preparation.

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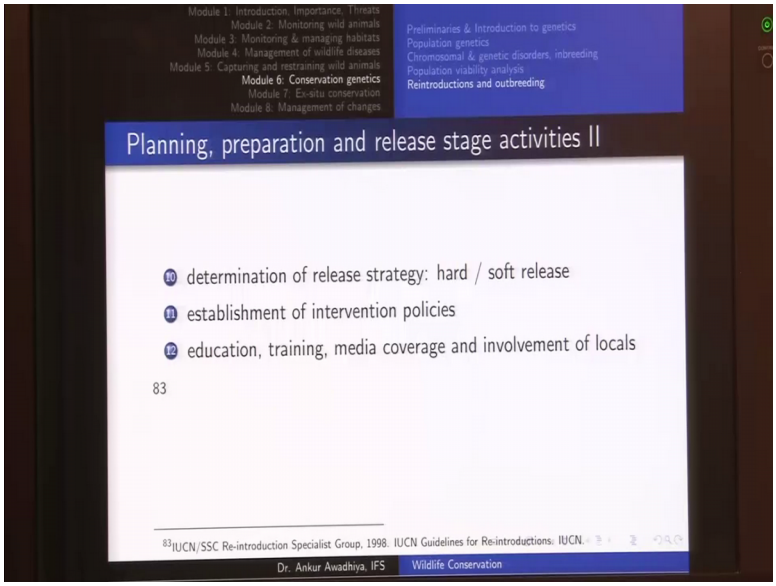

And release date so, you need to determine this release strategy because before you have begin your work. And then establishment of intervention policies, so, intervention policy means that if you find anything that is going wrong, if you find any new diseases or these animals are not able to established themselves then what sorts of interventions are you going to put in. Are you going to say that will allow nature to as she wants or you go in intervention policy in which you say that we are going to micro manage everything. And it also requires education, training, media coverage and involvement of the locals so, that there also a tune to our cause.

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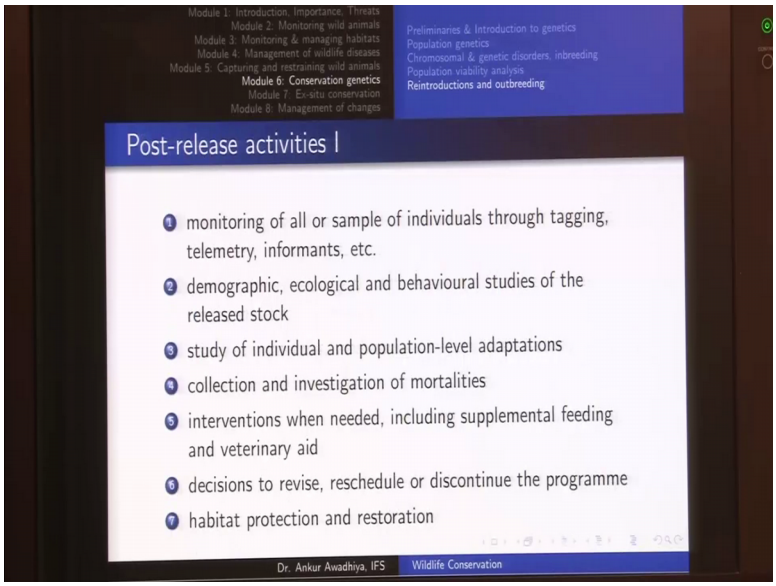

And once you have released this animals so, once you have a release this animals for introduction or reintroduction or supplementation then we need to monitor all or a sample of individuals through tagging telemetry informants and so on. So, for instance when the Tigers for released in the Panna Tiger reserve then all of this Tigers were fitted with radio callers.

In the case of those radio callers that has that a put in the neck region. So, they continuously give out the hf signals and then we had departmental stuff that were continuously monitoring these animals. So, day in and day out they were saying that these animals are surviving and that none of these animals have been post because of a Tiger population in Panna increase subs substantially.

So, we required to have a monitoring strategy of either a sample of individuals of all the individuals and base include tag in telemetric like radio telemetry and also informed. Then demographic ecological and behavior studies of the release talk with the they are existing there or not. In study of individual and population level adaptation, collection and investigation of mortalities, now this is very important. Because, in certain situations we have observed that you may have a very different species of plants that is growing up in the area where you are releasing the animals.

Now, this plant might have some toxins inside and because your annual for never expose to this plant when it is possible that they would feed on this plant and then they would

start dying of. So, investigation of these mortalities becomes very important and especially in the case of introductions of the species into an area where it was never found naturally so, this is also important. And then interventions when needed including supplementary feeding and veterinary it if something goes wrong decisions to revise reschedule or discontinue the program.

So, for instance we observe this in the case of our Khana Tiger reserve so, we had a program for transportation of gods. So, god for Indian bison, but then when they were being immobilized we observe some amount of fatality. So, the animals died off, in that case it was decided to stop the program then. And there so, that we could look at it in greater detail what were the problems. And how we could we could improve our functioning and once those for investigated we had we had different plants and then we were able to relocate the course successfully.

So, you need to have this post release activities of revision, re-scheduling or discontinuing of the program if you observe that these animals that for released they are dying of capture (Refer Time: 35:23) or they are dying because of the impacts of the ducks offers and so, many or for many other reason. Then also habitat protection and restoration is important because, when you are putting in animals into a new area, then you need to ensure that there are no porches nearby.

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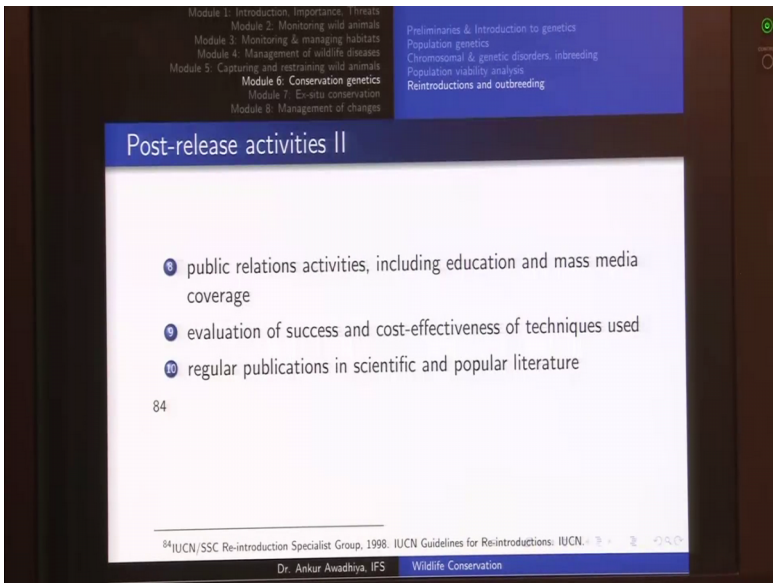

Also public relations activities including education and mass media coverage they are important. Evaluation of success and cost effectiveness of techniques used, now, this is extremely crucial because any activity will not be a one of activity, if we have successfully trans located animals then we might want to translocate more animals.

And so, a after every translocation after every release operation it is necessary to evaluate the success and the cost effectiveness of techniques used whether we can make any improvements for future. And also regular publications in scientific and popular literature because, after all we are doing this for conservation we are doing this to increase our scientific knowledge. And so, that other people are also able to use our technical expertise to traslocate and conserve some other species that are found in the radius.

So, for that scientific publications and also publications of popular interest articles becomes very important. So, in this lecture we had a look at introduction, reintroductions, stores locations and populations implementations. How do we differentiate between all of these, why is it important, how do we reduce the amount of inbreeding through genetic rescue, how do we go for and out breeding enhancement?

And how in certain situations this in place of getting an out breeding enhancement and how in certain situation in place of getting an out breeding depression as in the case of the ibix or in the case of the roebucks? So, those were the 2 case studies that we saw in this class. And then we also had a look at what all things do we need to plan and prepared for whenever you are doing any reintroduction or any transportation so, that is all for today.

Thank you for your attention [FL].