Plastic Waste Management
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Lecture – 22
Impact of Plastic Pollution on Marine Life (Contd.)

So, welcome back we will continue our discussion on impact of plastics on marine environment. So, we were discussing about great pacific garbage patch and the other garbage patches in the ocean in the previous video. So, we will continue the discussion earlier we were talking about the sources of plastic, how the plastics are ending up in the ocean. In this part we will start looking at what are the adverse impact in terms of from the plastic pollution in the ocean.

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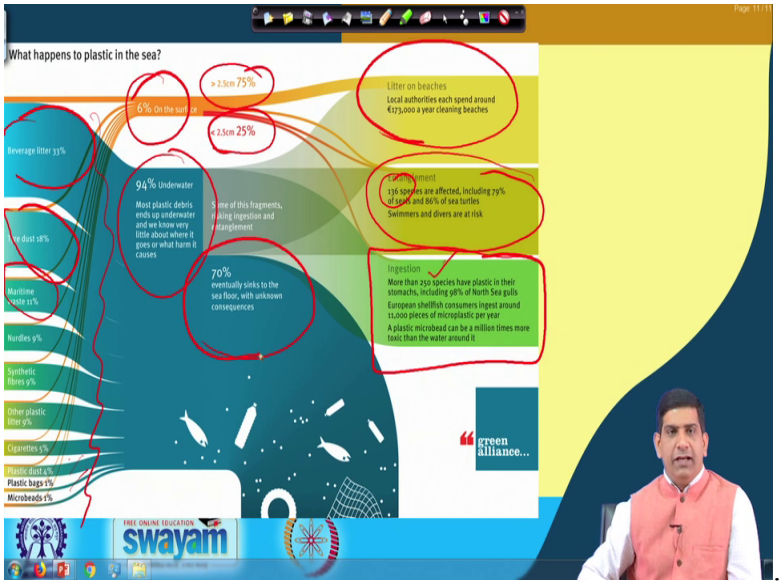

Once earlier we were talking about how the plastic gets into the ocean, now let us look at this slide that this slide where we talk about what happens to plastic in ocean. Once they are in the in the ocean what really is happening to them. So, as you can see over here, we can some information similar to what previously that we have a things coming from the beverage litter, tyer dust, maritime waste which is an and needles, synthetic fibers, other plastic litters, cigarettes, cigarettes buds, plastic dust, plastic bags microbeads so these are kind of the different sources coming into the ocean 6 percent is stays on surface. Earlier what we was 1 percent was for the microplastics.

So, here that we are talking about the entire plastic getting into the ocean. Total plastic getting into the ocean 6 percent kind of floats on the surface and just near the surface and on which more than 75 percent has a size of higher than 2.5 centimeter. And less than 25 percent has the size of less than 2.5 centimeter.

So, 2.5 centimeter is kind of almost an inch, so because one inches 2.54 centimeters so, slightly higher. So it is almost an inch so, 6 percent of the plastic or in the ocean, in the sea is floating on the surface level not kind of but this is surface someones like just in the surface area not just only at the surface and slightly below, so that is where it ends up. And 94 percent goes underwater.

And so, most plastic debris ends up under water and we know very little about where it goes and what harm it causes because, it goes under water and it because of the leaching of certain chemicals from plastic like bisphenol a, b p a many times you go these days to many of the big chain shopping area and you guy right to buy some plastic containers, plastic bottles, it saysBPA free. BPA free is that bisphenol a free. We are worried about bisphenol a later in this week we will be looking at a video on some research that is done a by USGS people or bisphenol a on different types of plastic bottles, so we will talk about that.

So, it is 94 percent is underwater 6 percent on the surface and the 6 percent on the surface the thing is that many of it is coming from the littering which happens on the beaches. So, lot of lettering on beaches. And local authorities this is this is coming from European Europe data. So, local authorities each spend around 173,000 Euros a year for cleaning of beaches. So, just the beach cleanup cost a local authorities on an average in on 173,000 Euros.

So, in terms of littering on beaches contributes to the plastic going into the surface floating. Then there are some entanglement which you may have seen a lot of video I have also I will also show you a some small clippings of the video of that angle, but then if you go on YouTube or Google videos you will find lots of videos on a plastic getting the animals getting wrapped around plastic, even plastic getting into the neck of, so plastic wires through like a ropes getting around the neck of a turtle or neck of a bird and sometimes the birds feathers are getting entangled in plastic and the bird is not able to fly. So, lot of thing is there and that becomes a problem.

So, entanglement 136 species have been affected. 136 species has been affected as per this report which came out last year including 90, nearly 80 percent of seals and 86 percent of sea turtles. Swimmers and divers are also at risk. So, and there was one video which is there on YouTube, where this those that straw that we use a straw has gone into the nose in the nostrils of a turtle.

So, the floating straw got into the nose of a turtle and the turtle was having a very hot time and these wildlife people who kind of tries to take care of the wildlife population this saw it and then they took it out. So, it is and then it was really painful probably it have been painful. So it is, so these kind of and it they were this was a spotted, if it was not spotted that could have led to a lot of problems for the turtle and may we do not we never know it may have ended up being fatal as well we do not know.

So, and then part of it is also getting ingested. So, ingested more than 250 species in have plastics in their stomachs including 98 percent of seagulls. 98 percent of North Seagulls have plastic in their stomach. European shellfish consumers largest ingest around a 11000 pieces of microplastics per year. So, you are if you are eating European shellfish you are consuming around a 11,000 pieces of microplastics per year. A plastic microbead can be a million times more toxic than water around it.

So, if plastic. So, microbead that it would be toxic. So, out of that 6 percent that what we are talking about in terms of what is floating on the surface, 94 percent goes underwater. Some of these fragments risking ingestion and entanglement, so they also kind of broken down and then that kind of goes into entanglement as well as ingestion. So, they also contribute towards that. 70 percent eventually goes to the sea floor with unknown consequences we do not know what happens.

So, 70 percent finally, eventually sinks to the sea floor and all the animals living near the sea floor must be getting affected from this plastic at that particular level. So, that is why would not gets a lot of media attention it is a big deal in terms of plastic pollution.

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This is a report from Australia, which kind of talks about the plastic issues in that particular area. So, this year like last year it is around that 9 million tons of plastic will enter the worlds ocean that is a study suggest that, out of that rate we are polluting our ocean doubles every 11 years.

So, first we have 9 million tonnes right now. So, in 20 like 11 years from now it would be 18 billion tonnes. Plastic is so permanent that is so indestructible that when you have tossed it in the ocean or even into a dustbin it does not really go away. So, plastic does not go away. So, that is and that was the beauty of plastic why we have started using the plastic for the first time because it is a wonderful material. That is what I keep on saying that plastic is a wonderful material it does it has brought in lot of it its being used in pretty much every industrial sector, whether it is a automobile, whether it is in your medical industries you go anywhere you will find plastics and the reason for that is it such a versatile material different types of it can be easily made into different shapes and it helps in providing lots of functions, from a small like a your small candy wrapper to all the way to car parts.

So, even today if you look at many of the car the car parts are made out of plastic. And that made car lighter and that after making it lighter our fuel efficiency has gone up. So, always it is not that plastic has plastic has helped in the environmental cause that way too. Because if the car is lighter your mileage is more that means, less gasoline less

gasoline means less environmental impact. So, that is that is a positive side of it and you we can list several positive side of it as well.

So, the problematic part is, we are not managing the plastic waste properly. So, it is the plastic waste which is a problem. Plastic bits plastic is a material is not of a problem as such. Here there are certain thin plastic which we have banned there are some single use plastic which we have got used to which probably is not good we should avoid using them, but at the same time it is the plastic waste the waste of a similarly for the municipal solid waste is a problem too. Organics and municipal solid waste, food waste is a problem, yard waste not managing yard waste properly is a problem, food waste creates lot of greenhouse gas we have if it can it is a good source of energy recovery.

Similarly, there are variety of waste streams which is a problematic, but since plastic is so much visible and the volume is so high although weight wise it is only 12 percent of municipal solid waste, but the if you look at the volume wise it is pretty high and it shows of everywhere it gets lot of media attention. And it is it is good that it gets lot of media attention we have to fix plastic waste management problem. But again as I am saying the it is a plastic waste management problem. Plastic by itself just like if you keep on if you think that oh from tomorrow we will not use any plastic I do not think we can even do that because that like to be we cannot do many functions without plastic today unfortunately or whatever we may call it.

We have been dependent on plastic because it is such a wonderful material. And it is that is why it is used in different pairs. Thing is that we have once this material it is that is end of its life of that particular material we have to manage that plastic waste properly, if you can do that job its not of a big of a problem in terms of a managing plastic waste. Since we do not manage plastic waste properly as many other waste stream it is becoming a problem.

So, and. So it say plastic does not decompose. that is why it was it is not actually supposed to decompose because that is why it the whole purpose of plastic was it has a very long life. So, you can make a plastic product and it will last for a long time. It just when it gets into the environment it gets is into smaller pieces, gets broken up so you will have a say single plastic bottles which you have can break down to 10,000 pieces of microplastics. Microplastic is a toxic sponge. A study shows that it can be 1 million times

more can more toxic then the water around it so, that it is a highly toxic micro micro plastic could be toxic.

Now, in Australia they found that they have 198, 192 billion pieces of plastic. In Australias marine environment this much plastic including every so, out of that 180 million from plastic bags, 420 million pieces of plastic bottles, trillions of micro plastic beads and fibers, 200 millions of other pieces of plastic container and 96 percent of the all biodiversity potentially in just plastic. So, again these problems are there because we did not manage the plastic waste properly. Had we to manage the plastic waste properly? We will not have these kind of impact showing up. 90 percent of the all sea birds are having plastic. The animals most vulnerable to toxic effect of plastic are those at the very top of the food chain which is actually us.

52 percent of all sea turtles, 100 percent of all coral reefs so they are all impacted by plastic. So, it says how what we can do? The first four step as you can see 70 percent of the marine plastic pollution can be prevented before it enters our ocean. How? You try to recycle. Ban single use plastic bags, remove microbeads from personal care and laundry product, ensure plastic producers and recyclers capture microplastic on their premises.

So, these all are talking about how to manage the plastic waste of plastic release form industries properly. So, that is what we need to work on, we need to work on proper recycling of plastic, but cannot be recycled like managing of plastic either in a dedicated waste to energy plant municipal waste to energy plant or somehow whatever like gasification or whatever works in that particular area, microplastics microbeads, which is used in personal care products that can potentially can be faced off laundry products use a certain microbeads how we have to use for alternative materials, then the plastic microbeads in those in those in those places.

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So, it is again the approach needs to be more from managing this plastic release managing the plastic waste properly so, that we can go forward.

In terms of having a better control on plastic pollution in our surface water and eventually in the ocean, now with all these plastic in the ocean which is already there or which is which is going to be there what is its impact? Where actually it is creating problem? So, there are we can talk about we can think about a Mechanical Impact and we will also talk about what is known as Entanglement. Now what is mechanical impact? It is so what we see that around 260 marine species worldwide suffer from entanglement ingestion of plastic debris. When such contact occurs organisms are seriously affected by the way quite often results in death.

So, it is the, so which it is a plastic which is in the marine species which is present it is getting impacted from the plastic and sometimes if it is the impact would be so high that it can even lead to fatal. Now what is how does this entanglement cause problem? It can cause death by drowning, suffocation, strangulation or starvation. Very often, birds, small whale species, and seals drown in ghost nets, lose their ability to catch food, cannot avoid predator because of their entanglement.

So, they got stuck with some plastic pieces or plastic wires or somehow they get stuck with all these plastic waste floating around and ones they are stuck they are becomes a easy prey for any predator. So, and then they or get consumed or they cannot eat. So,

they get suffocation they get they are a starved they cannot eat, they cannot breathe, they cannot swim properly because things have been entangled with all these plastic wires and other stuff in the ocean. So, that leads to drowning where think they are drown into the ocean and that leads to a fatal a situation as well.

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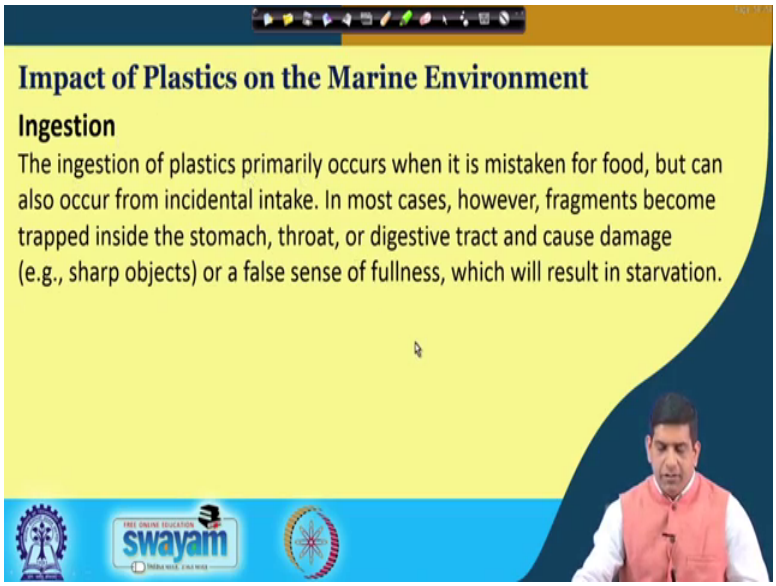

So, in and then there is also ingestion, ingestion of plastic when it is mistaken for food, but can also occur from incidental intake. In most cases, actually the plastic which goes it becomes, it goes inside the stomach, or throat, or digestive tract and cause damage or false sense of fullness, which will result in starvation. Because they eat this plastics and the thing that the tummy is full but the tummy is full, but there is no there is no really that is not real food. So, it is not digested in their body so it is stays in their tummy, but since it does not digested although the tummy is full, they are not getting any energy there and then that leads to a starvation of these species.

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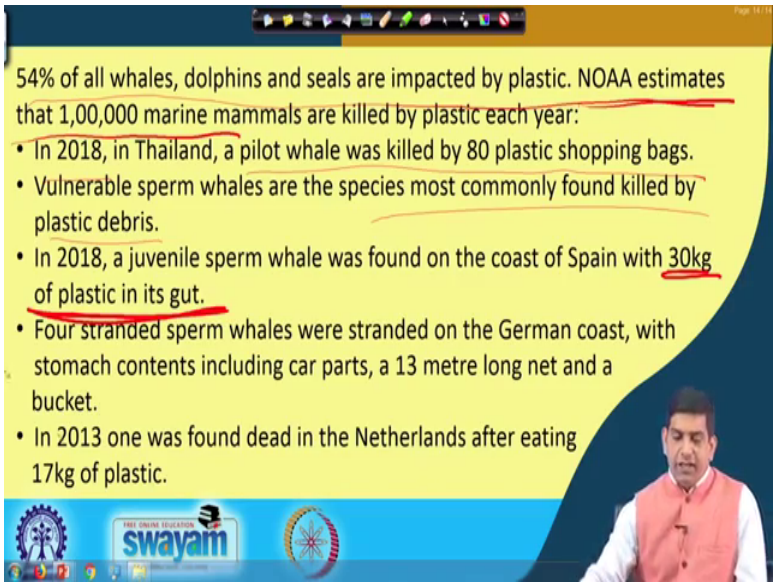

Some examples that 15 percent of the all whales dolphins and seals are impacted by plastic as per NOAA, which is national agency which of United States that NOAA has estimated that 50 percent of all whales, dolphins and seals are impacted by plastic and they also know another assumption they have, another estimate they have that around 1, 00,000 marine animals are killed by plastic each year.

Because of a plastic they are getting killed. In 2018 last year, a pilot whale was killed by 80 plastic shaping shopping bags. With 80 plastic shopping bags the pilot whale got killed. Vulnerable sperm whales are the species most commonly found killed by plastic debris. So, sperm whales are getting killed by plastic debris. And 2018, a juvenile sperm whale was found on the cost of Spain, on the coast of Spain with 30 kg of plastic and its gut. My god.

So, they have 30 kg of plastic inside the body. And they have been in Indian context in Inland in away from the sea we also see that that our cow, our bulls they are having lots of plastic in their tummy. They have been some you will find some videos out there nothing we have own which will play in this class as well. Where there was a they did some operation on a bull and remove lots of plastic from the stomach because of because that was making it sick, to that particular cow. So, in Germany four stranded sperm whales were stranded on German coast with the stomach contain including car parts, a 13

metre long net and a bucket. So, that is where all there in a sperm whale. In 2013, in one was found dead in Netherlands after eating 17 kg of plastic.

So, plastic is creating lot of impact in terms of like a sea life and the wildlife in for from improper management.

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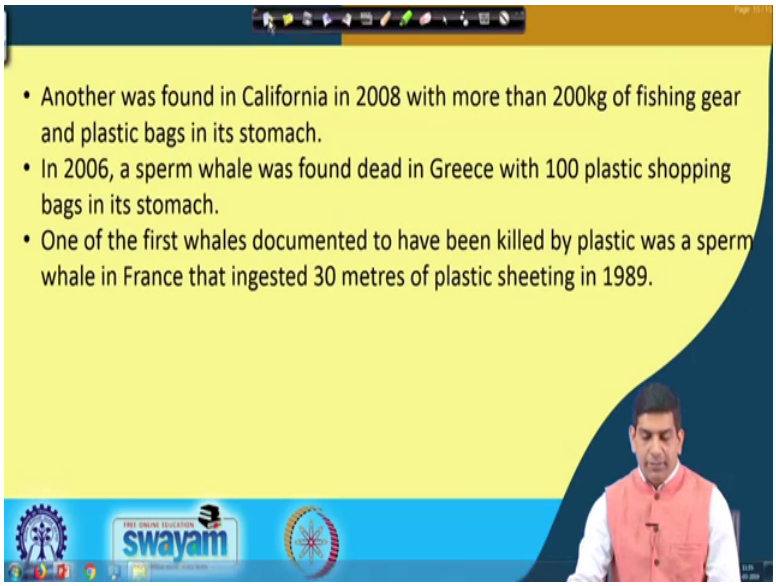

Another was found in California in 2008 with more than 200 kg of fishing gear and plastic bags in its stomach. In 2006, a sperm whale was found dead in Greece with 100 plastic shopping bags which we just talked about. One of the first whales documented to have been killed by plastic was a sperm whale in France that ingested 30 metres of plastic sheeting in sheets in 1989. So, that is was the impact from in France in 1989 just like 20 years ago. So, 30 years ago.

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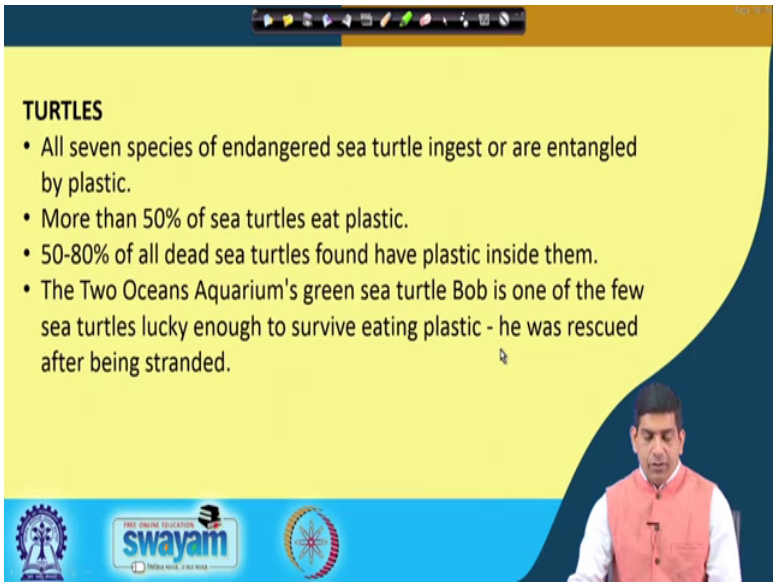

Turtles which is which makes lot of news in terms of the plastic waste impact all seven species of endangered sea turtle ingest or are entangled by plastic. More than 50 percent of the sea turtles eat plastic. 50 to 80 percent of all Dead Sea turtles have plastic inside them. The two ocean Aquarium's great green sea turtle Bob is one of the few sea turtles lucky enough to survive eating plastic. He was rescued after being stranded.

So, after. So, when they were a stranded with plastic all around them, they it was rescued. So, that is that is one of the thing this wildlife volunteers they keep on looking for a species, or the animals, or turtles, or fish not really if you like a turtles or birds and other things and they try to save them from this plastic entanglement. And which we see from time to time reported in different news videos and also on you can find those videos on YouTube.

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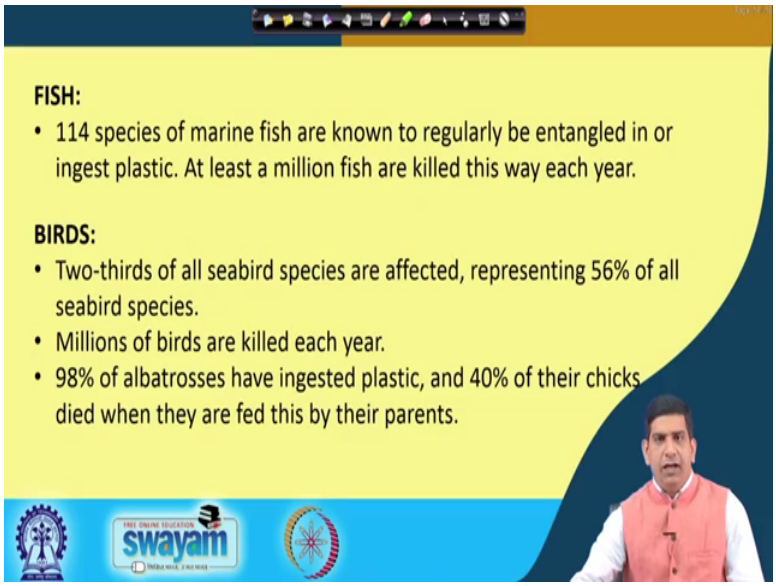

In terms of fish 114 species of marine fish are known to be regularly entangled in an ingest plastic. At least a million fish are kill this way each year. Birds two-third of all sea bird species are affected, representing 56 percent of all sea bird species. Millions of birds are killed each year because of this plastic problem. 80 say 98 percent of albatrosses have ingested plastic, and 40 of percent of their chicks died when they are fed this by their parents. Because of parents by mistakenly their feeding plastic pieces to even that to their child for the chicks and then that lead to death of some of these chicks as well.

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Corals are getting effected several coral species have been observed starving at their digestive system have been blocked by micro plastics or the photosynthetic zooxanthellae were killed by being shaded by plastic. Land mammal half of all camels that die on the Arabian Peninsula each year or killed by ingesting plastic bags, which form heavy cancerous lumps in their stomach. And Indian elephant was killed by eating plastic shopping bag in India in 2018. In 2019, the reindeer in Norway were killed by abundant fishing nets. 8 African elephants died in Zimbabwe in 2016 by after eating plastic bread bags.

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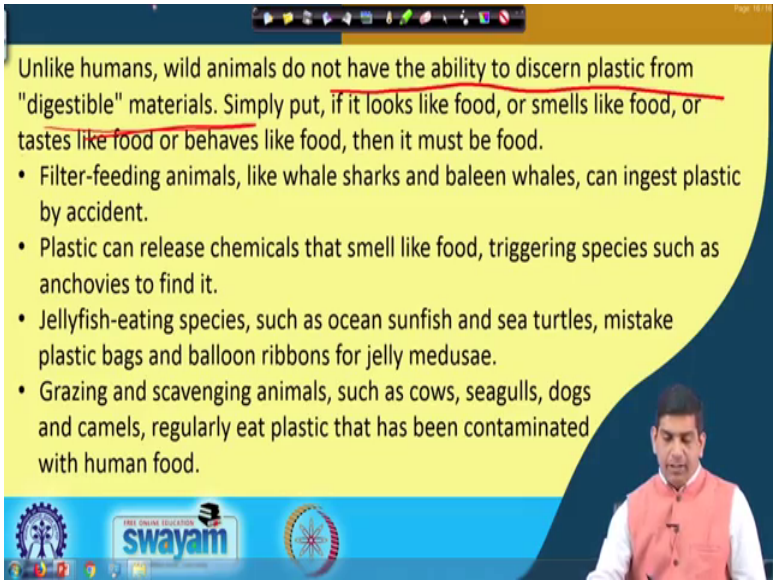

So, we do have a lot of impact on marine life and wildlife and different animals so in terms of a plastic pollution. Thing is that unlike humans wild animals do not have to do not have the ability to separate. They they do not know what is what is plastic and what is food. Say they do not have this ability; they do not have the ability to discern plastic from digestible material. Simply put if it looks like food, or a smell like food, or test like food or behaves like food then it must be food.

So, that is what their concept is, so if it feels if they looks like food and if it is a taste behaves like food, then it must be food. So, and they end of consuming lot of plastic based a stuff. Filter feeding animals like whales, sharks and baleen whales sharks and baleen whales can ingest plastic by accident. plastic can get release chemicals and it smell like food triggering species such as anchovies to find it. Jellyfish-eating species

such as ocean sunfish and sea turtles, mistake plastic bags and balloon ribbons for jelly medusae for jelly.

Grazing and scavenging animal such as cows, seagulls, dogs and camels regularly eat plastic that has been contaminated with human food. So, that is we have seen that happening as well.

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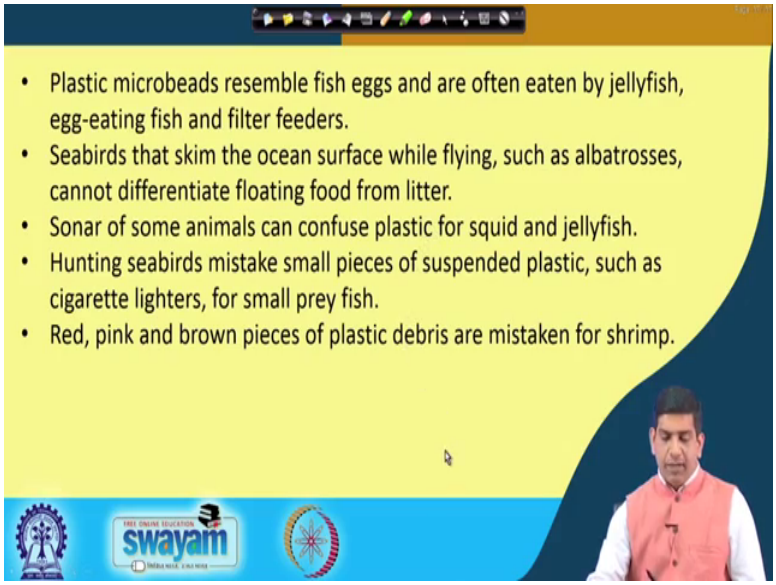

So, plastic microbeads resemble fish eggs and are often eaten by jellyfish egg eating fish and filter feeders. Seabirds that skim the ocean surface while flying such as albatrosses cannot differentiate floating floating plastic pieces from litter floating food, from plastic litter.

Sonar of some animals can confuse plastic for a squids and jellyfish. Hunting a seabirds mistake a small pieces of suspended plastic such as cigarette lighters for a small prey fish. Red, pink and brown pieces of plastic debris are mistaken for shrimp. So, that is what. So, different scenarios where things kind of can go wrong.

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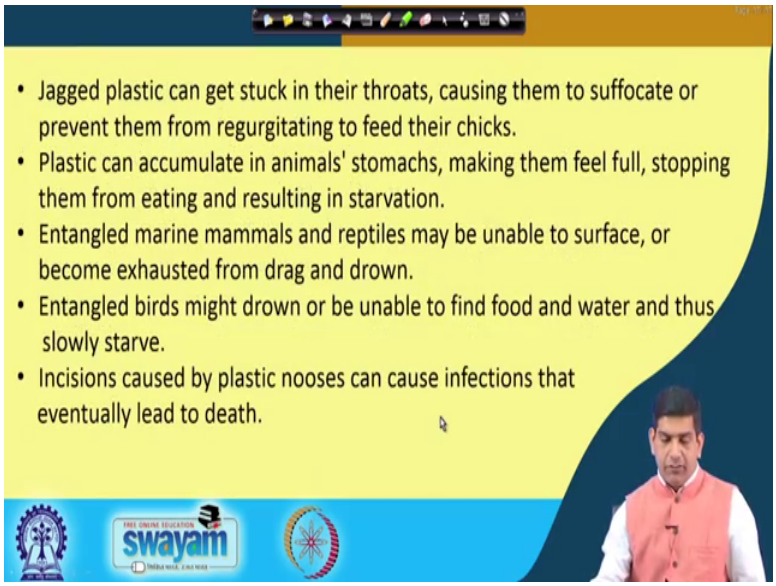

So, now what happens the plastic can get stuck in their throats, causing them to suffocate or prevent them from that that regurgitating their feed to the chicks. Plastic can accumulate in animals stomach making them feel full is stopping them from eating and resulting in starvation. Entangled marine animals and reptiles may be able to unable to surface and becomes exhausted from drag and drown. Entangled birds might drown or be unable to find food and water and thus slowly starve incision caused by plastic nooses can cause infection that eventually lead to death. So, there are lot of a impact that does happen.

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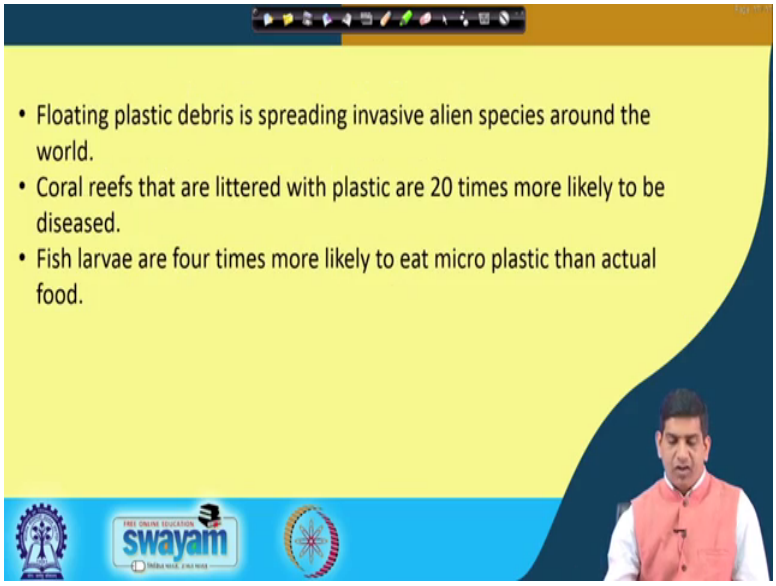

Floating plastic debris is a spreading invasive alien species around the world. Coral reefs that are littered with plastics are more 20 times more likely to be diseased. Fish larvae are 4 times more likely to eat microplastic than natural food. So, because they take this they thing that these are because of the smaller smaller pieces of plastic which are microplastics is taken up this thought as a food item.

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So, this is one picture as you can see here plastic things the fish is getting entangled by plastic. Is this is a plastic right there? They have a you see the plastic entanglement, the plastic kind of have damage the a body here again the plastic is in the middle, a plastic wires in the middle. So, it is creating lot of problem of with this abandoned plastic waste in the middle of the ocean is creating lot of problem for different species.

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So, here plastic bag of food seagulls falls into this olfactory traps, some fish mistake plastic for krill. Sea turtles confuses bag with jellyfish. So, the thing that the plastic bag, like single that single use plastic bags are more like a jellyfish and sea turtles try to eat that. And here you can see a picture of this plastic actually wrapped around this particular animal, where you see that plastic wires or wrapped around on their body creating problem for them. So, you will see lots and lots of pictures and videos around this line if we go on YouTube.

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So, let us look at this particular video and then we will close this module. And here in this video the that there is a small report on what we are talking right now. This is where they have a tried to rescue some of these birds, which has been affected by plastic pollution, they got entangled, they got other plastics kind of all over their body. They they are even they the one body is not able to fly as you can see.

So, let us watch this video and then we will be close in this particular module which will be the second module of week 5.

I mean this bird is a see from a nest. And this one is inside the more leg twist the more turnd get tighten tight.

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Yeah, (Refer Time: 29:09) I am getting it near. (Refer Time: 29:14) Right in the middle here over this (Refer Time: 29:20) this is probably one worst case I ever seen (Refer Time: 29:31) how do you (Refer Time: 29:30).

So, as you saw that the birds, where is entangled with that plastic, there were several other species that are entangled with plastic. So, that is what we have been I mean trying to highlight in last few slides that, things does and then this video kind of a shows you a pictorial representation of the same.

So, this is one of the biggest problem when we look at plastic in ocean. Where this birds and sea turtles and other species are getting wrapped around with plastic or plastic wires,

plastic bags and this is creating a problem for their health issues, their food, their nutrition as well as many times they feel full. But because they have plastic in their stomach, but they do not have any energy. So, these are the issues that we have to we are dealing with in terms of plastic pollution in the ocean.

So, we will continue our discussion in the next video. So, let us close this video right here and if you have any questions feel free to put it on the discussion forum and we will be very happy to answer that.

Thank you and see you again in the next module.