

Nuri ÖZBAĞDATLI, UNPD Manager

Hello, Thank you, Mr. Chairman, director, distinguished participants, professors. Thank you for gathering here today. Especially because of the COVID-19 and Izmir disaster, things are not as expected but still we continue working. Let me express my condolences to those who lost their beloved ones in Izmir disaster. UNDP- United Nations Development Program is working in the cardinalship of Ministry of Foreign Affairs and the presidency, budget office and, collaborating with public organizations and NGOs and many other organizations in Turkey, and UNDP is based in New York, the headquarters is in New York, but we have offices around the world in more than 170 countries. And the purpose of the regional and national and activities of UNDP is to reach the 2030 Global Agenda. And the 2030 Global Agenda has been set by the countries has been country's signatory to the to the United Nations, that is why we are collaborating with the countries in order to achieve a 2030 Sustainable Development Goals. While sustainable development has multiple dimensions, not only social, or environmental and economic, what we need to do is to bring together social and human relations together and we need to strike a balance between those relations, we need to identify the imbalance between those dimensions within those relations and then then respond to increase the capacity to respond the crises, including the health crisis that you're currently having. Well, during COVID-19, you're having a systemic crisis, because in any way mentally your source problem can lead to an economic and health problem or problem which afflicts the whole system. So, within the framework of climate change, we have been conducting a number of projects in order to view the changes and see what are the changes in environmental and social relations and dimensions and we are trying to collaborate with the public organizations and the relevant actors in order to create structural reform and transformation, marine environments, the seas, they are our natural resources and within the framework of biodiversity and natural resources. Seas are an area of work which requires intensive collaboration and lots of new activities and projects. We worked with DG- Forestry, DG- Nature, conservation and national parks of the Ministry of Agriculture and Forestry of the Republic of Turkey on a number of projects. So far, both when it comes to development and implementation, we try to do projects which can decrease the inequalities which can contribute in the phase the state of economy, society environments and many other dimensions. This is how we how we view the invasive alien species, we believe we can we are trying to bear the fruits of this project in the long term. Generally, people think that the impacts of this project can be particularly be visible after 2013 maybe in 2015. This is a GF funded project. This is why we need to consider the environmental side of the environmental targets of the SDG target and SDG global agenda, and also we need to consider the 11th National Development Plan of Turkey and we want to contribute to that to the conduction of that plan as well. Talking of marine alien species, invasive alien species it has it has an anthropogenic side. So we need to handle this issue from the side of human impacts the social impacts and environmental impacts etc. But at the same time for the decision makers to take the required and correct decisions there has to be a floor of information going to the decision makers and the scientists together. In the decision-making mechanisms, information availability is important but what is also much more important is the participation of the actors, each and every relevant actor, all the stakeholders have to participate in a decision-making mechanism. Today, we are specifically focusing on the invasive alien species and specifically lionfish but our efforts will not be limited to the lionfish in this project. This project has certain has a certain component about the legislative work and Legislative Review in Turkey and there will be certain activities geared towards economics supports. But for all of them to happen to be to be conducted to be realized we need the guidance of the scientists, we need the guidance of the specialists, we need to collaborate with them. And we need to understand that the problems to be brought about my invasive alien species may not be the problems of today only,

but they may also impact the future. That is why the solutions that we are going to come up against come up with it should be sustainable. This project is of great importance to the NTP. We believe this project to the global scale project today we have participants from Turkey and abroad. And we believe the potential collaboration to be fostered between Turkish specialists, participants and the participants from abroad will set an example for the next projects to come or for the next activities to come. And I wish all the best to you in this meeting and in this project in general as well. We are going through gloomy days, unfortunately, but hopefully this project will come up with sustainable solutions to the gloomy days as well. Thank you very much for the kind attention.

Translator1

Deputy General Director of forestry, Fisheries and Aquaculture will take the floor to do the opening speech from the Ministry of forestry and agriculture. The floor is yours sir. Thank you.

Mehmet Nuri YILMAZ, Deputy General Manager of Fisheries and Aquaculture

Mr. General Director, distinguished participants, I'd like to welcome you all on behalf of my institution. We attach great importance to this meeting. Both at national scale and global level, this meeting and this project is of great importance, because there are lots of littoral states around the Mediterranean, not just Turkey. Each and every new species, alien species coming in contact with the native ecosystem are causing harm to the native species. That is why we have to put up a fight against them. And the impacts of invasive alien species on the new ecosystems that they touch on it should be analyzed very well. And we need to be in constant monitoring on constant monitoring for them. Well in the Mediterranean, and Aegean, and well, if an alien species comes into Mediterranean, they can make their way up until the Mediterranean region and sometimes the Black Sea region to Black Sea itself. And these alien species can really damage the native species to a great extent and eliminate the native species at times. That is why we have to pay great attention and be on constant alert against those alien species. And we all have responsibilities in this respect as the scientific world as the public organizations and NGOs. Because the ecology this social structure is damaged by the alien species. That is why we attach great importance to such activities including this project itself.

Muhammed ÇOLAK, Deputy General Director of Nature, Conservation and National Parks from the Ministry of Forestry and Agriculture

Distinguished participants, I welcome you all to the workshop under the project, entitled addressing invasive alien species spreads at key marine biodiversity areas project implemented by the ministry in collaboration by UNDP, founded by GF. I'd like to welcome you all to the digital event on the exchange of knowledge on lionfish. As a person he physically experienced the disasters is the earthquakes of the 17th of December and 12th of November, I have to extend my deepest condolences to those who lost their beloved ones, hopefully, we will not again go through a similar event of similar nature. This workshop we wanted to do physically in the city of Antalya but because of COVID-19 we had to adopt another methodology and do it in zoom and hopefully, in the near future, we will be able to do such activities not online but face to face, when it comes to the invasive alien species do harm to native species and also the ecosystem services and they are one of the most important factors that we have been encountering in the recent years. Because of the climate change and developments in the technology and also increased movement of the people, invasive alien species started to establish disseminated in a higher increased

number of countries around the world. And the use of alien species constitutes a problem not only for a single country, but multiple countries actually. And it they have been establishing and disseminating very quickly in the countries recently and they reproduce very quickly. And with the opening of the Suez Canal and because of the ballast waters of ships, the number of alien species in the Mediterranean came up to reach 1000 and we have 500 alien species in Turkey. And one of those invasive alien species is lionfish in Turkey. This species was detected for the first time here in 2014. But they reproduce so quickly that they started to be seen in the Aegean and the Black Sea as well. In the right environment, they can spawn between 10,000 to 30,000 eggs a day. And because of the climate change, they can damage the marine ecosystems and they can, they feed on the native species and invertebrates as well. And this way they also do harm to and threaten manners of the fishery-based livelihoods of the people. They are a threat for the Mediterranean and for the waters of Turkey as well. They are so much invasive, but they might also be they may also be so much tasty, that is why they are being also consumed as a sea of seafood in a number of countries. And especially lionfish disseminate very quickly in the waters. That is why they have to be eliminated. And they have to be put back in the economy in the market. That is why we need national, regional and global collaboration and biological diversity, sustainable development and economy politics. I mean, we need specialists from a number of disciplines so that we can also good collaborations and contribute to the solution of this problem. And hopefully, the pandemic afflicting the whole world will disappear soon. And hopefully, we will be doing the next workshop on the alien species specifically the lionfish in Turkey physically very soon. I wish a very safe and good day to you all thank you very much.

[Mehmet GÖLGE, UNPD Turkey- Project Manager](#)

Thank you, Mr. General Director, managers, General Directors, thank you very much. You have seen the videos, you have seen the comparatives of the project but still take the floor and summarize the components and activities of the project which brought us together today. This is the content outline on my presentation, project identity pilot areas species that we cover as well as activities. This is a GF funded project which will go on for six years. It started in late 2018 and it'll continue up until 2023. And the executed implementing agency is the General Directorate of nature, nature conservation and national parks. And this is executing agency implementing partner and to the implementing agencies the UNDP Turkey country office. The target is to ensure resilience of marine and coastal ecosystems to strengthen capacities and investment in prevention, detection, control and management of invasive alien species. The ultimate purpose target is to protect the marine ecosystems and specifically the purpose is to do activities for the alien species. And these are the pilot areas and four of them as you can see, we tried to protect a pilot site from each region above with protected areas. The first one is Igneada floodplain, floodplain forest National Park coastal seascape. Ayvalik Island National Park and in the Mediterranean especially, we had species coming from the Red Sea. The Marmara Island National Park is a project site and Samandag Mediterranean monk seal habitat and sea turtle nesting of spawning grounds would be the fourth area site of this project. These are the species of the project: lionfish, pufferfish, sea snail water, hyacinth, and Atlantic seastar. Today we are getting together for the lionfish specifically, but it doesn't mean that we will limit our activities to cover only these species. And these are the activities of the project in the four pilot sites are our experts started to do field studies and literature search as well. And such studies will continue seasonally, the field studies have kicked off and there will be a database and decision support system systems actually to be established in this project. We are doing the preliminary studies and preliminary work for them. So if you're trying to set up a system to detect the alien species and also help with the decision making and you know, one source of for the alien species to come to the waters would be the

ballast water. So there will be a E DNA and ballast water system in place. There will be activities for environmental DNA and ballast of water. And so we did a technical work about health just published an E DNA environmental DNA system. And we are collaborating with the General Directorate for this purpose, awareness raising as a next type of activities that we are conducting, which details will be provided later in this presentation. And legislation would be the next topic and next type of activities. You know, maybe awareness raising activities, by the way, are particularly important because certain measures will have to be taken on the side of the people. And legislation related activities are also there in the project. In Turkey, there are lots of pieces of legislation directly or indirectly related with the alien species with the marine environment. We have the environmental rule, for example, we have the secondary legislation. We have the circulars and regulations. But we are going to have a specific activity under this project in collaboration with a specialist and the relevant people to consider what kind of legislation could be put in place for us to fight better the alien species, send some mechanism, it might be a monetary mechanism or a mechanism for implementation for certain practices, I don't know. But this incentive mechanism is being worked on by the specialists by the consultants, they are coming up with recommendations and suggestions about the incentive mechanics and that we can have then the relevant departments of the Ministry of forestry and agriculture and also NGOs working in the area of Fisheries will be engaging in this mechanism. This is the idea. But you know, we want the outputs and results of this project to be sustainable. So after setting up all those systems, we want them to be sustainable, and quarantine and biosecurity is the next type of activity conducted in the project or the expense. The specialist working in the project created drafted reports about quarantine and biosecurity. And there was a portable guide us, Julie, for example, they'll guide us about what could we do in relation to quarantine, it might be difficult to do in the marine environment, but easier to in the territorial environment. But in time, our specialists will give us more concrete outputs. And some awareness raising activities have been done so far. And some examples can be seen on the screen. That side web side and has been constructed both in Turkish and English. So it's the larger.org would be the Turkish name. And once you go online and use the Turkish website, you can always direct yourself to the English version of the site and using the tab there and we also put in certain videos into website. The video that we showed you in the introduction was one of the videos that we also fought, show cost and in the website. We're also sharing videos in a social media to raise awareness and we also have some info graphics. At the bottom in the right-hand side you can see an example for the lionfish. We have not started sharing the info graphics. But once they're ready, we will also be sharing them. And for the kids journal. Technical scientific journal was prepared for the children and the journal was circulated among the local administrations. And they further circulated the journal awareness raising active purposes. And also the childrens book. The childrens book which can be very well seen on the right-hand side on your screen. This will be a children book with stories for the kids and also giving information about the native species, alien species written in a language which is easily comprehensible by the children, and also a calendar about awareness raising purposes as well as workshops. This is the first book for capacity building, but this workshop will be followed by some other workshops as well because we really attached great importance and knowledge exchange workshops are of great importance I think you would appreciate. Also in this workshop, we will exchange knowledge to talk about what kind of measures we can take in fighting alien species. There are experiences out there in the Caribbean for example, you're going to exchange the knowledge with a specialist from different regions for your contributions are extremely valuable. Please contribute in the workshop or you can always reach us through email and also give your feedback later. That was it from my side. Thank you very much for the kind attention. Well, at the end of the day, there'll be a Q&A session a discussion session, but it is

a possibility that we may not be able to collect each and every comment or question. If possible, please type your questions in the chat box so that the experts the specialist can answer the questions today or later, or you can pose your questions using the email channel all the time, always. Well, at the end of this meeting, we are going to come up with a workshop resulting workshop report which will be circulated among yourself. So after receiving that report, result and report from the workshop, you can again, give your feedback. Thank you very much for the kind attention. I'd like to give the floor to the program manager.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay, we're here to discuss the lionfish invasion. And we have a guest from Florida. And he's going to speak about the history of that invasion. And we have many attendances today.

[James Hart, Co-Founder, Lionfish University \(NGO\), Florida](#)

Thank you. Stacy will be sharing her screen for a presentation. My name is James Hart. I'm one of the founders of Lionfish University which is the 501 c3 nonprofit. That is was founded to educate and spread the awareness of the lionfish invasion. Stacy Frank is my co-founder. And I see we have some colleagues here today Dr. Steve Gittings, Dr. Holden Harris, Phil Karp, Scott Gonnello. These are all people that we work with; in this invasion that we would never have met. If it had not been for this lionfish invasion, which has created a community around the world now, we would have had people that probably never would have crossed paths. So I'm going to let's get started out here. Again, we're going to focus on our experience in the Cayman Islands.

[Stacy FRANK, Caribbean Lionfish Invasion History](#)

Start with a little bit of humor here. Life in the times of COVID, who would have figured a year ago that we might have actually needed an old underwater diving helmet from the history of the diving museum.

[James Hart, Co-Founder, Lionfish University \(NGO\), Florida](#)

Actually, the safest, ~~safest~~ place to be from COVID is underwater. Stay there because it's safer.

[Stacy FRANK, Caribbean Lionfish Invasion History](#)

So back to the invasion in the Caribbean, ~~here on~~ the very first invasive lionfish was sited off the coast of Dania Beach, Florida, in 1985. And there are so many theories about how the lionfish ended up there, among them the ballast water theory, but the most accepted theory that aquarium owners just got tired of their lionfish probably eating their other tropical fish in their tanks and dumped them into the Atlantic. And in this slide, you can see the animated map of the invasion starting out in Florida, and then not too much happens till around 2000, then these populations just explode up the Atlantic coast, then down into the Caribbean second, then up into the Gulf of Mexico last and going all the way down to South America.

James Hart, Co-Founder, Lionfish University (NGO), Florida

And it's not true that lionfish came from outer space, but they could have. There is some wisdom in this cartoon. Just like all the Hollywood movies about invasion from outer space and alien species ~~coming in~~ ~~invidious~~, they always show up in the flying saucers. And the spaceships. We were never prepared. They have better weapons than us, ~~they're more than the rest~~, they kill a lot of us until finally as a population, we figured out a way to survive. And it is exactly the way the lionfish invasion is there. They showed up unannounced, they showed up nobody knew what they were, they started eating everything in sight. And it took a long time for the human community to try to find a way to respond and we still don't have an overall management plan.

Stacy FRANK, Caribbean Lionfish Invasion History

We're focusing on the behavior and the history in the Cayman Islands. Because it's a place that Jim and I have been diving for many, many years before the lionfish invasion. And ~~after so~~ ~~we firsthand~~ could see firsthand the effect of the lionfish on the reefs when they arrived. And at first, there were absolutely no predators that would eat the lionfish at all dead or alive. And another interesting thing was there were no internal parasites or very, very low in the very beginning that were found inside lionfish. And we got to know Dr. Tuttle, Lillian Tuttle, at the central Caribbean marine Institute quite well, and that was her specialty, ~~was~~ research on parasites. It would be very interesting to see a comparison between the Mediterranean and the Caribbean in terms of parasites loads.

James Hart, Co-Founder, Lionfish University (NGO), Florida

And what we did, they'll begin to see once we responded to the invasion and began to cull and capture and harvest the lionfish we noticed a progression of change and behavior of the native reef ~~and~~ ~~lavery (?)~~ fish and lionfish over time, especially in the grouper population. The grouper ~~or~~ population began to behave like a hunting dog with a hunter. They would actually find the lionfish on the reef and point to it and locate it and wait for a diver to come over and eat or spear or capture it. But they wouldn't eat the lionfish on their own. They made no attempt to do that. So in the beginnings, divers would spear lionfish and feed them to the grouper. We did not know the impact that was going to have at the time on other behavior. There was an unusual relationship that formed between Dotty Benjamin, we can go to that we can go to that video. This is ~~a real this is~~ footage that we shot in 2010. This is Dottie Benjamin noted diver, look at the relationship she has with Mini Me. This is a grouper that hunted with her. The way a dog hunts with a hunter ~~Hutch~~ hunting for birds. Mini Me would locate the lionfish on the reef and wait for us to come. ~~in~~ ~~spirit~~. The grouper would not eat the lionfish unless it was speared. Again this is 2010 we did not know that this was a bad habit to get into. Now the grouper goes and hides in the reef and waits for her to kill the lionfish. This was footage that I shot with Stacy's brother, Courtney Platt. She spears the lionfish on the reef in full view. ~~that you'll see many me hiding under the reef~~. The fish would wait until she signals before the fish will come and eat the lionfish off the spear. It's like a bird dog holding a point on a hunt. Here we go. Now that ~~now~~ the grouper will come and take the lionfish off the spear. And they must taste good because, ~~you know~~ they don't spit them out even with the spines. But this is unusual behavior between a fish and a human. Unfortunately, Mini Me was caught by fishermen fishing in restricted areas. ~~and they no longer hunted together~~. Again, we didn't know that this was creating a change in behavior in

predators. Five years later, we encountered another grouper in a whole different spot during the grouper aggregation. We encountered a grouper in a totally different situation in 2015. Let's go to that video.

Stacy FRANK, Caribbean Lionfish Invasion History

As cool as this behavior is it definitely can lead to predator aggression. So we would not encourage anyone to feed lionfish to any predators. And this was, as Jim said, way back before anyone knew what the consequences of doing that. So hope you can learn from our mistakes along the way. And here is a good example of ~~right here diving I were diving,~~ this normally very docile nurse shark coming up and was quite aggressive. Neither of us were bitten, but she did have to hit it on the nose several times to get it to leave. And unfortunately, there have been people bitten by sharks. Another example on the right, a very good friend of ours down in Grand Cayman was bitten by a large green moray eel. And not that he was feeding lionfish at that particular time. But unfortunately, it had gotten used to people feeding it. And with their eyesight not being very good, his hand just happened to be in the way of where the lionfish was. So anyway, just that one huge thing just don't feed predators. We definitely learned that.

James Hart, Co-Founder, Lionfish University (NGO), Florida

And again, the invasive species can come from anywhere they can wash up on your shore very much like they did in the Mediterranean, very much like they did in the Caymans in the Atlantic. And we're ~~never we are still we have still not~~ fully prepared for these invasions. And hopefully some of them will come out of this workshop that will show the need for regulations and uniform ways to deal with the invasion. We did see this is five years later. This is 2015 the end of a dive that Stacy and I were on doing our safety stop and I saw a lionfish about 60 feet. I went down and started filming it. Suddenly this grouper showed up. We've seen this behavior before. He was waiting for me ~~to be or she was waiting for me to spear.~~ I stayed with this for a moment, I was about to go to the surface when suddenly another ~~big piece of~~ unusual behavior happens when our grouper gets some assistance. And again, I don't have a spear, all I have is a camera. So ~~this and~~ then this happened. He suddenly had a partner and I thought I better not turn the camera off. This is unusual. We haven't seen this. So now this grouper starts hurting the lionfish. There's some controversy on who's in charge here. Is the lionfish ~~is~~ in charge, or is the grouper in charge. But again, the grouper would normally be waiting for me to spear the lionfish, but that's not what's happening here. This actively trying to maneuver the lionfish into a position where I'm thinking maybe we're going to see a grouper eat a lionfish without the intervention of a diver. Now there is some controversyI am a diver.... I'm there with a camera, I have a light that can be construed as changing behavior but then you see how the grouper maneuvers the lionfish ~~into the~~ off the reef into the water column. Lionfish do not like to be in open water. They do not like to be away from the reef. Now, is the lionfish in charge, or is the grouper in charge? The lionfish begins to ascend in the water column which they also don't like to do. Always the dorsal fins are facing out so it's always in defensive mode. And I'm running out of air, my alarms are going off. I'm worried that I'm gonna run out of juice on the Go-Pro and I'm just saying finally to myself: Why don't you eat the lionfish? Please eat the lionfish while I'm still able to breathe and while the camera is still running. ~~and this~~ This went on for two or three minutes, and I'm hearing my alarm scream, I'm afraid to look at my computer, I don't want to look away. And now you see, this is Stacy, and another friend of ours on the safety stop watching this. And they had not ever seen this behavior before. And at this point, ~~my,~~ my inner voice is screaming eat it, eat it, please eat it. Because we've not seen this. Normally, the grouper would be waiting for me to spear. He's trying to find a way to take the lionfish, whether it's from the rear or from

the top or from the middle and avoid the spines. And then finally, at the very last moment, the grouper eats the lionfish and swims off.

Stacy FRANK, Caribbean Lionfish Invasion History

You would have thought we had just seen the biggest Super bowl touchdown of all time: we were jumping up and down. This was such a historic event in retrospect. And that particular video has now been leased out several times by National Geographic Wild . It was very controversial at the time, but there have been other studies and empirical observations of predators eating lionfish now. I'm going to go a little bit of the history of the culling equipment in the Cayman Islands. And one of the first things which was used, because spearing was not legal on scuba, much like it is throughout the Mediterranean, these nets were used. Well, that was okay in the very beginning when it was just one or two fish that you would see, but it was such a hassle to have just one fish at a time and have to take it back to the boat. So when the laws were changed, and culling was allowed with spears and scuba diving, there was quite an evolution of equipment. The very first one actually, which I'm holding here was a mask box that Dottie Benjamin used to collect the very first invasive lionfish sighted in the Caribbean, which she had seen in the Cayman Islands. She collected it with a snorkel and this mask box, so pretty primitive. They're the very first thing and then down In the lower right is a was made out of a containment unit made from a floor mat for a car. There's like a bucket from Home Depot, various things that people just found, in water bottles etc that they made into a containment unit and then there is Allie ELHagee who you'll from zookeeper who you'll be listening to you later on. He has invented a much more professional and very useful container for collecting lionfish.

James Hart, Co-Founder, Lionfish University (NGO), Florida

One of the problems that was faced in the early culling days were government regulations, which are still not uniform in the Caribbean. There was no spearing allowed in the Cayman Islands, whatsoever. And so you had no way to harvest the lionfish unless it was through a net and there was no commercial fishing. And finally, through pressure from dive operators and resort owners and divers in general, the Cayman government authorized a very specific spear: a Hawaiian sling that was licensed to the user and could only be used for lionfish. And that actually opened up the whole idea of culling on a much broader scale. And but again, that is one of the things that we all face is a uniformity of government regulations, because sometimes a government postponing or having a delayed action just lets the lionfish continue to ravage the reefs and ravage the juvenile fish population. And what resulted in Little Cayman was an experiment that actually worked. The research supported organized, weekly calls, use it with dive masters on their time of, because culling with recreational divers became dangerous because of sharks. because of possible stings. So this picture right here is of a cull in 2012. And again, all of these people have come together because of the lionfish invasion. At first their harvest was enormous in the hundreds and it shrunk down to less than 100 and the central Caribbean Marine Institute actually did a study on this culling program. improved what is The first papers published that prove that culling works in a controlled area. This was in the marine parks in a controlled area, they reduced the lionfish population and actually resulted in an increase and a return of the juvenile native reef fish. And once again, there is a silver lining: that this invasion has brought so many people together who we never would have met you know in their

daily lives or in their or in their career vocation. And it's this is demonstrated by this very workshop, this international workshop, this never would have occurred if it weren't for an invasive species that brought us all together with a common cause. So, on behalf of Lionfish University and, and Stacy Frank and our colleagues that you're going to be hearing from, we appreciate this opportunity. ~~and hopefully, our experience the American and the Caribbean in the Atlantic, and you're going to hear from the other for other people that can give you some, course corrections or some courses to pursue in your own invasive species.~~ So thank you very much.

Stacy FRANK, Caribbean Lionfish Invasion History

Thank you so much.

Aylin Ulman, MariAS Project Incentive Expert

Welcome, everybody. I am going to give you a little history of the Mediterranean invasion. I have been studying invasive species in the Mediterranean for the last six years. For the last two years I've been studying puffer fish quite seriously and this year the lionfish with our many new friends we've made along the way. Okay, why is this fish so invasive? If you see a lionfish underwater, it looks like the most dangerous food item, like a mix between a porcupine and a sea urchin. It has very sharp spines, It has camouflage. It has an incredible appetite. It can go without eating for months at a time. It has a very large mouth it can fit species half its body size inside, it can expand its stomach 30 times. Its eggs are hidden from predators because they are in a gelatin mass. It has very low predation and Mediterranean so far, we only have three countries controlling this fish right now, we only have Cyprus, Israel and Lebanon actively spearfishing this. About a few months ago, we started these really lovely exchanges with our new American friends. They are giving us some beautiful guidance from their history. We have started a collaboration and we are calling ourselves Lionfish Universe. And anyone studying lionfish is welcome to join our group, you can just get in touch with me and I'm really excited about the future collaborations comparing the invasions between the Mediterranean and the Caribbean as both basins are similar in size and in biodiversity. So it's going to be really interesting. Why should we be worried about this fish? We have many invasive species in Turkey actually, I live in Fethiye, and sometimes we have here about 80% of invasive species abundances. As you may know, our fisheries are in trouble and our native species are in decline. What lionfish do is they generally eat all the fish in one area before moving on to another area. So our native biodiversity is that serious risk of declining even further, which is going to make our ecosystem much less stable. So we need to help our native fish biodiversity by controlling this fish as soon as we can. Some research objectives we are currently working on with my teammates at Istanbul University and in Cyprus. We're working on the biology, the growth, the abundance, we're comparing different abundances between Cyprus and Turkey. We're monitoring their predators, we're monitoring their prey, and we're trying to exactly figure out their reproduction and their spawning season in the Mediterranean. In the Caribbean, they're spawning all year, it seems possible they're doing the same thing here. We are trying to evaluate how effective marine protected areas are at controlling them with the much bigger control species that they have. And we are on the lookout for parasites and lesions which have developed in the Caribbean. Now I'm going to take you through a little slideshow of what has happened in the Mediterranean. So in 1991 we have one sighting in Israel, and then nothing was seen again until 2008. We had another sighting in Greece in Kalymnos Island, but these had not established yet here because they were just individual sightings. Fast forward to 2012. That's when the invasion really began in the Mediterranean. We had our first reports in Lebanon in 2012, we had reports from Cyprus in 2013, in 2014,

the entire southern coast of Turkey got invaded. In 2015 lionfish had crossed the entire basin to Tunisia, in 2016, Sicily, most of the Greek islands, all of the eastern Mediterranean 2017, and in 2018, the southern Mediterranean. And this is what has happened now. Now, I have noticed in the last two years, the populations have exploded where we are. Where I live, you can see groups of between 20 to 40 lionfish and in one area, Cyprus, the invasion is a little more progressed and you have stories of about 70 to 80 lionfish together. So I'm just going to take you through a little history of what we have learned so far in the Mediterranean. The population has very low genetic diversity, it is derived from just two Red Sea haplotypes. Okay. So, what do we know here, they are maturing very young? They are growing faster and larger than in their native range. There is a very high female to male ratio here in Turkey and in Cyprus, which is quite alarming. What we have learned recently, which is very interesting is that pufferfish are eating lionfish. Myself and Hasan Deniz Akbora found lionfish spines in several pufferfish species. So that is one form of natural control group or predation. Natural predation has been confirmed now all across the eastern Mediterranean in Turkey, Lebanon and Greece. And loggerhead turtles are actually eating live pufferfish we just found in Egypt, which is the first record of pufferfish predation and they're also eating dead lionfish. So perhaps we can increase turtle conservation to help the lionfish invasion as well. What are they eating? This is really interesting. Lionfish are eating pretty much all native species. Native species are not scared of lionfish because they haven't developed the evolutionary history, they are swimming right in front of their mouth. So for lionfish, it is like an all you can eat buffet for them. Unlike the pufferfish, which is eating mostly invasive species, as well as native species lion, giving most of our natural marine biodiversity they are also eating baby groupers. This is a very important concept because if we are scared to allow diving with spearfishing, thinking that perhaps some people will spear groupers, lionfish and the insane abundances they have now are going to eat thousands more groupers, so we have to start controlling them. This is a really strong point. We are at a very high risk of localized native fish exploitation. And there's a picture of the Terminator in the back. Some people call this fish the Terminator in the Caribbean we have learned. It's a quite serious matter. Another thing we have to do here is get in the media across the Mediterranean the proper first aid for lionfish stings. Most fishers I talked to do not know this yet. The first aid is to put the area in hot water for about 90 minutes to reduce the pain. This is my friend from two weeks ago. and I was stung the day before. I do not want to get stung again. Now I am using safety gloves and that seems to be helping now so please be careful. And if you have any, if you're playing with lionfish make sure to have hot water with you on the boat it will help you a lot. I have just started my own line of lionfish jewelry that is for sale on my website or you can contact me directly again, this wouldn't have been possible without our American friends showing me how to do this. So I am hugely thankful. Conclusions. We should be very optimistic about this fish. We have a beautiful delicious new fish to eat. Here fishing can form a new form of scuba tourism. Most people scuba diving, get bored of doing the same thing every day. In the United States this has proved to be a great new business. There's even a PADI lionfish specialty course. Dive operators can sell to divers, it has also created community building. We also have a huge opportunity to develop new markets here. We should get them on our dinner tables in our restaurants in our supermarkets, we can make dog treats out of them. We have to figure out how to use the whole fish. And another important thing across the Mediterranean we need to add this fish to the national fisheries statistics so we can track how the catches are changing over time. And more marine protected areas will help to boost natural predation, it will help increase groupers and turtle predation. So let's be excited about this and let's find the best ways to go forward. That's all, thank you very much.

-Q&A

-Coffee break

-Video

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay, thank you. Thank you very much. For excellent video or documentary. Now we have to go biology and behavior of the lionfish Mr. Fogg, please.

[Alex Fogg, Coastal Resource Manager, Florida Fort Walton Beach](#)

Right. Good morning from Florida here in the United States. My name is Alex Fogg. And I'm a marine biologist who spent a good bit of time studying these invaders for many years. Hopefully, I'll be able to cover everything biology and behavior in the next 10 minutes. And I apologize in advance. If I do miss anything, don't hesitate to reach out after this presentation to chat more. So first, to orient everybody to what I will be talking about today, I'll first touch on lionfish distribution and the potential mode of introduction. I know that Stacy and Jim already touched on that, but I want to cover it again and how it relates to their biology and successful invasion. I'll then talk about their life history, specifically biology, age, growth, reproduction and diet as it relates to my work in the Gulf of Mexico in the United States. And lastly, I'll discuss some other biological traits and some behavior that's been observed in the western Atlantic. So I broke down the map that Stacy showed you a little while ago into four slides skipping ahead by decade. So this is for 1985. And as you can see, there's a little diamond down there in southeast Florida off Miami. That was the first detection. Um, we don't there's a lot of years on how lionfish were introduced. We suspect it was the aquarium trading owners either releasing them intentionally or accidentally. And there's also numerous studies that have attempted to quantify the number of lionfish that may have caused this invasion. The results vary from just a few dozen lionfish to hundreds of lionfish. So moving ahead, 10 more years to 1995. There's a few more reports, but they're all pretty isolated to Southeast Florida in the United States. And one of the reasons why this may have happened is not necessarily that there weren't many lionfish there, it just there were maybe a lack of reports and lionfish just weren't cool in the middle 1990s. Moving again on to 2005 this is really start to see an increase in the reports and realize they're expanding distribution. Lionfish outreach and education is beginning to raise awareness, maybe contributing to the greater reporting. I know Dr. Gittngs will be chatting about outreach and education later in his presentation. But the progression of the invasion was strongly related to the current and couldn't have been more evident with a number of reports increasing on the East Coast, over into Bermuda and down into the Bahamas. And this is the last distribution slide I'll show you. Its 2015 30 years after the first detection. As you can see, there's a drastic increase in the detections and lionfish can now be found up the entire eastern seaboard, Bahamas, Caribbean, South America and the Gulf of Mexico. I showed you a slide. For 2020, it'd be just all shaded in red. On it's important to note that lionfish really first detected in the Gulf of Mexico in 2010, but we're seeing higher numbers and really anywhere else in their invaded range. So now to touch on some lionfish life history talking agent growth first, as you may know, lionfish or the ear bones or just one of the structures in the head of a fish that can be used to estimate the ages of fish. After the otoliths have been sectioned, you can take a closer look under a microscope and count the rings or the annual years. This gives you an estimate of age which you can then use to calculate growth. The two images on the right that you see you're actually cross sections of Otoliths, the top image is a four year old male lionfish that was captured in 2012. And the significant fishes if you back calculate its birthday,

this particular fish was actually in the Gulf of Mexico two years prior to them first being detected, which isn't, I guess, too surprising, because you're not going to see the first lionfish that may have entered the region on the other image done upon the wild. But it's important to note that there was actually a lionfish that lived in captivity more than 30 years, they can get quite old. So as I touched on the last slide from these data, we can actually calculate growth. The plot you see is a plot of all of the lionfish that age during my work. And the curve that you see is the growth curve or model. What I'm trying to point out in the red box is that lionfish were aged at or younger than one year. And note that there were some lionfish that were one year old and measured about 250 millimeters or 10 inches. On the table below the graph really summarizes my work in the Gulf of Mexico and how it compares to other regions where agent growth has been analyzed or been looked at. And to summarize, it's quite different across the invaded regions. In general lionfish in the more northern latitudes grow slower, but in general, they grow larger. So it'll be really interesting to see how that compares to the Mediterranean. Lionfish reproduction is something that provides very shocking numbers as far as spawning frequency and fecundity or egg production on invasive lionfish which are batch spawners with indiscriminate or indeterminate fecundity. What that means is lionfish are born as either a male or female, and they stay that sex the entire life. Unlike some other reef fish species that actually switch sex as they age as they get older. Further, lionfish are able to release their eggs or a gelatinous mass of eggs into the water column and they were fertilized externally, lionfish are able to spawn many times throughout the year, but production is related to water temperature and food availability. Through my work, I processed thousands of lionfish to describe the reproduction in the Gulf of Mexico. And what I found was that just an average size female, so at 200-millimeter female is able to spawn 20 to 30,000 eggs every two and a half days. So if you do the math that ends up being about 2 million eggs per year, and again, these numbers can be pretty shocking, but when you compare them to a native species, these numbers are similar in some cases are actually lower than some native species. But the difference is that lionfish eggs may have greater survivability. And because lionfish are able to spawn throughout the entire year, they may find more favorable spawning times or when egg survival is higher. And just to show some of the data, speaking of spawning season, here's from the northern Gulf of Mexico plot shows can have somatic index or GSI. Plotted with average sea surface temperature by month GSI is on the left y axis sea surface temperatures on the right y axis. Now as you can see, they line up pretty well showing that these fish are spawning. Based on water temperature, at least in the Gulf of Mexico. It'd be very interesting to see how this compares in the Mediterranean and see if there's seasonality like this or depressed, spotting seasonality, maybe in the cooler months. So lionfish feeding ecology is probably one of the most studied aspects of the invasion. Everyone aims to describe what lionfish are eating and they're part of the invaded range. This information can be pretty helpful to determine potential impact and inform management. And from all the studies conducted throughout the western Atlantic lionfish have been documented to consume more than 167 vertebrate and invertebrate prey species numbers probably a lot higher on this diverse diet is consistent with their opportunistic generalistic feeding strategy. Essentially, if the per item can fit in their mouth, they're gonna definitely eat it. The image on the right illustrates just how many prey items these invaders consume in a very short amount of time. Go into behavior. While this doesn't really fit under behavior, disease and parasitism is something that we've examined in lionfish and for the most part while lionfish are susceptible to parasites and potential diseases. They may be less susceptible than native species was until recently that we started seeing an emergence in an ulcerative skin disease that may have contributed to a pretty significant decline in the population. I'm sure Dr. Harris will be touching on the disease at some point during this meeting, but I'll mention a few things about it. In late 2017, we started to see the first lionfish presenting with these ulcers, like you see in the picture there.

And over time, we saw a major decline in the number of lionfish on reef sites in the northern Gulf. And, and in many cases, in other parts of the immediate range, these similar symptoms sort of popping up on fish. We saw a 70% decline in the population on reefs sites in the northern Gulf of Mexico, and commercial landings decreased by more than 50%. So this kind of crash or decline has been seen in other invasive species. But the question is whether we'll see a rebound in the lionfish numbers or whether the numbers will remain at these depressed levels. There have been numerous reports of native species preying on lionfish groupers snappers Jacks sharks, you saw some video that Jim and Stacy showed before, this isn't uncommon, but I will say the predation behavior does not occur often enough to keep flying fish under control, or really to alter their behavior as they still really don't fear anything as evident when you go hunting them. Um, but lionfish behavior is something else it's been examined in the invasive lionfish range the western Atlantic and can certainly help inform management. Lionfish behavior can also be used against them. For example, lionfish have very high site fidelity or tendency to associate with reef sites very closely. Their affinity for restructure has been used against them to develop traps. Dr. Gittings will be touching on this in his talk. But basically lionfish just want to hang out on the structure, as you can see in the photo there. Another behavior trait that lionfish have is that they are generally unafraid of divers and native species going back to them really not have any predators. On this behavior trait makes lionfish one of the easiest species to fish for harvest while spearfishing, so they really don't move. And one last behavioral trait I want to mention is that lionfish on natural reefs are way more active and less cryptic during dawn and dusk hours in on natural reefs in some parts of their invaded age, which makes them a heck of a lot easier to, to harvest, or at least you don't have to search as hard. And just one kind of cool note about their behavior, their agonistic behavior that they have, that they exhibit is more of an interesting observation. I have some pretty awesome video of that, from a trip down the Caribbean. While it's been documented and species of reef fish really hadn't been documented in lionfish, and the large lionfish or male lionfish use their rough spines that are on their face, to scratch or injure the opposing lionfish. This behavior is to establish dominance to gain access to food or potentially a mate. And once this event is over the sub dominant or the losing male lionfish will actually change color and retreat. So I think I have time, I'll go ahead and show you this video real quick. Just another cool video to kind of illustrate some of the behavior that lionfish have we actually approached these lionfish and they're already fighting. But this goes on for about five minutes. Um, I'll go ahead and skip to the end. So the losers the one that's swimming away. And as he goes into a cave, he changes color, would be dominant male pursuing. If you have any questions, please reach out.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay, thank you Mr. Fogg. Next speaker is Mr. Gonnello flows from the session of the lionfish.

[Scott Gonnello, Founder - Lionfish Central Nonprofit Organization](#)

Thank you. First of all, I'd like to thank you for the invite. This is a great, great conference, and I would encourage more of these down the line. My name is Scott Gonnello and I started lionfish Central to help all efforts with the lionfish community, we basically were an IT company and we look for solutions. And we evaluate everything from the business world to the nonprofit world, governments' diverse locations, and then we educate on that. And then the goal is to try to help eradicate or at least control the lionfish marines. You know, we do this by a bunch of different ways we do free web development, free Google ads, we do, you know, e commerce, we help the efforts out there get their message out even better. One

of the projects we're working on right now is called Lionfish Patrol. And that is what I'd like to talk about today. It's an app. But you can get it from any device, you can get it from a computer, you can get it from a tablet, you can get it from a cell phone, you can, you know, get in there and do the work, however, you want to do the work on any device. Currently, the Android version is live. So you can download that from the Google Play Store. And the iPhone version we're still working on hopefully the next couple of weeks, it should be live. But we'll let everybody know, it's a communications app, right? Apps have failed in the past, because it's all focused for one country or one state or one region. And a lot of it was made for the science world where they wanted a lot of information. But the divers, there was nothing in it for the divers, so a lot of them failed. So this is the first app that helps communicate from all regions, all divers, all businesses, and throughout the entire lionfish community. And it's a free app. So now countries can get the information nonprofits can get the information businesses, and it's important if we're going to solve any problems or these challenges is to have all three sectors working together. And that's where this app comes in to distribute all that information. So now, countries don't have to start their own little app and try to distribute it throughout the region. Everyone can use this. And we actually can work with governments to help make it better, that it is diver focus, because without the divers, you're not getting any information. So this is basically a social media app. And the app itself is like a Facebook or Instagram. But it's only for the lionfish community. And only the divers can put their catch in and put it on the feed. But so you can add your catch. For the divers, there's a divers log, so they can see all the lionfish they've caught over the years and keep track of them with all kinds of data. You can comment you can like, you can share it to social media email, however you want, you can message the diverse, and this is just the beginning, there's a lot it's going to be able to do in the future. So again, focused on the diverse, we like to try to break it up by region, country, and then the dive city, we don't care the GPS location of where you're diving, because if you see six lionfish, and you catch them, they're not there anymore. Pretty much if there's lionfish in the area, they're going to be out there. So we do catch totals. And what's nice about that is now we can see on a global level and the regional level, the amount of lionfish that are being pulled from the waters, which has never been done before. You can go to certain states or certain countries and try to find that information. But now it's right at your fingertips, you can log on to the website and see all kinds of charts, we track the depth so that the divers can learn where their sweet spot is for diving. We track their bottom time. So if we see a 30 minute bottom time, and they come up with 100 lionfish, that location or that depth is great information. We track the environments, we want to see if it's personal or wholesale. And again, just a lot more that this app will evolve into and help share this information. The nice thing about it is its adaptability, right, we can work with local governments, like for instance Curacao. When I approached some of the divers in Curacao, they said, well, we don't count the lionfish, which I thought was kind of interesting. But they take measurements. So eventually we're going to be rolling out a Curacao version, where when you log in from Curacao, it's going to ask for weights and measurements. Then working with Aruba now and they've got some specific things they want to add to the list so that they can track the things they want to track. So what's nice about it is you can adapt this to any country or any region for this specific information you're trying to track or trying to follow. So it evolves based on what is needed for those areas. We're going to start doing tournaments in this so you can if you want to do a tournament, you can log in and set up a tournament, and then the divers have to add their number. So we're collecting the data. It can be a global tournament it can be a local tournament. It's gonna be, it's already working really well gathering information, but it's going to be the go to source for information and distribution of that information. So at any given time, you can log into the website and look at the data. The important part of this is dream big. You know, I really want countries and businesses and divers and

nonprofits and, you know, Minister of Fisheries to think about what they would like to see this app use for so they can get the information they want. There's a ton of information out there, it's just never been pulled together on a global scale, and disseminate it to where it needs to be. And this app will change that. Here's some information just you can kind of look at and see what is showing up on the, for the regional right, so this is a regional catch totals by divers. You can see the Caribbean is killing it right now. Obviously, it's a much larger area. But they're tracking it, most of the divers using it in the beginning were from the Caribbean. It tracks local, county, regional, global, and we can share it with everyone. So the next one is average catch totals by divers. So you can see in the Mediterranean, the average diver catches 23 fish. So this shows us that the Mediterranean is the new hotspot for lionfish. And in doing so we can track to see on a, you know, daily, weekly basis, what's out there, if you want to track it down by gender, right, so the male, the men in the Mediterranean right now are catching about 26 lionfish per dive. And the females are about 23 per dive. This is important for the business world, right. So if they're trying to market their dive gear, their dive charters to go lionfish hunting, they can see who's out there using the app more collecting the information more, and then they can really fine tune their message to the right audience. So what's nice about this as we gather more information, it just gives everybody better data that they can make better decisions for from the divers, helping them become better hunters so that they can see where the locations are, when their sweet spot time is that the average depth. They can keep private notes in there for their own GPS if they want that's not shared. And then we run some regional numbers by month and some global numbers by month. And the nice thing about that is it's a rolling average. So you can kind of see on a live day, what's happening currently with about 17 divers in the last two and a half months, they've logged over 1800 lionfish removed from the four regions the Gulf of Mexico, the Atlantic, the Caribbean, in the Mediterranean. So with just a handful of divers pulling out 1800 fish in a couple of months. And this is a new app. So it's just beginning to start to take off. So as we get more and more people using it. And we would encourage governments and dive shops and nonprofits and businesses, to encourage the divers to use it. There is a wealth of information that we can use to make our community better. Again, I'm Scott Gonnello the founder of Lionfish Central, we focus solely on lionfish. And we're there to help dive shops, we're there to help nonprofits, we want to work with governments to give you the knowledge and the tools to help make your, your work towards solving this issue better. And we do it through a host of different items. So I would encourage you all to reach out to us. And we want to help. So if we can help you out in any way with a better website or better data or e commerce or, you know, development of this app to work better for your area. We would encourage that and yeah, let's keep the conversation going on. I'll get back my time. Thank you.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay, thank you, sir. Thank you for an excellent presentation.

[Alex Fogg, Coastal Resource Manager, Florida Fort Walton Beach](#)

I'll go ahead and get started. Um, so thank you again good talking with everybody. We know invasive lionfish can degrade the systems that they've invaded, but people in newly invaded areas are uncertain how to respond. In the Western Atlantic where lionfish have been present since the middle 1980s. There have been a number of programs and technologies that have proven successful. But there are also some responses that were not so successful in some cases backfired. Hopefully these notes will help guide efforts in the Mediterranean and help avoid mistakes made in the western Atlantic. Dr. Getting's Dr. Harrison, I will first touch on some of the practices that have been successful in the western Atlantic. Go ahead,

Steven, the next slide. So first, let's talk about what's worked specifically removals organize lionfish removal activities or events that have demonstrated that they can be extremely effective and are probably the most effective means of removing large quantities of lionfish very quickly. While I'll be going a little bit more into detail in tomorrow's presentation, it's important to mention them here as a success story. Shortly after lionfish started showing up on reefs in the western Atlantic organizations such as the Reef Environmental Education Foundation began hosting lionfish removal events. These removal events also known as derbies, reward competitors, or scuba divers, that remove the most the smallest and the largest lionfish. As time passed, the number of events increased in the local communities as well as governments began providing support for these events. In Florida or the United States, this state government provides financial and logistical support to groups interested in hosting lionfish removal events, and numerous state governments have actually hosted season long or warm season removal events which incentivize individuals to collect lionfish on their own time. On these have been very successful as from 2014 to 2020, the state of Florida alone on more than 750,000 lionfish have been removed as a result of their removal programs. These events have a number of benefits not only do you physically remove lionfish from the reef, which benefits the system, but the scientific community is able to access a large number of samples to collect valuable information about their biology and distribution. Further lionfish are collected and can be prepared at local restaurants or distributed to the market to develop a market demand, which Dr. Harris will be discussing in the next slides. And the event itself also acts as a focal point for outreach and education which Dr. Gittings will talk about later in this presentation as well. So we'll go ahead and move on and I'll hand it on over to Holden Harris.

[Holden HARRIS, Doctoral Researcher, University of Florida](#)

Thank you, Alex. So for lionfish market, it helps the lionfish are of course really, really tasty. In this commercial line fish fishery could offer a win-win solution. So, first as an alternative harvestable stock for fishers and second as a protein source to improve food security for coastal communities. And third as a means to remove lionfish and mitigate their ecological impacts. The most common means of harvesting lionfish from spearfishing using scuba. In Florida, areas that have high concentrations of lionfish have enabled the development of a commercial spear fishing fishery, with yields as high as 20,000 kilograms per year. Although lionfish food fisheries have been widely promoted, they still face market challenges. There is the initial concerns that wild fish may contain high levels of mercury or ciguatera toxins. Research has now confirmed that line fish meat is relatively low in mercury levels. And although line fish can accumulate single toxins, it's only in the equatorial regions where these toxins are prevalent, and these levels are no higher than other types of dwarf species about the same size as lionfish. The most prevalent misconception for eating lionfish is that people often misinterpret lionfish which has venomous spines, that they could also have been poisonous meat. Outreach campaigns have really worked to clarify that the venom in lionfish spines do not affect their meat. And in fact, the allure of eating a venomous predator that's invasive, can be used to help increase their economic value. And really for commercial market, the economic value of lionfish is key. And Florida in many other areas of the Caribbean lionfish is now in high demand by seafood consumers. In fact, it's now generally true that demand surpasses supply restaurants and wholesalers basically want lionfish, but often times they can't find them. The primary impediment to the commercial market is the supply chain breakdown at the producer level. Basically, we need more Fishers and economic incentives to harvest lionfish, the ex vessel price of lionfish, that is what fishermen get off the boat is now about two and a half US dollars per kilogram. And this is slightly higher or about the same as other high end reef fishes such as snappers. Now reach campaigns have really helped to

increase this economic balance. Recently, though, we've witnessed the emergence of a novel alternative skin disease in lionfish. As Alex alluded to earlier this morning, densities in some of these high concentrated reefs declined by 60 to 80%. And these density declines because region wide catch per unit effort for fishermen to decrease by about 50%. Due to spear fishing becoming less economical. We don't go into too much details, but we detail these population declines and an article published earlier this year in nature Scientific Reports, and I'll post that link in the chat after this. This also points to the inherent paradox of developing a free market approach to an invasive species. Basically, if we're successful that's what reducing densities of lionfish to catch per unit effort for fishermen will make commercial harvest less commercially feasible. It's not to say that a commercial market isn't impossible, but this paradox should be considered by policy and management strategies. And we currently have bio economic forecasting projection research in review right now. And I'll share with the group when that comes out. With this paradox, we mainly encourage lionfish harvest.

Steve GITTINGS, Chief Scientist, NOAA Office of National Marine Sanctuaries

Equipment Development

In addition to presenting a threat to ecosystems in the Caribbean, Gulf of Mexico, and western Atlantic, the lionfish invasion has been an unexpected opportunity for some people. Several entrepreneurs and retailers either developed or sell specialized equipment to divers to promote safe and effective lionfish hunting and handling. The four main categories are spears and spear tips, containers, gloves, and traps. Most people use either pole spears or spearguns to hunt lionfish (see links below). Some use special tips to ensure fish retention. Due to local laws and to protect native fish, some places restrict the length of the poles. Fortunately, lionfish are easy to capture with short spears, while most fish are not.

Perhaps the most popular container for holding lionfish after they are speared is the ZooKeeper. Invented by Allie ElHage in 2011, it is a molded plastic device with a retainer that allows speared fish to be inserted and pulled off the spear and prevents them from escaping or poking the diver. Allie had been an interior designer before developing ZooKeeper, and the new business took off as lionfish populations were rapidly growing and their range was expanding. ZooKeepers now come pre-assembled or as kits, and some have expandable, puncture-proof pouches that hold large numbers of fish.

Puncture-proof gloves are extremely useful for hunting and handling lionfish. In the early days of the invasion, the International Association of Diving Contractors asked James Morris and Lad Akins, two lionfish specialists, to advise them on equipment that would reduce the risk of divers working on offshore oil platforms. At the time, lionfish stings were resulting in costly lost time and work stoppages. Finding needle-resistant gloves was an early and important step in getting people comfortable with hunting lionfish, handling them, and preparing them for consumption. Because these can limit dexterity, some people use less resistant gloves that may not prevent puncture, but strip much of the venom off a spine if it does penetrate the glove.

Traps of several types are being developed. Some involve alterations to the size and shape of openings on existing traps (primarily lobster traps). Others are attempting to use image recognition and only open when lionfish are in view of small cameras. New baitless, FAD-based non-containment traps will soon be

tested by commercial fishers to evaluate their potential. Their open design dramatically reduces bycatch, bottom impacts, and ghost fishing.

Spears and Spear Tips

- Lionfish Striker (no longer making units)
- Lionfish Slayer
- Hammerhead Lion Buster
- Eradicate Lionfish (ELF) Tool
- ZooKeeper Quadralyzer
- 6-Prong Lionfish Tip

Containment units

- Zookeeper
- Lionfish Dungeon
- Lionfish Hotel
- Lionfish Tamer
- Lionfish Armor

Gloves

- Hexarmor
- Turtle Skin

Traps

- PLOS ONE article
- AP story
- NPR coverage
- Purse trap article in Cool Green Science

Outreach

Most of the successes we are seeing with regard to controlling lionfish abundances in certain areas can be traced to the many outreach activities that have made people aware of the problem and empowered them with information on how they could help address it. The lionfish invasion has been covered in countless lectures, discussion panels, websites, web news stories, magazines, fact sheets, field guides, YouTube videos, and documentaries. You can find them in artwork, jewelry, and on t-shirts. They have even been incorporated into some informal and formal science education curriculum. The Reef Environmental Education Foundation led much of the early work on lionfish awareness and control, and led many workshops on hunting, handling, and even jewelry making. Lad Akins deserves a lot of credit for his tireless work, and there are several scientists who did excellent work determining the level of the threat - James Morris, Paula Whitfield, Mark Hixon, Isabelle Côté, Mark Albins, and Stephanie Green. The Florida Fish and Wildlife Conservation Commission has been a leader in responding to the lionfish invasion in the United States. This has coincided with a growing social network of people spreading

information on lionfish, including the tremendous work by Stacy Frank and Jim Hart at Lionfish University. You can easily find information on the best ways to hunt and filet lionfish, find teaching materials, and see the latest technologies being tested to capture lionfish. And to see how different places are dealing with the invasion, many plans have been written to describe the ways that jurisdictions will conduct monitoring and control, education and outreach, communication, and policy related to lionfish. In the U.S., there is a national plan, as well as plans for the national marine sanctuaries and the National Park Service. There is a plan for the Wider Caribbean as well as for individual countries, including Belize, St. Eustatius, St. Lucia, and Anguilla. A list of links will be provided as examples for each of the topics discussed.

Below are just a few examples of resources available on lionfish:

Lectures

- The Lionfish Invasion (Florida Fish and Wildlife Conservation Commission video)
- The Lionfish Invasion (pdf version)

Discussion panels

- 2018 FWC Lionfish Summit

Websites

- Invasive Lionfish Web Portal
- Florida Fish and Wildlife Conservation Commission
- Reef Environmental Education Foundation Invasive Species Program
- Lionfish University Website
- Lionfish University Facebook Page
- NOAA Office of National Marine Sanctuaries

Web news stories

- National Geographic
- Taming the Lion(fish)
- Fish Fence: Yard Decor Becomes Lionfish Control - Cool Green Science

Magazines

- Smithsonian Magazine
- The Lionfish Compendium - Guy Harvey Magazine

Fact sheets

- Lionfish Quickfacts
- NCCOS/ONMS Infographic
- U.S. Geological Survey

Guides and Activities

- Lionfish Central
- Lionfish Dissection: Techniques and applications
- Jewelry Workshop
- Jewelry Making Kit

Videos

- Guy Harvey: Lionfish Invasion

- Lionfish Dissection
- Filleting a Lionfish
- How to Build a Lionfish Trap

Lionfish University PSA Series

- Part 1: Preparation
- Part 2: The Hunt
- Part 3: Handling
- Part 4: The Sting

Documentaries

- Why Eating Lionfish Could Save Coral Reefs - Al Jazeera
- Antigua Lionfish
- Appetite for Extinction
- Toxic Invaders

Artwork

- Etsy Lionfish

Jewelry

- Etsy Lionfish Jewelry
- Lionfishhunting.com

Clothing

- RedBubble
- Zazzle

Informal and formal education

- Lionfish Classroom Invasion (Lesson Plan)
- The Invasive Lionfish
- Blaff the Lionfish
- What Do You Know About Lionfish?
- Lionfish Invasion

Research

- Lionfish.info

Management Plans

- Invasive Lionfish: A guide to control and management
- National Invasive Lionfish Prevention and Management Plan
- NOAA National Marine Sanctuaries Lionfish Response Plan (2015-2018)
- National Park Service Lionfish Response Plan
- Regional Strategy for the Control of Invasive Lionfish in the Wider Caribbean
- Belize National Lionfish Management Strategy, 2019-2023

Holden HARRIS, Doctoral Researcher, University of Florida

That's me now. And as Steve mentioned, this work to improve the technological here awareness about regulations can often impede the lionfish response. Marine managers have responded to this by developing policy changes that can encourage lionfish removals, these regulatory changes generally on purpose, second line fishery, and third to allow lionfish and only lionfish to be harvested in areas where spearfishing is otherwise prohibited. In Florida, where fisheries are very highly regulated, lionfish has been purposely deregulated. So now unlike all other saltwater species, people that are harvesting lionfish do not need a fishing license, and there are no limits on the number of lionfish that can be harvested. Restrictions on spearfishing using rebreathers have also been lifted. And specific attention has been given in Florida to helping the commercial side for lionfish regulations have been put in place to allow lionfish sales can be done by fishermen to license wholesalers with only the basic commercial licenses. In many areas regulations have sought to allow lionfish harvest in places where spearfishing would otherwise be prohibited. So generally these are marine protected areas such as the Florida Keys, or USA, Caribbean Island is normally, completely unallowed. To address the lionfish problem specifically, new accommodations allow divers to hunt the spears if they have appropriate training and use specific gear restrictions. In some cases, blanket permits have been issued to trust organizations like dive operators or marine Institute research areas or research organizations. And these a lot of train divers and those organizations hotline fish. For example, permits are held by the Reef Environmental Education Foundation, as Steve mentioned in the Florida Keys by the central Caribbean marine Institute and Little Cayman. And as Dr. Ulman pointed out earlier this morning, the images of not removing lionfish appears to really far outweigh the potential that people have to potentially abuse these regulations. And really what we've seen so far is that these government stakeholder partnerships has shown that divers and their organizations can be trusted to remove lionfish. Lastly, guidelines are currently being developed for the potential use of the new traps that Steve mentioned earlier. Environmental assessments have recently been played by the natural tree service that allows testing inclusion of these certain trap designs, commercial use or otherwise, fishing traps are not allowed in the United States. And Steven I will talk much more specifically about these traps tomorrow. Turn back over the Alex now.

Alex Fogg, Coastal Resource Manager, Florida Fort Walton Beach

All right, we'll go ahead and wrap it up here. So moving on some things that were maybe not successful in controlling lionfish in the western Atlantic or failed. This is a photo that exemplifies something that you should not do and resulted in a pretty painful sting. Early in the western Atlantic lionfish invasion, there were groups and individuals that thought that if you throw enough money problem it would go away. This mode of thinking was the game rewarding to harvest lionfish. The few bounties that were implemented were soon after canceled two funding sources being depleted. I was actually one of the individuals who created a bounty but it was to collect more samples for my research. Unfortunately, the funds I set aside were gone in a matter of a couple weeks and I had to figure out another way to acquire more lionfish for my research. Similarly, in the Caribbean, numerous countries have developed bounty programs. And again, the money was quickly depleted, and the lionfish invasion really raged on. We've already discussed numerous alternative programs that have worked instead of a bounty, maybe use those funds to host a lionfish removal event or Derby. The number of lionfish removed will be much higher and the money can be leveraged for a friendly and incentivized competition. Another failed experiment was trying to

encourage native predators to develop a taste for lionfish by actually feeding those native species. There have been numerous examples of individuals throughout the western Atlantic attempting this. Unfortunately, in many cases, the native predators didn't begin praying online fishing, just associated divers with food became a dangerous situation. And in many cases, lionfish hunting, in some cases, diving had to be suspended in those areas. And then can you wrap up your speech police? Yep, next slide is the last one. Excellent. Go ahead, Steve. All right. We'll go into much more detail about these topics. If you want to talk offline. Here's all of our contact information please don't hesitate to reach out chicken tissue cooler.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay. Excellent presentation.

[Cemal TURAN, MarIAS Project Samandag Field Expert](#)

Alright, I'm sorry for the internet interruption. I lost. So now I'm going to talk about the current knowledge on lionfish and monitoring in Turkey. Now in this part of my presentation, I will try to address these two questions. How many lionfish species that are in Turkey marine waters and are there cryptic invaders? A no cost extension, firstly start a single record of 30 miles from Iskenderun Bay in 2014. Then later, two years later, a single male specimen of red lionfish also recorded from the Iskenderun Bay also in 2016. This was the first record of the red lionfish threats what it does, along the Mediterranean Sea. Now, I show the tourist bays. First occurrence from Iskenderun Bay and then the other records from around the Turkish marine waters. Then also there is red lines transfer also recorded from the Iskenderun Bay. And then recorded from Mersin and Antalya Bays. This is the model for current and future distribution of tourist's bays in the Mediterranean. This is the prediction. First on the left side current distribution of tourist's bays in the Mediterranean. As you see the bathymetric and surface temperature means surface temperatures are the main factors or drivers for the current distribution or extension of lionfish in the Mediterranean Sea. And in the future distribution there are other drivers also like bathymetry surface temperatures mean and range for the extension of tourist's bays along the Mediterranean Sea. This is the right-side futures distribution. This is the probability on the bar there is a probability of the distribution in the regions. And what are the characters differentiate these two species, what are the features distinguishing features. We mentioned in the papers as you see Turan and Gürlek. But most of them as you see are overlapping to each other. The important thing is how many characters that can be used to distinguish the two species. The important part is we should find as much not overlapping characters to between this species. So this of course, not the trustable much trustable characters so, that's why they we contacted genetic study, to elucidate are they cryptic or same species. So, as you see, we found them they are cryptic species, we got gene classes which has already been sequenced and we took them as you see on the phylogenetically. They are on the same with our samples the numbers which accession number for sequences this neighbor joining. As you see they are the overlapping with all samples from this Pacific Ocean and that samples from the Pacific Ocean for both species. What they are overlapping with our species. So that's why and this is the Maximum Parsimony Tree for the same samples also. And also this Maximum Parsimony is also supported, they are different species, genetically they are genetically different. So we found the question the answer to the questions the addressed the questions they are cryptic species. They have in our marine waters two lionfishes. So recently, we contacted the underwater visual census method for population density the abundance and distribution of lionfish in our water Iskenderun Samandag cost. We use that classic method for density and abundance. This is for sampling region and transects. We have three

different transects at 5 meters, 15 meters and 25 meters for visual census. And in this region, this is the frequency of the species occurred or be observed. And on all the areas in total, as you see the red bars shows, invasive species or alien species. As you see the first most occurred species are aliens. That's the tourists' bays here. This is the monitor biomass of lionfish and monitor desk of lionfish in this area in total. We don't observe lionfish because these areas are sandy bottom they have sandy bottom. They don't have reef or rocks. The sandy bottom or sandy structure is a limiting factor for lionfish distribution. They don't like open areas and they like rocky reef areas to hide or to catch fish other fish for feeding. And the frequency of centimeters we observe we distinguish them as a length for granted like 10 centimeter and 20-centimeter, 30-centimeter, 40-centimeter and more than 40 centimeters, this s is the distribution of this length. As you see all sizes classes for all sampling areas, this is the size class distribution for each region, considering the depth also, this 25 cm is at the bottom. There are not any rocks or reefs here, that's why they don't show up here they prefer rocky and reef structures that's why they are usually here. As you see this one in eight meters, which is record bottoms, that's why they are observed only here and this is the biomass for lionfish for each sample in region on the base of length frequency and depth distribution for each sample inside. As you see the more depth, more big fish we found. In shallow waters more we observed small lionfishes. What we see from this correlation or regression, as much as more diversity as much as more lionfish they are correlated with species richness. If there are more species there are more lionfish that shows. It is related to number of species for occurrence of lionfish. So, in this region I made the correlation if there is which species are correlated with lionfish occurrence. They hide themselves and they want to protect themselves. Also in this species, the groupers are predators of lionfish. And other species as you see they are trying to find a catch the other species in the rocks and reef areas. We didn't have video but we observed the picture. Yeah, thanks very much.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay. Excellent. Excellent Professor Turan. I think we will have to discussion either tonight or tomorrow. So next is another short video about lionfish in the Turkish part of the Mediterranean Sea. It is done by Turkish Marine Research Foundation two years ago with regional activity centers of the bars Ana commercials in for the Mediterranean Sea. At the same time, I would like to show this book. This book is also printed by Dr. Fatih Hüseyinoğlu and me two years ago. About the biology distributions, fish, cook, pray, and all the part of that there are lots of information about the lionfish. And you can download it free of charge and free access it by eBay if you enter the Turkish Marine Research Foundation webpage. So can we see this short movie because we have last and most one of the most important issue is a health issue. So Mehmet, can you help me to put the video in the five minutes video?

[Mehmet GÖLGE, UNPD Turkey- Project Manager](#)

Oh, of course.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Thank you.

[Orhun Hisli, Istanbul University- Phd Student](#)

The Mediterranean Sea is one of the largest semi enclosed seas and the marine flora and fauna of this large sea are one of the richest in the world relative to its size. However, the marine biodiversity of the Mediterranean is now under threat of alien species. Following the opening of Suez Canal and in

combination with shipping and agricultural activities. Alien species in production has had measurable impacts on the Mediterranean Sea. By the year 2016, the total number of alien species in the Mediterranean Sea reached 837 among them, there is a brilliantly colored fish swimming around, but the serious problem lurks behind the beautiful decade, the lionfish patrol is a gene of famous marine fish known as lionfish. The lionfish have been described as one of the most aggressively invasive species on the planet. They are a recent and significant invasive species in the West Atlantic, Caribbean Sea and Mediterranean Sea. They're known for the venomous fin rays. Lionfish are skilled hunters, prey mostly in small fish in large amounts and destroy ecosystems. However, they have few identified natural predators. They grow and reproduce faster than other fish. They are native to Indo Pacific region. An entry to the Mediterranean Sea. Why is Suez Canal? After 22 years of its first record from Israeli coast, the lionfish to row is MS was imported from Lebanon, Cyprus, Turkey, Greece, Tunisia and Italy in the recent four years. According to the results of scientific studies, it is evident that the lionfish has established in the eastern Mediterranean Sea. However, there is still a lack of information about its abundance in order to evaluate the current situation and to formulate future plans. Turkish Marine Research Foundation organized the regional workshop on the lionfish in eastern Mediterranean Sea. New problems. New solutions in Antalya. Over 50 participants attended the workshop, including experts from various countries such as Cyprus, Israel, Greece, Turkey, Tunisia and Libya. This first workshop was a great success with enthusiasm in a promising way of regional cooperation, and easily received first shared with the public to cook the lionfish according to Mediterranean taste. Lionfish can be a part of commercial fisheries and can be carefully utilized for human consumption. New recipes can be developed for this purpose with necessary precautions do the venom spines of the fish. Lionfish venom can cause systemic effects such as extreme pain nausea, vomiting, fever, breathing difficulties, dizziness, flashes on the affected area had economic heartburn, diarrhea and sweating. Rarely, such things can cause temporary paralysis of the limbs, heart failure, and even that such reactions can be fatal if not treated. Lionfish are not aggressive towards swimmers. Most accidents happen to fishermen and divers who happen to catch them. Eradication of the lionfish from the marine environment seems quite difficult. Public awareness for the whole species is a critical issue and especially important for invasive species like the lionfish. Turkish Marine Research Foundation has prepared a poster to raise awareness in Turkey and this can be downloaded freely from the website www.tudav.org. The lionfish invasion is evaluated as the worst environmental disaster for the Atlantic waters and probably it will be also for the Mediterranean Sea. It is up to the people the face commonly known predator to save the ecosystem. So before we face a big change in biodiversity in the Mediterranean Sea, we have to take responsibility precautions and try to control it before it is too late.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay, thank you very much. Again for the next speaker Dr. Gamze SÜMEN. She will talk about the lionfish and the medical part of the issue.

[Dr. Selin Gamze SÜMEN- Turkish Marine Research Foundation, TUDAV](#)

First of all, thank you very much for inviting me to such a productive workshop. Of course, among these invasive species, I will talk about the effects of lionfish, which is the current agenda, on human health and why we should take protective measures for this species. I am working as a doctor at Hamidiye University. I work at the Turkish Marine Research Foundation. Due to its effects on human health, the lionfish is now an important issue on our agenda, and researchers are talking about their increasing number, and we also encounter cases of injury in clinical conditions. As we all know, the lionfish is a creature that has spines on

its back, side and tail fins, and causes injury when it enters the skin as a result of poisonous stinging inside its spines. When we examine some studies in the world, the epidemic data of injuries related to marine life are as follows, in fact, we often encounter such injuries in the summer. Being in the sea determines the information about the existence of those creatures. Swimmers constitute 90% of the cases and nearly 3000 cases are encountered daily in emergency medicine clinics around the world. Contacts with poisonous fish barbs account for 25% of these findings. And most of them are fishermen. So, what clinical signs and complaints do we encounter if a lionfish is injured? I'll talk about that a little bit. In the clinic, we encounter with local or general symptoms. Especially in the place where the sting is stuck, a very severe pain is noticeable. The pain is very severe and can last a long time. We may experience pain that lasts 12-24 hours or sometimes for a few days. What other local pains can we encounter? We can see 3 stages as skin findings. The first stage can be lighter. Redness, swelling, sometimes bruising, where the sting is ingrown. When we say the second stage, now a gradual blistering in that area can be like a burn and sometimes turn into a wound. In the third stage, tissue decay can occur. Let's get to the general findings. Severe poisoning, nausea, vomiting, headache, fever, cold sweating, shortness of breath, swelling of the face, eyes and neck, change in voice, anaphylaxis, allergy, confusion, high blood pressure, heart rhythm problems and we may even lose the person with sudden death. The important thing in the treatment is to alleviate the poison at first, and the first treatment should definitely be applied correctly. If there are faulty applications, it can threaten human health. The gold standard is heat application. We apply heat to the injured area for 30 to 90 minutes, or until the pain subsides, no hotter than 40-42 degrees. Here the pain sometimes subsides but sometimes it tends to recur then we can do the shower, compress or soak, as you can see in the picture. At the same time, of course, there may be an irritation in the place where the sting is ingrown, so the wound should be clean and dry and closed. If it extends up to the bone as you can see in the picture, it is necessary to move it away. In some findings, antibiotic treatment may be needed and tetanus vaccine should also be administered. We must take protective measures in the health system. In addition, we should create a treatment algorithm for marine injuries in general. Sometimes health institutions may not have detailed information for these situations. For this, we must provide support. We must manage the process correctly with the knowledge of the creature, its background, through our observations, first intervention and necessary diagnostic methods. So, what steps have we taken in this regard? As Prof. Dr. Bayram Öztürk stated, the Lionfish Book was prepared. And the design of this book was done by both Fatih Hüseyinoğlu and Bayram Öztürk. Some part in it includes health. You can also easily learn the algorithms to follow. What else did we do? Here, we developed the training curriculum on First Response. One of the most important activities was a work plan developed in partnership with the Ministry. We held meetings. We're addressing these issues because lionfish really do have a negative impact on human health. We have encountered such situations. Fishermen, our diver friends can be affected adversely. We know that swimmers, families are sometimes affected by even a lionfish caught at the tip of a harpoon. As a result, we encounter costs alongside injuries. Of course, we do not have such data on lionfish, but I want to share with you a magazine's cost data previously published in 2014 as an example. Especially as a result of the jellyfish injury of 1733 swimmers, an amount close to 400,000 Euros was incurred in 5 years. To sum up, human health is very valuable, therefore, appropriate treatment approach and preventive and informative measures should be disseminated. Thank you for your patience, for listening to me.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Dr., thank you very much for your great speech and very enlightening all of us shimmied a basket. So that was that last presentation? I think we have a discussion part. Do you have any suggestion? But can be follow it? What is the procedure? What do you want to do?

[Mehmet GÖLGE, UNPD Turkey- Project Manager](#)

In that and we're also planning a coffee break, but I think no need for any break. If it's okay for you and or for our participations, we can have some of the questions. And after those, if there are more questions, maybe they write to us, and we will answer it later. We can have a question as well, but for 20 or 30 minutes.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay, let's say half an hour. If there are questions from the audience, is there any question first of all, to Turkish presenter or guest presenter from abroad?

[Mehmet GÖLGE, UNPD Turkey- Project Manager](#)

We have a question to our Caribbean colleagues. If is here, maybe they can ask you his or her questions. Sorry, I don't know.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

She is from the IUCN I know.

[Mehmet GÖLGE, UNPD Turkey- Project Manager](#)

Let me see the questions. I think she left.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

If she is left, okay, we can send the email. Okay, accordingly. What else? Who are there? Any questions from the participant?

[Mehmet GÖLGE, UNPD Turkey- Project Manager](#)

Our colleagues can directly ask or raise your hands. Put on the application.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay, direct is better. But in case of course I can help or you may help no worry. Any questions? Because there was very interesting speech about the lionfish today. How distinguish male and female individual excellent work. So I can ask this question to Professor Turan.

[Cemal TURAN, MarIAS Project Samandag Field Expert](#)

To me?

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Yes.

[Cemal TURAN, MarIAS Project Samandag Field Expert](#)

I'm gonna finish them all. You can ask me from the gonads.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Yes. Anything from the morphological variants is a decay or not.

[Holden HARRIS, Doctoral Researcher, University of Florida](#)

There is some morphological changes for the sexually mature individuals. So for the very large lionfish. Males will be oftentimes be a darker color, males do get larger. And they oftentimes have a lot of those spiny modules on their head. So generally, when you see those large, dark line fish, those will always be males. Sometimes they'll get a little bump behind their head too. And it might look for some pictures to help show that when they're smaller you can't really tell a difference unless like Professor Turan said, when you look for their gonads and then when you do research, we always check by looking at the gonads.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay, thank you excellent.

[Cemal TURAN, MarIAS Project Samandag Field Expert](#)

Taking the scientific research you have to look at gonads for all large fish and small fish as well.

[Holden HARRIS, University of Florida Doctoral Researcher](#)

Exactly. Yes.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Thank you. Okay, its clear picture is clear. What else now? Protecting groupers. Okay. Is that the questions for a grouper? Issues? Question to rise to whom? But what is my special interest or curiosity that Professor Turan said grouper eats by fish? Is that correct?

[Cemal TURAN, MarIAS Project Samandag Field Expert](#)

Yeah it is.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

What did what I understood is correctly? No.

[Cemal TURAN, MariAS Project Samandag Field Expert](#)

Yeah.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay. So this is a hope so we have to protect the groupers in the Mediterranean Sea in that case.

[Cemal TURAN, MariAS Project Samandag Field Expert](#)

Inverse also. I mean, lionfish also eat grouper but small grouper and big grouper also eat small lionfish. Both ways are correct.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay. Aylin you said the sea turtle we have to protect sea turtle against lionfish. Is that correct?

[Aylin Ulman, MariAS Project Incentive Expert](#)

Well, we found the first case of puffer fish predation from loggerhead sea turtles eating puffer fish, which is exciting. And loggerhead turtles are also eating dead lionfish. So, if we increase turtle protection, we may help both species, which is a win-win.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

But you said dead lionfish.

[Aylin Ulman, MariAS Project Incentive Expert](#)

Not alive yet.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

So how we can find this? How we can discover these findings? Do you look at the digestive organ of the sea turtle or Dead Sea turtle? How do you know this?

[Aylin Ulman, MariAS Project Incentive Expert](#)

This is just from diver's records, from divers witnessing it from lionfish that they throw away and then the turtles eating them and Fethiye and then Kaş.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

All right, excellent. This is also interesting news. Thank you. So what else now? My question to Dr. Sümen. Is there any causality for Turkish waters for fishermen or someone else?

[Dr. Selin Gamze SÜMEN- Turkish Marine Research Foundation, TUDAV](#)

Yes, we have. We have had several cases represented by different symptoms, complaints. And there was one boy, 14 years old, and he was stung by the spine of the lionfish from the spear gear. Another old man was stung of a in after the catch after the fish catch. And it was interesting, because there was no fish, no fish in the net, it was all cleared. But the spine was there and which and that shows us that part of spine can be poisonous.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay, excellent. Thank you. Mehmet. There's another questions from friends from Malta. What is the question? Exactly? Can you read this question?

[Mehmet GÖLGE, UNPD Turkey- Project Manager](#)

Yes. Before his question someone want to make a contribution. Please, main topic.

[Irfan Unsal MarIAS Project Coordinator, MoAF GD NCNP](#)

Come up, should you be cut global amongst your business? Can you hear me? Okay, this project was formulated back in 2014. It means that we have foreseen the threat coming up. And then we wanted to come up with a project for that. Because it because of the warming of the waters as a result of climate change, we be have always seen that Pacific source species would end up in the Mediterranean and keep threatening the native species. And this is the reality at the moment, we cannot eliminate them totally from the Mediterranean. That is why we have to come up with a policy over the tourism sector. For the fishing sector, we need to do something to put this species in the market actually. Also, by protecting the sharks, groupers, I think we can keep an ecological balance between the native species and this alien species we cannot really fight it totally we cannot eliminate it. That's why we have to make use of it. We have to put them in the market put the alien species in the market to find a solution to the problem of food insecurity and hunger around the world. Thank you.

[Irfan Unsal MarIAS Project Coordinator, MoAF GD NCNP](#)

Now, is there any other questions? That there seem to be a lot of discussion in the chat about allowing harvest lionfish. Cemal, can you replay this question?

[Cemal TURAN, MarIAS Project Samandag Field Expert](#)

First, to make the language economically valuable, we have to find reasonable fishing gear. Which catches rely on lionfish. Because we have, we had lots of trawl operation in the Mediterranean and lionfish by Thrall, we took film just film 1, 2, 3 individuals but in nets, only nets can catch lionfish. Properly. Usually, you don't need to get Spears or something else close it takes, it's not economic to get lionfish by spears. I mean only grouper, okay economic to get by spears, which is a good thing because they sell it to restaurants as well. And to be just affordable. But to make the lionfish economic by fisherman, not by for us for individual supporters. We cannot sustainably fish by us by individual support lionfish, but we have to find the correct fishing gear to make the gear economic which can only be adapted by fishermen that only get his net, and longline, that's rich.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay, so we will discuss this issue tomorrow. I guess. We will have more detail discussion tomorrow about how it can be sustainable or not. The issue is that for lionfish and others alien invasive species issue. We need monitoring. That's also another issue. I think we might talk to you tomorrow about the monitoring issue. My personal congratulations to Aylin Ulman, for the very nice souvenirs. Do you sell this one is Aylin?

[Aylin Ulman, MariAS Project Incentive Expert](#)

Yes.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

All right. Okay, I guess you can send me one or for my wife free of charge. Oh, thank you. You are so good.

[Aylin Ulman, MariAS Project Incentive Expert](#)

I send lionfish regularly to your university.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Oh, yeah. Excellent. You are so generous. I know what to do. Okay, what else other questions to or colleagues from the Caribbean area. So because we have to learn many things from them, they are more advanced from us. They have lots of experience. Plus, they have a success story as far as I understood. So we have to learn anything from them. Today and tomorrow. So please don't be shy, ask some questions. Even it is stupid questions. So we can continue to discuss because we have time.

[Fadiyah Ali, Gulf & Caribbean Fisheries Institute-Assistant Executive Director](#)

Can I ask a question? Hello. My name is a Fadiyah and I'm from Croatia, that is the Arctic Sea and that is for someone who doesn't know that part of the Mediterranean. I came here because for now in an Adriatic Sea there is no record of lionfish. But we are trying to do some preparation of that time when a lionfish arrives at the Adriatic Sea. So I wanted to ask the colleagues from Caribbean Sea. Do you have maybe any suggestions? Some, maybe direction to go what to do to prepare us for that moment when it comes to the Adriatic Sea, thank you.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Who will answer this question? Gentleman from Caribbean Sea.

[Steve GITTINGS, Scientific Coordinator](#)

Yeah, uh, two points I'd like to make. One is preparing divers to keep an eye out to monitor for the arrival. The earlier you can catch it, the more likely it is you can keep it from growing. So prepare the dive community to keep an eye out for arriving lionfish. Second is preparing the regulations related to what is allowed in response to a species like this, knowing that it's likely to get there. Lionfish probably will get there, so you need to be ready to allow people to spear the fish in the early days so that they don't have to wait for months or years to respond. Because lionfish abundance increases very rapidly over a few months period, and they begin to reproduce in one year or less. Yes, you have to be ready with regulations and with vigilance and monitoring. Those are two points I can make.

[Cemal TURAN, MariAS Project Samandag Field Expert](#)

Thank you. This is a record from South of Adriatic Sea from the Greek islands. There's record lionfish apart from the south.

[Fadiah Ali, Gulf & Caribbean Fisheries Institute-Assistant Executive Director](#)

Yeah. Really, really close. Thank you for the answers.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Thank you. The question is from Filiz Eker. The question is, is there a new success story in the Caribbean Sea in terms of what? Can you clarify? What you said exactly. What do you mean with your question? Can you please explain? Your question is not too understandable.

[Filiz Eker, BSGM Engineer](#)

During the presentation, you talked about some incentives to bounties, actually. And you said that the bounties were not successful. Why was that? Because the amount of the money was low? Or do you think what was the purpose of the incentives actually bounties? Was it only for research making and why they have a failure? Who are you posing your question to? They did it the person who did the presentation before? Professor Cemal? Bow? This is like a puzzle. Puzzle fillers. He was he will say, I think he was it was Alex. Hello. I'm sorry, I couldn't catch him

[Scott Gonnello, Founder - Lionfish Central Nonprofit Organization](#)

Holden, you want to take that one?

[Holden HARRIS, Doctoral Researcher, University of Florida](#)

Sure, I think Alex may have had to run. Generally, the issue we've seen with bounties is that the money quickly runs out. And that if there's only very small amounts of lionfish, it could work. But generally what happens is, the bounty program starts and more and more lionfish start building up. And there's only so much money. What seems to work more as a long term solution is that to try to increase the market value of lionfish, so once people get interested, people are willing to pay money then increases the economic value and that works as a bounty to incentivize lionfish. Another thing that seems to leverage a lot more money is to help encourage these lionfish derbies. So for instance, the state of Florida does give some money to groups that are putting online fish derbies, generally a couple thousand dollars, what we've seen is those derbies can generally take relatively small bits of money, make some prizes, also get other sponsors, and then sometimes harvest 10s of thousands of lionfish, which with much less money, so it seems to really push what you can do with that money much further.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Thank you.

[Steve GITTINGS, Scientific Coordinator](#)

And I think the last Derby in Florida gave out something like \$50,000 in prize money. Am I right? Holden?

[Holden HARRIS, Doctoral Researcher, University of Florida](#)

Yes. It was total \$50,000. And the state of Florida only gave them \$5,000. Most of that was from other sponsors. And that derby harvested over 20,000 lionfish.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay. Thank you very much again. Is there any questions? And other question? No?

[Holden HARRIS, Doctoral Researcher, University of Florida](#)

Yep, it was something I wanted to follow up. It sounds like she asked for a success story. Something else we have seen in some places, in places where you have really healthy coral reefs with high upper trophic level biomass where you still have large groupers predators, sharks, and some of the marine sanctuaries. So for instance, the flower gardens or new sanctuary, lionfish densities never did get really that high. So I think I would consider that a success story. And then in some areas, these commercial fisheries have developed for fishermen are making money selling wine fish and reducing their densities. So it's not there are some success stories.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Okay. Okay. Excellent. So we are six o'clock is jog time is over. And they hope to see tomorrow. We met again tomorrow. Just on time, please. Thank you for all your contribution for organizer interpreters and everyone who contribute very interesting topic and very interesting alien species issue. That will be very good challenge for us as well. Again, thank you very much.

[Mehmet GÖLGE, UNPD Turkey- Project Manager](#)

I like to thank all the participants everybody, hope to see you. Hope to see you again. Tomorrow. Good night or Good day. See you tomorrow. Thank you, professor, I think he will not be able to see you tomorrow. I'll try to come tomorrow but if not, Cemal will be taking over for motivation. Thank you very much.

[Holden HARRIS, Doctoral Researcher, University of Florida](#)

I think Phil has another success story for tomorrow. So to be continued.

[Prof. Dr. Bayram ÖZTÜRK, Director of Turkish Marine Research Foundation](#)

Thank you.

[Holden HARRIS, Doctoral Researcher, University of Florida](#)

Thank you.