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The U.S. Government's Global Hunger & Food Security Initiative



USAID
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Agrilinks

LINKING THE FATE OF THE OCEANS TO THE FUTURE OF FOOD SECURITY

AUDIO TRANSCRIPT

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PRESENTERS

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PRESENTATION

Jerry Glover:

Happy Earth Day to everyone. Thanks for coming out this morning. This is – besides just being Earth Day I think it's a great timing on having Sylvia over to talk with us today about the future of oceans and food security, in part due to, of course, the great attention being placed on food security and what it means to the planet's resources.

This is the most recent *National Geographic* magazine issue, and it's one of I believe seven forthcoming issues that will focus on food security, and I'm sure they'll have quite a lot on oceans as well. But I think one of the important things about the cover of this, and it's an issue that I hope we all keep in mind as we discuss this, it says, "Serving more than 7 billion every day." And I like the fact that they put on there "every day," because a lot of times when we talk about food security we talk about our need to feed 9 billion in 40 years, or now its 35 years; it keeps shrinking. But, you know, it's as if – it sort of paints a picture as if 9 billion people are going to show up, we feed them, and then they go home and that's over.

But, you know, if we look back at the past 40 years the negative impacts of food production and consumption are cumulative; they just keep piling up. The greatest damage to resources due to agriculture have of course come in those 40 years, and it's been tremendous. If you look at the graphs it's just bad lines all across the board. Now of course we don't want to get sunk on this beautiful Earth Day into all the negative, because there are a lot of positive trends as well, and we'll be covering those too.

Some of the most troubling trends, though, I believe, have come from the oceans, where our collective attention just has not been focused on the oceans, in part of course I believe because we don't see below much of the ocean. So that's why it's just tremendous to have Sylvia here. She's our eyes and ears below the waters and, you know, there's a whole list of accomplishments that Sylvia has achieved over the years being a pioneer in ocean exploration, ocean development, ocean conservation, and bringing a whole new generation with each new accomplishment into appreciating the wonders of the ocean.

You know, I could go on and on. My kids would just say, "Well, what more is there to say for somebody that has a Lego action figure made after them?" I Mean that's pretty much all you really need to say. But she is an explorer in residence at the National Geographic Society; there's not many of those. And she's created, developed, and expanded several non-profit organizations. Many of these are heavily-linked to the private sector. She's made some of the most interesting

partnerships with the private sector. I just recently, I think it was two months ago, I saw Sylvia on a Land Rover commercial, Land Rover going undersea, you know, with Sylvia there pulling them under the water. But you'll see on her biography, you know, there's great biographies of her all over about all the many awards, the records that she's broken by going underwater, the depths, the durations, and she was there early on, so a real pioneer in many different ways. And I've been on panels with Sylvia several times and we do disagree on some things, namely I think it's all about soil and she thinks it's all about water. But I guess in the spirit of Earth Day, today we'll agree it's about both.

So without going through her long, extended list of accomplishments, I'd just like to introduce Dr. Sylvia Earle. Thank you, Sylvia, for coming.

Dr. Sylvia Earle:

Thank you. Thank you. Thank you, Jerry. Thank you, National Geographic, for getting us together in the first place and for really focusing on this critical issue of how are we going to sustain ourselves, feed ourselves, and otherwise keep ourselves alive from this point onward.

We've been able to succeed and have such great prosperity over the years that humans have been around by consuming the planet one way or the other. But there is a point beyond which, you know, things begin to unravel and we are there. We are there. And the curious thing is we are perhaps the only creature who has ever lived on earth with a capacity to understand that we are there, we are at a critical point in understanding that the very systems that keep us alive, the air we breathe, the water we drink, of course the food, all of it, a planet that has a certain temperature range, and all the other things that we have heretofore pretty much taken for granted, now we know there are limits. Birds don't know that. Elephants, as smart as they are, haven't been able to dive back into the past or anticipate the future; they don't have computers to crunch the numbers; they don't have the capacity to store and draw upon knowledge as humans have done over the ages.

When I was about five years old it occurred to me that there was a lot I didn't know, because that's when I started school. And it was kind of overwhelming, the thought that I had to somehow stuff my brain with the knowledge that had been accumulated before my time. I had to learn how to read, to write, to deal with numbers. Nowhere in my education did I learn about where air comes from, not until far along in my education, if you will. It actually didn't come in school; it came from reading, it came from asking questions, doing what little kids

tend to do. I just never stopped. You know, who, what, why, where, when, how, why; that's what kids do and that's what all of us should do. We should never quite grow up in terms of that attitude and we should never lose that sense of "There's so much to learn. How am I ever going to master the basics?"

Well that was many decades ago, and what I find is there's even more to learn today than there was then. We've learned more actually in the last half-century, certainly about the ocean, more about ourselves, more about the diversity of life, more about our place in the universe, how extraordinary it is that Earth exists at all or that life exists or that we exist.

So we're going to get around to the ocean and food security, but I want to do this by putting it in perspective to realize life is a miracle, we're a miracle. For most of Earth history there were no humans, and a lot of other critters that are still with us, upon whom we're totally dependent for things we care about, like breathing, like a planet that works in our favor, planetary chemistry that basically all preceding history to get to the point where we can breathe, where oxygen is about 20-percent of the atmosphere. And it continues to be replenished every day by green things on the dirt, the land, but also in the ocean. Somewhat more in the ocean, it turns out, than on the land. And it's replenished very quickly in the ocean because the green things, blue-green things, the photosynthesizers in the sea tend to be small and have a short, fast, productive life history that not only generates oxygen, but generates food, fixes carbon dioxide, makes the planet run the way it does.

Well, now we know what we couldn't know when AID was started in 1961; this view of Earth did not exist. When I was a kid this view of Earth didn't exist. I saw Earth as a globe and the ocean was a big blob of blue. Now we have a capacity, and it is still imperfect by a lot if you've been following the news about what happened to the Malaysian aircraft, what's it like in the depths of the Southern Indian Ocean? We don't know. We don't have a map that's good for the ocean in that part of the world, or in most of the world, as we do for the moon or Mars or Jupiter. We've invested in exploring the skies above and it really has paid off handsomely, and we've neglected the ocean, the blue part of the planet. Why? Well, perhaps it's because we are terrestrial by nature, you know, it's just we're air-breathers.

Most of life on Earth lives in the water. Most of life in terms of sheer quantity and certainly in terms of diversity. Freshwater of course, but that's only like 3-percent of the water on Earth; 97-percent is the ocean. All life requires water. Dirt helps; we need to anchor. But as I

sometimes say, “No blue, no green.” You have to start with the water; all life requires water, most things on the land also require soil. And it’s just great that we have a planet like this that works in our favor, at least so far. But you can imagine, take away the ocean, take away the water, we’ve got our – there are lots of options out there in the universe, including our sister planet, Mars, and there is water there, and apparently it used to be a lot of water. We’ve managed to somehow retain liquid water at just the right temperature within the range that the processes have developed over the ages to make life possible, makes our life possible.

Yet some of my pals with the Oceanographic Institution have calculated just how much water there is, and if you take it all the clouds, the water that’s in all of us, in all the rest of life on Earth – I mean we’re mostly water too, you know – take all the ocean, all the frozen water and you put it in a ball, that’s about all there is, spread it out over the surface of the world, the average depth is 2.5 miles. It’s about where that Malaysian aircraft is thought to be, 2.5 miles beneath the surface. And the maximum, 7 miles. Seven miles. A few places. It’s about something between 2 and 3-percent of the ocean that is below 6,000 meters. That’s what’s kind of below half of the ocean’s depth. But the average depth is 4,000 meters. So it gives you an idea of how much water there is; if you spread it out it looks like a lot, but if you ball it up that’s it, that’s where everything that we care about ever – it’s where our existence really is anchored, in that blue part.

And we have historically taken it for granted. We take climate and weather more or less for granted, although, you know, that is changing. Well, the climate is changing, weather is changing, and our views are beginning to change. We are beginning to understand that we have the power to alter the nature of nature, alter the processes that underpin our security. We talk about food security, but food security has to be anchored in a planet that works; you have to be able to breathe, you have to have a temperature range that is suitable, and to recognize this is not just a physical process; this is a biological process. Earth has been shaped to be what it is because largely microbes, those little guys that we’re just beginning to understand matter in our own bodies, in the soil, in the air, in the ocean where most of the action actually is. We are just like five-year-olds in a way, beginning to understand the magnitude of our ignorance and the risks that we are imposing on our life support system. Food security is like level two; first you have to have a planet that can give us the ingredients so that we can eat and breathe and live.

And much of what we now know has come about because we have harnessed fossil fuels so that we can go high in the sky, so that we can see ourselves with new eyes, the way that no bird, no bacterium, no fish can know what humans know, and never before could we know what we now know, and it's getting better all the time. But there is a point where we can have those a-ha moments and pull back and say, "Wow." By connecting knowledge gained somewhere in Africa with somewhere in Asia with North America and Europe and Australia and wherever, now we are beginning to see the pieces of the puzzle come together, drawing back through all of human time to the present time, we're connected and can see what we couldn't see before.

There has always been a tendency – it's true in business, it's true in sometimes families, you tend to get siloed, you get focused on your special area of interest and are not as receptive to understanding what others are thinking or doing or learning that might benefit you, but that is changing. Knowing that kids run around with the Library of Congress in their pockets, at least access to it; they have Google Earth, the dirt, but they also have the ocean. You can find yourself, you can find your neighbors, you can see yourself in perspective in ways impossible to contemplate not only when I was a kid, but when today's kids were kids. You know, ten years ago what did we know as compared to what we now know?

But the policies that we have guide our existence, the laws that we've set in place take longer to shift, to respond to the new knowledge that we have. Now we can see that not only are we connected, but the world is connected, that what is dumped in the ocean off the coast of Africa or Japan or wherever ultimately affects everybody. What we put into the atmosphere ultimately affects everybody. Here you see sands of Africa blowing across the Atlantic. Well, they're dusting Washington, D.C. Oh, by the way, they continue across and darken the snows of Colorado and land in the Pacific. Some of it may even circle all the way around and wind up back in Africa. We're connected. And I think it's just the greatest time to be alive ever, that knowledge that now we can see where storms come from. Our ancestors, they had almanacs maybe 100 years ago, even 50 years ago, to kind of predict the future, but now we know we can do a lot better than that. Now we can measure things in ways we couldn't measure before. We can measure the changes in the atmosphere, the changes in the ice, we can see the changes even in places that we're just beginning to explore.

The figures on coral reefs are that from about 50 years ago to the present time about half the coral reefs are either gone or they're in a state of sharp decline. In the Caribbean it's more like 80-percent. Some places are in better shape, parts of the Pacific, where they're 80-

percent in good health. But nowhere are coral reefs as pristine as they were 50 years ago. For many reasons. Part of it is the changes in temperature, part of it is our appetite for the creatures that live in coral reefs. Gradual understanding that coral reefs are not just about the corals, they're systems like Washington, D.C. or New York or Sydney or London. You need the garbage collectors, you need the taxi drivers, you need this, you need that; it's not just about the buildings. Coral reefs are not just about the buildings, and we have depleted many of the aspects of coral reefs and other systems that cause them to function properly, and we are seeing a meltdown of places like kelp forests, of systems that once we could – or thought we could take for granted.

It's not just what we're taking out of the ocean, of course it's what we're putting in. Maybe the most important thing that we're putting in, and it's a headliner today, plastics, as bad as they are, are not as worrisome as excess carbon dioxide, that is not only driving climate change, global warming and, you know, other sea level rise things that people do worry about, but acidification of the ocean is now a headline. I participated on a call yesterday that is a planning call for the U.S. State Department's conference on the ocean that will take place in June of this year. And there are three topics of great concern; one of them is *gah*, overfishing. Another has to do with pollution. But the third big headliner is ocean acidification. Ocean acidification; change the chemistry of the ocean, you change everything. It isn't just about diminishing shells of oysters or loss of coral reefs, another pressure on top of the others, but what about coccolithophores and other photosynthesizers that have a calcium carbonate shell, or even the backbones of fish that as larvae may be susceptible to the formation of that critical backbone in a more acidic environment. Lots of questions; we're just beginning to get some answers.

At the same time the concerns about other things that we're putting into the ocean; plastics that don't go away that did not exist when AID came into existence in 1961. How many Ziploc bags existed then? None. There were some plastics, but no water was available in plastic bottles in 1961 or even in 1971 or 1981. It's taken a while for us to get that notion that carrying water in a plastic bottle for one-time use and then tossing it was a good idea. Not a good idea. One-time use plastics we're now beginning to see, not a good idea. But the policies haven't caught up with what we now know. And we've got to get better at responding to what we know, as we understand that we are at critical points. And what we're putting into the ocean, whether it's excess nitrates and phosphates and things that flow from the land through rivers and into the groundwater, or through what we deliberately put into the ocean.

I'm reading a book now about getting trapped under the sea, the story of brave guys who actually made it possible to relocate Boston's sewage ten miles offshore through pipes. It used to be dumped right there in Boston Harbor when I lived in Boston in the 1960s. You know, there's a nice, gooey sludge on the bottom of Boston Harbor. Not a good place that I wanted to dive, not a good place. I released some lobsters and I wished them well because I probably didn't do them a favor by turning them loose in Boston Harbor. But, you know, now Boston Harbor has improved because we've relocated the sludge and all that sewage. It hasn't gone away; it still exists. Everything connects. We've just distributed it more widely, affected more of the ocean in ways that we're beginning now to measure.

There's got to be a better way of dealing with the waste that we generate and turn them into something positive. We're so concerned about losing nitrates and phosphates, and yet, you know, we're making it happen in part through our policies. So you know better than most, because you do track numbers, you are interested in security, food security. How do we get from where we are to a better place? How do you do it on the back of knowing that the systems that we now look to produce even more than they have in the past, when already they are shockingly depleted?

Wildlife from the sea; this image – well, it is just – you know, you can't take it literally, but you can take it as a suggestion. There were a lot of fish back when my father was born in 1900. A hundred years later there aren't so many. We've seen a sharp decline, and it isn't just in the North Atlantic. It is globally we have seen a reduction in ocean wildlife. And there's a pattern here. Ed Wilson speaks of how on the land over 10,000 years – Ed Wilson, Harvard ant man, biologist, big thinker – commented that “We consume the large, the slow, and the tasty wild animals on the land.” We did. We did, and over 10,000 years a lot of things magically disappeared. The big wildlife, North America, but also Australia; everywhere that humans arrived; Madagascar, New Zealand, Easter Island. We consumed our way into some level of prosperity.

And then in order to feed ourselves what did we do? We had to cultivate. How could we possibly have 7 billion people if we depended on wild birds or wild animals? How far would that take us? Songbirds, they're already greatly depleted, even though we don't tend to eat very many of them. Or even so-called game birds that are plant-eaters and generally do reproduce fairly quickly, but we – look at the level of ducks today; we can still take a few home once in a while for dinner, wild ducks, wild turkeys, but only because we realize

if we are to have them to take home for dinner once in a while you have to protect breeding areas, you have to protect feeding areas; you can't take them anywhere, anytime, in any numbers, and they're not free.

Well, with fish we haven't quite figured that out. The accounting base for fish swimming in the ocean is zero. Go figure. We don't put into our books thinking about real estate; the ocean is free, open, you know, whether it's aquaculture or catching wild things, you know, it's really tempting to say, Oh, the ocean, it's free, you can go and take or you can let – put pens out into the ocean and the tax base there is pretty attractive compared to a piece of land. And the water, it's there, it's free, you don't have to think about where it comes from because it's always been there, the idea that it will always be there. And we have to think again about that. Fish should not be regarded as free goods. And if they are then who gives fishermen a special right to take from what – if it belongs to anybody it belongs to all of us. I want my share, if there is such a thing, to be alive. Who says that the only fish – only value of fish is to kill them for food? Aren't there some other values that we should be looking at, whether you care about coral reefs or care about the integrity of ocean systems and how they function.

It's like birds, people used to think birds were primarily something to eat, and some people still do. And we do eat a lot of birds; Kentucky Fried birds and, you know, Christmas birds and whatever. You know, we eat a lot of birds, but most of them we don't. And particularly we don't eat eagles and owls and top predators or birds that live a long time, that take a long time to mature. We used to. Everything used to be fair game, 10,000 years ago, or even 5,000, even 1,000, even now in some parts of the world if it's edible its fair game. But only now, with our perspective that is drawn from all preceding history are we beginning to understand that we are really making inroads into our life support system.

The chemistry of the ocean has to be influenced when you take whatever it is – is it 80 million, is it 100 million, is it 110 million tons of ocean wildlife out of the system every year – relocate those elements of food chains, of nutrient cycles. When a whale eats krill that eats plants, both the krill and the whale give nutrients back into the system, sort of natural fertilizer, if you will. In agriculture a lot of attention is paid to, "Where's the fertilizer going to come from?" Well, in the ocean it comes from the creatures who live there, who constantly give back. But there's no excess; there's no fat in these systems just waiting for humans to extract. It's a tightly-wound system that if it looks like there's an excess it's like an insurance

policy against the next wave of new predation or disease or storms or whatever. And we haven't taken that into account.

We didn't with whales. Whales were just there to be consumed. We did a really good job over a few hundred years of consuming whales as commodities. It's only late in the 20th century. If you go down to the White House today in the afternoon there's going to be a full-sized blue whale celebrating our new attitude about whales. It's not just that they're mammals; it's that, you know, these are wild animals that we can empathize with and maybe see the ocean through their eyes and maybe see ourselves through their eyes in the process. It was not until 1986 that the commercial taking of whales, wild whales came into effect. And I mean there are still a few nations that kill whales, but the bigger problem today is virtually every coastal nation kills wildlife from the sea the way we used to kill birds and whales and seals and whatever else we could get our hands on.

It's not just what we take out; it's also what we destroy in the process. The price of trolling is enormous. The price of shrimp – yum yum, shrimp – it's enormous. The by-catch and the habitat destruction in taking wild shrimp, nobody thought about in 1961 or even as recently as 1991 or even 2001 around most of the world. We don't think about it; it's there, it's free for the taking, let's go get it, let's feed people. But actually shrimp, think about it, how many people – how many starving people are being fed shrimp? You see popcorn shrimp in Red Lobster, you see all-the-shrimp-you-can-eat, but it's pricy food when you come down to it.

Krill, wild animals, in the 1980s we thought we'd kind of fix things by making up for the loss of whales by taking what seemed to be excess krill. There had to be excess krill, right? Because we had fewer whales than did exist before. But what we didn't think about is that yes, whales that eat krill were depleted, but that was a boon for everything else in the southern oceans that also eat krill. It's not just a straight line; there was no real excess of krill. The wonderful thing about healthy oceans is that they are resilient; the depletion of one piece means good news for somebody else for a while, until they slip into oblivion for one reason or another.

What we're beginning to understand, as savvy five-year-olds, is that we really don't understand or appreciate how these systems function, but we do know we can disrupt them, we can destabilize systems that have been developing over hundreds of millions of years, and we have been destabilizing them by moving inexorably across the land and now into the sea, taking at a level that none of these natural systems have ever experienced in all of their history.

The fleets that now travel to Antarctica through the southern ocean to take krill, not to feed people directly, not a penny that is expended on the fuel and all the rest goes to feed people directly, but it does feed people in the sense that these little krill creatures are squeezed of the oil that does go as a nutrient. And it's an intermediary; krill are ground up and fed to cows, chickens, and pigs. So they do feed people indirectly, just the way many other fish in the sea are now taken, to feed the animals that many of them are not natural carnivores, who we insist that they eat other animals by putting it in their only food supply. They're natural grazers. You know, cows, if they had their way, would eat grass. And they get a few bugs in the process, so they're partly, you know, omnivorous. But we tilt the scales in a drastic way by taking large quantities of ocean wildlife to feed to domesticated animals. And the cost is not really accounted for in terms of what's it costing the ecosystems to take that much krill. We're talking thousands of tons. Or in the global sense what we're taking, the wildlife out of the sea, to feed cultivated fish.

I mean aquaculture, another whole topic, and an important one, and a growing one, may be the solution in many ways of how are we going to feed people going forward if you choose the right animals or plants to grow. We haven't been doing a very good job on that front either, growing shrimp could be a partial solution, but not the way we have chosen to do it so far. Wildlife; sharks, they're way beyond the equivalent of lions and tigers in the sea, because when you think about it, lions and tigers, what do they eat? They eat grazers. What do sharks eat? They eat fish that eat other fish that eat other fish that eat other fish, and pretty soon you get down to the little guys. So it takes thousands of pounds of plants at the bottom of a long and twisted food chain to make a pound of let's say a 10-year-old shark, and sharks can be 50 years old by the time they're hauled out of the ocean.

We used to think the only good shark was a dead shark; that's what I was told when I was diving, "Watch out for the sharks, they're man-eaters out there." But its humans now doing a really good job of eating sharks.

Oops, we're stuck on a place; let me try it this way. Let's see. So if I push Help does that help? Oh, there we go.

So sharks, perhaps if they ever thought about where they are on the food chain, thought of themselves as top predators, but we're the top predators, obviously, on the ocean as a whole; nothing compares with humans as the top predators in the sea.

And most of our predation on sharks has come about since about the 1980s. NOAA actually fostered a program of utilizing – of trying to develop markets for underutilized species to connect U.S. fishermen with Asian markets, because there's a taste there for shark and shark fins. Oh, we've done such a good job. It wasn't just that; the prosperity now in Asian countries, where it's, you know, really a delicacy. This is not feeding people. It might feed people in terms of countries that are now looking to sharks as a source of revenue, it feeds their economy, but it's not feeding them directly. And the price we're paying, the price the ocean is paying, the price that our life support system is paying is enormous; we just haven't been accounting for that.

When you take the big predators out of the ocean; sharks, swordfish, tunas, the dolphins, whatever, these creatures that historically are part of the processing system, nutrients going back into the ocean in a form that the phytoplankton can use directly to keep the system rolling, well, we've disrupted it. We don't think when you have a tuna fish sandwich or sushi or sashimi about the real cost or what is taken out of the ocean, the hole that's left in the ocean that may never be filled, considering the numbers now that....

You know, when I was chief scientist at NOAA a little piece of paper came across my desk saying that blue fin tuna in the North Atlantic had been depleted by 90-percent since 1970. This was 1990, 20 years to knock off 90-percent of the blue fins using techniques that didn't exist in 1970, but we began to use aircraft and nets and spotter planes and new navigation techniques and sonars. Well, here we are; will there be blue fin tuna by the middle of this century? Well, tunas generally? It's a family of about 60 variations on the theme of scombroid fish. All of them taste good, to their detriment, from our standpoint. They're all regarded as food. Getting to them is relatively new, and even coastal communities, we couldn't get out far at sea, could not intercept them on their great migration routes. Now we can. I mean we could if we really tried take every last tuna, just as we could, if we tried, take every last whale. We've done a pretty good job of doing both. With whales you can still go to the Tokyo fish market or Iceland, Norway, and dine on whale. But now we know and that knowledge ironically comes from fossil fuels; we've burned through a lot of it in half a century, and it's given us so much that we now value: fertilizers, plastic, knowledge, probably the greatest gift, the greatest value of having burned through those assets, non-renewable assets, that now we can see ourselves in ways that no humans could before.

And well, this just graphically illustrates what we started talking about when we began this meeting, that when my father came along

in 1900 they were well past the billion mark that marked 1800, and we were shy of the 4 billion number that came about in 1980. And this is just a guess. How far is it going to go? Is there a point where it's not going to continue to increase because we have disrupted our life support system, disrupted our food supplies, disrupted the water system, the air we breathe and all of that? Nice to talk about here on Earth Day, but it's the reality. You know, we are seeing ourselves, seeing the future with new eyes. And it isn't just the biologists, it isn't just the whale hookers of the world, isn't just those who are concerned about conservation.

I attended the first meeting that the economists had in Singapore about the ocean and the most recent one in San Francisco in February of this year, that looking at the world with new eyes. Yes, the economy we now see is, as Tim Worth once said, "a wholly-owned subsidiary of the environment." You've got to take care of the assets in order for there to be an economy.

So I know AID is mostly, and rightly, focused on terrestrial issues, on feeding people by harnessing the land and a handful of plants that do the heavy lifting in terms of calories, whether it's animal calories or plant calories, whether it's carbohydrates, fats, or proteins, most of it comes from agriculture. And one of the things that we've learned, one of the many things, is that we can do better, that we have to change our ways in terms of agriculture, as we learn if we can take what we now know and adjust our policies to be more in keeping with what we know, we likely can feed at least the same number of people that we now have without stressing the system as much as we currently are.

So where does the ocean come into this and is it just food that we should be focusing on? What about forests as carbon sinks, as oxygen generators, where we're beginning to get that on the land? Carbon credits for rain forests. We haven't gotten very far with that, but at least it's an idea that's beginning to take hold. And now it's really new information, and so we should be incorporating this into our policies. Mangroves, as it turns out, are about 50 times more effective in terms of taking up carbon dioxide and storing it, sequestering it in their aquatic roots, generating oxygen, sequestering – capturing and sequestering carbon, and providing habitats for lots of little guys as nursery areas in that network of roots. And yet to cultivate shrimp we trade off these valuable forests of mangroves. We've lost more than half of the mangroves for coastal conversion to, whether it's shrimp farms or fish farms or parking lots, whatever, condominiums. We haven't really valued our life support system or the contributors that make the planet function. But we're getting there.

Sea grass meadows, while these prosper in shallow water and they're just the ideal place to take and turn into parking lot in coastal areas; dredge and fill, dredge and fill. I saw it in my childhood in Florida, where Tampa Bay has been reduced by about 20-percent because the once productive, generating oxygen, taking up carbon, habitat for lots of creatures from clams to larval fish, that they're gone, and in the process the water has become murky. I went to high school in Clearwater, Florida, when Clearwater had clear water. It isn't that way anymore.

So just a moment to salute the creatures that contribute one in every five breaths you take. We didn't know their existence until 1985, about the same time that we started, just started to commercially put a moratorium on the killing of – commercial killing of whales. So what you see here in this blobby image is one image that was sent to me by Penny Chisholm – Sallie Chisholm from MIT. She and her colleagues discovered in an expedition out near Bermuda the existence of prochlorococcus. Not a word that most administrators or politicians have begun to pronounce, but maybe that will change as we realize how important they are. Food production, oxygen generation, and we didn't know they existed until 1985. Now with changing chemistry of the ocean what's that going to do to our source of oxygen, the source of food, nutrients, that begin at the bottom of the food chain? They feed the little guys that feed the bigger guys. They feed the little fish that become big fish that also are food for the next level.

You know, in agriculture farm animals, they eat low on the food chain, except when we tip the scales away from that by putting wild animals into their food; fish I'm talking about, of course. But out in the ocean, you know, even big animals can feed low on the food chain, but low on the food chain is a relative thing. If you think about a jellyfish, that's like a tiger, 'cause they eat animals. Tigers eat animals that graze, so do jellyfish. And when you think about some of the other fish – that's why it's happening. I see what I'm doing. Sorry. Little fish eat small animals that eat the plants; it's true with squid and the bigger fish and whales, dolphins, eat the small fish. Food chains in the ocean are just different from those on the land. The principles are exactly the same; it starts with sunlight, goes through photosynthesizers, goes to animals, and then on from there. But in the ocean most of the fish that we consume aren't taken when they're a year old; most of the animals we consume are a year or two old. We don't access the plants in the sea, but on the land we eat mostly plants as a source of most of our calories.

So when I hear food security in the ocean and I hear people justifying the continued large-scale taking of things like tuna I just have to

wonder what are we really thinking. Now we can see with new eyes where we are. Now I'm just going to quickly zap through a few images to show you where I'm coming from as somebody who has spent a lot of time looking at the world from the standpoint of the fish. Well, starting when I was a little kid, with a face mask in Florida. Then ultimately harnessing some of the cool new technologies that make possible to go below, where plants live. We have a space station in the sky, we have a space station underwater. I was there most recently in 2012 and I've lived underwater now ten times, using the ocean as the laboratory. It's possible with that perspective to think differently about and see food chains in action, to wonder where it is going from here.

The first time that Aquarius, this underwater laboratory, was established and I had a chance to use it was 20 years ago. Well, 22 years ago. That reef has changed enormously in 22 years. We've seen a depletion of the fish in many parts of the world, but in places where fish have been protected, it's a small part of the planet, there is a chance for recovery. Can we take care of enough of the ocean to have enough fish? Can we reach that magical point that everybody is sort of zeroing in on? Sustainable extraction of wildlife from the sea, if we just take care and manage ourselves, manage the fish, then maybe we can extract a meaningful amount of food from the sea.

It was the vision going back to the 1950s and '60s and '70s, and it's still the vision of the World Bank, and I think it's still the vision of AID, both through cultivating a handful of particularly appropriate species that are low on the food chain, fast-growing, and taste good, or even for products such as the phytoplankton that is grown for oil, cultivated in closed systems that can be an alternative to krill oil or menhaden or other fish oil. Good news for the fish if we can get ourselves together, to think about alternatives.

You see, most people think a fish is something to eat, but I've had thousands of hours getting to know fish on a different basis. Like birds, they have a place in the ocean that transcends pounds of meat or buckets of oil. And the systems of which they are a part, the Earth system of which we're a part, it all ties together. What we do to them we do to ourselves. We have to put them on the balance sheet as something more than pounds of meat. Their role in keeping the planet a planet that works in our favor has to be there, right along with maybe some small amount relative to what we have set our goals on that we can take for food. But food for what? To serve a luxury taste? That's where most of the trouble comes from, industrial scale fishing with destructive means of extraction; trolling or gill netting or long lines that take whatever is there and leave a path of destruction

behind. It's not selective, what we take from the sea. New values, new understanding of the importance of having intact systems, protecting the biodiversity, the engine that keeps us alive, all these creatures.

We're just beginning to realize the diversity, the numbers. The census of marine life came up with a figure of something like 250,000 kinds of creatures live in the sea; all the plants, all the squids, even in the deep sea, where photosynthesis doesn't take place, but chemosynthesis is an alternative to producing food from the chemicals that are available in the absence of sunlight. We're just beginning to understand the role of microbes that power much of the way the world works.

Just getting to the point where the technology to go into the sea mirrors the technology that takes us up into the sky or enables us to go around the planet on the land. I mean there are literally billions of cars have been developed, but how many submarines in the course of the last 50 years? A few. How many exist who can go to half the ocean's depth? Half the ocean's depth, about six. And about six countries have them – well, five: Russia, the U.S. Well, maybe with Alvin, here's the Russian sub. This is the Shinkai 6500; that's Japan's. China, the Sea Dragon goes to 7,000 meters; they can get down to where the lost Malaysian aircraft is believed to be. This is the Sea Dragon. We're just beginning to have access so that – you know, I love the idea of making it possible to have Hertz Rent-a-Sub or whatever it takes, so that any of us, not just a handful of military types or scientists, have the privilege of going into the sea, but to get systems so easy to drive that even a scientist can do it, even, you know, kids can take rides. And it is possible; new systems are on the horizon.

We're in the time I think of the greatest era of exploration of the planet. It's just beginning and it's happened on our watch. The Trieste went to the deepest part of the ocean the year before AID was formed, but it took 52 years before somebody got back to that depth again, the deepest part of the ocean, to understand the ocean, to see what it's like, to report back to us. Well, he is kind of a scientist, Jim Cameron, but he's an artist, he's a polymath, he's a filmmaker, for heaven's sakes, with *Avatar* and *Terminator* and a few other blockbuster films to his credit. But he's an explorer, fellow explorer-in-residence at the National Geographic, who gave us new insights, new reasons to look at the ocean, to realize, as I said at the Economist forum in San Francisco a few weeks ago, that the most important thing that we extract from the ocean, it's not oil, it's not gas, it's not krill, it's not shrimp, it's not whatever, fish; it's our existence. We have to put that as our highest priority, to protect the systems that yield our existence.

We have begun to carve up the ocean. It's also happened in the same remarkable period of time that some of us share. 1982, law of the sea, exclusive economic zones, half the world beyond that, the high seas. Some look at this as an opportunity for the great fish grab. We had the land grab that preceded much of what we inherit on the land. In the ocean it's free, right? The high seas, no nation owns the high seas; all of us do. It's the ultimate global commons, right along with the air we breathe. This is the time, right now, and AID, being an internationally-focused organization, has got to be a big part of being smart about how we go forward with carving up the ocean.

We will, but can we do it with intelligence? Can we do it with protecting the assets in mind, with the realities in mind, most importantly, the unknown surprise in mind, those black swans that exist that we didn't know what we didn't know when we made some of the policies that currently govern our behavior? We've only protected – well, less than 3-percent, 2.2. These are the areas that have some form of real protection. A fraction of 1-percent is fully protected. And there are areas now of considerable interest, like the Arctic, that is up for grabs. What are we going to do? Fish? That's a big deal. What are we going to do about the living creatures that heretofore have been inaccessible? As we lose the ice we gain access. Bad news for polar bears, good news for shipping. And what about the Sargasso Sea? Just this spring in Bermuda nations began to come together, five signed, including the United States, to really take action to protect this big area where there's a forest, but it is not anchored in dirt, it's anchored in water. It's the floating golden rainforest, the Sargasso Sea, generating oxygen, taking up carbon, providing habitat, but at risk through what we are doing.

Good news, and here's the grand finale, by protecting the ocean, big pieces of the ocean, and fishing perhaps, and conducting aquaculture perhaps, in a relatively small part of the ocean, we might be able to get away with increasing the capacity of the ocean to feed humans without degrading the system, our life support system. But we have to be smart. Right now it's the other way around; we protect a tiny piece of the ocean and we fish everywhere, and we're suggesting that we could conduct aquaculture anywhere in our life support system. I hope that maybe in the comments that we have today we have a chance to think about these issues. We don't really have answers yet, but at least to know that we are able, as the only creatures on the planet, to celebrate prochlorococcus. I don't think the fish know what they're eating; they just go for it. And now there are kids coming along who are protecting sharks. We're looking at the mammals and other creatures with new eyes. Even jellyfish, if you're a five-year-old

you don't see them as a hazard, you don't see them as food, you see them as incredible creatures. We need new eyes to look at ourselves the way that only humans can.

I studied this bird, a 62-year-old albatross two years ago, when I had a chance to go to Midway. And I thought, you know, her future and all the birds that follow can't know what humans know, and her future is totally dependent on what we do or don't do. And, you know, she's 62 years old, and every year or so – there sometimes skips a year – but new chicks coming along. But they don't know either. It's really our offspring that have the choices to make on our watch. We need to think more like five-year-olds. Thank you.

QUESTION AND ANSWER

Jerry Glover: Thanks so much, Sylvia. That was – that was really tremendous. And I think it gives us a lot of –

Sylvia Earle: Food?

Jerry Glover: – food for thought.

Sylvia Earle: Thank you.

Jerry Glover: The right kind of food, though, and consumed in the right portions. I wanted to also bring in some folks that I've worked with at USAID. One of the great things about working at USAID is the many talents and great, extensive experience of the people there, including with our partner organizations like World Resources Institute. So I'm very pleased to have come in today, provide some responses, additional thoughts to Sylvia's ideas, Robert Winterbottom from the World Resources Institute. He's a senior fellow there in the Food, Forest, and Water Program.

I've worked quite a bit now with Bob since I've moved to DC, and Bob led a recent report on improved land and water management that's available online. That was a great experience, working with Bob and several others on that. That's been a real guiding light for USAID's terrestrial-based activities. I don't think we covered much oceans in there, but I think there's a subsequent report coming out more focused on water and oceans.

So Bob will have a few minutes to respond to comment – to provide some responding comments. Also, Barbara Best from USAID's Economic Growth, Education, and Environment Bureau. I'm in the Bureau for Food Security, so I have the tremendous great fortune to work with folks like Barbara, focused more on natural resource management, some of these more ecosystem-scale ideas. As many of you know, agriculture often focuses at those field and farm scales. Folks like Barbara really help bring in the larger landscape and ecosystem perspective to make sure that as we develop agricultural systems, we're not wiping out upstream and downstream resources.

And then I think on the – on – virtually present is Richard Volk – isn't that right? Is he still with us? And Richard Volk is a leader on – in that Economic Growth, Environment, and Education Bureau as well. He's a senior coastal and aquatic resources advisor. He had planned on being here in person, but had an accident, so he is stuck at home, I believe, listening in. So we'll be sure to get some of his comments in.

If I forget to bring him in, please, somebody remind me to have him speak up.

Anyway, perhaps we could – maybe if Barbara and Bob would join me up here, and Sylvia, we could just have brief responses from both of them. I'll get out here. Bob, you want to lead off?

Robert Winterbottom: Cool.

Jerry Glover: And then we'll open it up for some questions and comments.

Robert Winterbottom: Is this one? Everyone hear me? Well, thank you, Sylvia. I learned a lot. I'm sure everyone in the room did. It's great to be part of this panel, this discussion, as we think about Earth Day and our planet Earth and what we might do to be better stewards of both the sea and the land.

And as you concluded, a lot of it is about choices. We need to be thinking more deeply and be better informed about choices we make, about options we pursue. At the World Resources Institute where I work, it's sort of an everyday effort of ours, is to be thinking about how we can make good choices, better informed choices, and manage the tradeoffs that are often necessary, because we all realize we're at a point where, yes, we already have seven billion people on this planet, of whom 900 million are not adequately nourished every day. So we do have a challenge to feed people better and to make progress in food security.

As you pointed out, though, a lot of the commercial – agricultural and commercial activities to produce food really doesn't contribute directly to food security. So we need to be maybe rethinking some of those efforts, and devoting more attention to how can we really improve food security, especially for those that are currently undernourished. That's why in the report that Jerry alluded to, we put a particular focus on sub-Saharan Africa, where there's some tremendous challenges, where a large amount of the people that don't have enough food these days, there are many opportunities there to address that, where crop yields are low, and they could be increased, where land – large amounts of land are degraded, and where some of the agricultural efforts – agricultural development efforts that we have taken haven't proved to be as sustainable as they need to be. So we can come back maybe during the question and answer, if you wanted to explore those a little bit more.

One thing that occurred to me, too, as we sort of went through that last 30 years of roller coaster ride of what's been going on in the

world technology has been such a big factor, both a foe, something that has enabled mankind to do things that we're still suffering the consequences, and will be for some time to come, particularly through climate change, but it can also be our friend. It can also, obviously, be a tool, and you alluded to many ways that – and I'm thinking like the tremendous advances in remote sensing. Recently, the World Resources Institute launched the Global Forest Watch to harness these new capabilities that are there. We have a global database now, down to 30 by 30 meter resolution, of what's happening in terms of forest change, forest cover loss. It can become a tremendous tool to increase transparency, accountability.

And similarly, we could have a Global Reef Watch. We could harness these technologies, work with Google and others to begin to get a much better pulse on a day to day, what's going on and what's the impacts for people, and where are we making progress? Where does more progress need to be made in terms of shifting to more sustainable modes of management and use of coral reefs, of coastal ecosystems, and just to help raise awareness of what's going on. And as I say, bring more transparency to that.

Similarly, all of the communication and outreach tools that are available, it's astounding to me that there's incredible transformations going on, both for good and for bad, and yet still there's so many decisions being made without a full awareness of those. We know the potential for scaling up agroforestry, farmer managed natural regeneration could make tremendous differences. It's happening on millions of hectares in some areas of the dry lands of Africa. And yet many people still are not very aware of it.

Similarly, I'm sure in terms of – there are some very neat experiences, success with locally managed marine areas, where because of people's recognition of their dependence on these resources that give life in so many ways and are so important to livelihoods, they've made an effort to sort of stop the over-exploitation, to – where rights to manage those resources have been clarified, where it's shifted from an open access sort of room for all to pillage to let's see if we can steward, husband these areas where people have designated sanctuaries and respected – where people have come together and agreed on how one can collectively adopt restrictions on the time of harvest or the period of – or the length of harvest periods, or the technology used, setting aside parts of the landscape as necessary to maintain ecosystem health and so on.

Those areas, we can see how it is possible to steward and husband these resources in a way that increases their productivity and directly

contributes to more food security and livelihood security for the people directly engaged in stewarding and husbanding the resources.

I wanted to just – I know we're kind of short on time. There's probably lots of questions. But I'll just close by saying that as – again, as Jerry alluded, at WRI, we've been working on the broader issue of what are the different things that could be done, because there's no single silver bullet to solving, you know, how do we eat, continue to eat every day, in a way that doesn't destroy our planet and doesn't undermine the economies that are so dependent on agriculture around the world.

And we've thought about this, and there's a whole menu of items, really, including managing and doing an effort to address consumption and demand for food. You alluded to that many times. Clearly, there's a need to rethink and maybe shift diets, to eat less meat. There's also a need to be thinking even how – what we do in terms of trying to feed the world is connected back to what we're doing in areas of population and health, and there's many sort of things that are – still need to be done, especially in sub-Saharan Africa, to improve girls' education, to make family planning more available, and to otherwise address the high fertility rate and bring it down to replacement facilities. That would make a huge difference in terms of curbing the overall demand, and the need to convert more and more land, and lose those tropical forests or whatever that might be converted to drop land, if we don't do something on the population side.

So there's things on the demand side. We – we're more and more conscious of the number of undernourished, but I don't think we realize that of the 800, 900 million people that are undernourished, there's over 1.2 billion people that obese, overweight. So there's –

Sylvia Earle: Over-nourished.

Robert Winterbottom: Over-nourished. So there's a lot to be done on the demand side. And on the production side, clearly, one of the menu items is to reduce and then stabilize capture fisheries. What's been going on can't be sustained. We're depleting the capture fisheries. A lot is known about how to proceed on that. We just haven't had the political will to do it. And why we don't go into depth in that in the – as the capture fisheries have been depleted, aquaculture has risen, and unfortunately, as you alluded, there's cases where aquaculture has been ramped up, and we're producing more fish in ways that are not sustainable.

But we think there are a lot of specific recommendations, and fortunately, we have people, Rich right in front of me, which worked on that, and so maybe during the Q&A, too, he could delve into some of the specific recommendations. So that's something we're thinking deeply about, is if we do need more fish, and if we're not going to be able to get them from capture fisheries, we want them as a source of protein, what could be done to maybe make use of – less use of fish as feed stocks and aquaculture, make more efficient use of it, reduce the atrophic levels of the fish that are raised in aquaculture, do a better job of __ landscape level management of aquaculture, and integrating into seascapes and landscapes. Harness the technologies that are there that could, again, help to move aquaculture forward in ways that's sustainable, build in safeguards so that it doesn't contribute to the loss of mangroves. There's a host of things that could be done.

And again, it comes back to making wise choices. Thank you.

Jerry Glover: Okay, Barbara. __ a few words.

Barbara Best: Okay. It's always a pleasure to listen to Sylvia speak. I mean, her knowledge, her commitment and passion for the oceans really resonates with so many of us. And it really reminds us that our wellbeing depends upon the health of the oceans. So thank you for that.

As Sylvia highlighted, fishing is really the largest extractive use of wildlife in the world now, yet what people often don't realize is that fish products, both wild fisheries and farm fish, is the world's most widely traded food. And in fact, the net export value of fish products from developing countries is greater than rice, coffee, tea, cocoa, rubber, tobacco, and something else – rubber – combined. It's huge.

And so one of the challenges I think that we see here is how do we get wild fisheries discussion into the international dialogue on food security, and actually resource management. As Sylvia pointed out, so often, it's considered to be free resources.

And we had a global grain crisis in 2008, and sort of in response to that, the international dialogue on food security focused just on grains. And so it really is our responsibility to broaden that discussion, to look at systems approaches to food production, to include wild fish and farm fish, but also climate smart ag, integrated water resources management, and smarter approaches to productivity and production. So it really is our responsibility to move those discussions forward.

I'd like to start by sort of debunking the myth that it's either/or. Either we can have food security or we can have conserved ecosystems. We know that both in terrestrial and ecosystem productivity, it depends on healthy systems. And I'm glad to say that this summer, USAID will be launching a new agency biodiversity policy which really recognizes that human wellbeing and our progress are dependent on the health of biodiversity systems, and that durable development gains are not possible unless these systems are really valued and safeguarded. Thus, to maintain fisheries' productive ocean health, we need to maintain the structure, function, and diversity of these systems.

And some people say, well, is that really doable? And here's one opportunity I want to highlight. I would say yes, it is. We do have enough examples out there from USAID other programs that show if you focus on fisheries management, you can enhance fish stocks, fish catches, nutrition, and incomes. It is possible, but you need to apply modern management approaches, you need to conserve critical habitats, reduce destructive fishing gear, and you really need to focus on governance, getting that tenure and governance systems correct.

What we've seen in terms of transformation and agricultural systems is that focusing on land tenure has really helped generate a reform, both in terms of equitable and sustainable production. We need that same sort of approach to the oceans. We need to focus on securing tenure for coastal communities to those resources, as well as addressing this open access nature in the larger oceans. That is going to be so critical to generating the stewardship over resources, which can lead to better management decisions and better resource use.

Another major challenge is that global food security really will not be achievable unless we take that broader systems approach. And we do have the capabilities and the technologies and the knowledge now how to do that. We can take that larger landscape/seascape approach to look at production and productivity. We have the tools and the techniques. Oftentimes, what we lack is the political will. So we need to work on that angle.

Another challenge which Sylvia touched upon is that we really can't achieve food security unless we really sort out and reform fisheries management, both wild fisheries and farmed fish, and particularly this question about who has access to the resources, and how do we use those. How do we distribute the benefits from those resources? We have to have these larger discussions about do we promote small scale fisheries or allow access to foreign industrial fleets? Do we promote use of fisheries at the local level, or when it is appropriate to

allow exports, or do we allow focus on fisheries versus farmed fish? We need to have those larger discussions as we – as we move forward.

And I think there is opportunity for change. We're seeing now that some of the big businesses whose whole business model relies on sourcing from developing countries, they are now realizing that poor management of oceans, and particularly fisheries, is a real business risk, and a threat to the value chain. So there's market leverage we can now tap to try to help promote reform and better management of these coastal resources as we move forward. Okay? Thank you.

Jerry Glover: Okay. Thanks. And is Richard Volk online? Is he –

Julie McCartee: I don't think he'll be able to speak.

Jerry Glover: Oh, okay.

Julie McCartee: If he has any interesting comments, we'll be capturing them and we might bring a few of them forward.

Jerry Glover: Okay. And we'll hear –

[Crosstalk]

Jerry Glover: – from some online comments from you folks in the back?

Julie McCartee: Yes.

Jerry Glover: Okay.

Angelina Gordon: We do have Richard on as our guest web facilitator. Hi, everyone. He does have a question as well as a comment. This is Richard Volk from World Resources Institute.

Sylvia Earle: No, from USAID.

Angelina Gordon: Oh, I'm sorry. Just as we have so much sunk capital in the oil and gas industry, and thus opposition to taking on the global climate change challenges, we have immense sunk capital in the global fishing industry. Is anyone working on the question of how we as a global community begin to solve the over-capacity program, given its strong economic roots and already invested capital? And further, do we adequately consider political economy in our fishery reform programs and efforts? And that's open to the panel.

Sylvia Earle:

Well, I'm not sure how quite to respond, other than to say that we are investing globally in fisheries, even here in this country. The part of NOAA that is supporting the National Marine Fisheries Service is about \$1 billion a year, even in these depressed times, or tight times financially. Nearly \$1 billion supporting the – underwriting how do we find and capture and market ocean wildlife. It's a reality.

Imagine if \$1 billion were put into let's see how we can restore what's been depleted over the last 50 years. And some of that's happening, too. You know, the whole Marine Sanctuary Program, but that's a tiny budget compared to a big budget of extraction.

You know, I just somehow have to believe that in the end, we will respond to the knowledge that is in front of us, that we will step out of the guidelines that have brought us to where we now are, thinking that our – like the Stratton Commission Report came about in the 1970s, really supporting the idea that we could feed large numbers of people with ocean wildlife, and our job was to go find better ways to capture them. And now we know that that has – we've succeeded all too well. We've taken so much that now the very source of that potential avenue for sustaining human prosperity, whether in terms of food or products that we derive from ocean wildlife, that we've put it at risk, and put ourselves at risk in the process.

So how do we – how do we get over that? How do we change it? It happens when people wake up and say, this isn't working. Let's do something else. And otherwise, it will go to a point where we will have lost the opportunity to make the change, and in some cases, maybe we've already exceeded the limits to recover. I don't know whether there can be Bluefin tuna going forward, given how few now remain, and knowing that it takes a lot of tuna to make tuna, with broadcast spawning. Everybody likes to eat those little baby tuna when they are released into the water. There have to be enough to be able to grow up to be big tuna, so there can be more tuna. You know, it just goes round and round. And if 90 percent are in the Pacific – some say 96 percent of Bluefins are gone – how many is – when have we passed the point of no return? I don't know.

All I know is that the trends do not favor a prosperous future, and this is the moment we have to face up to it. And I've love to hear more about what Dr. Volk has on his mind about how do we solve this problem, and my other panelists, too.

Jerry Glover:

Well, perhaps we'll open it up to audience questions. Questions? And please state your name and maybe who you're with, or what organization.

Ben Shelk: Ben Shelk with the Ocean Foundation. And making better choices seems to be a recurring theme of this discussion, and as Robert pointed out, how important transparency is to making better choices with Global Forest Watch. And it got me thinking about what you were saying, Sylvia, about how people feel these resources are free. You can go out there and grab them. There is no consequence, right? And it may – it reminded me of should there be a Surgeon General’s warning on some of these products?

Sylvia Earle: Surgeon General.

[Laughter]

Ben Shelk: Good pun. Should there be a warning label on some of these products, on the food that we eat?

Sylvia Earle: Of what’s – what they’ve been eating?

Ben Shelk: Right. Right. On the gasoline that we use. Should we even take it to the extreme, like in Latin America, where on cigarette packets they have pictures of diseased lungs or birth defects. Should we put on our gas pumps pictures of bleached coral reefs, or on our plastic whatever, our bags, pictures of seagulls full of plastic debris and detritus? Are these kind of transparency measures going to make an impact, or is just going to be another ineffectual scare tactic that, you know, as we’ve discovered, it hasn’t really moved the needle at all, and has only alienated people and made them less willing to change their behavior?

Sylvia Earle: I’m going to just jump in and say I think it is about knowing. I mean, once you know, however you get that knowledge, it’s with you. You can’t unknow. You can’t take away what’s been stuffed into your brain.

And now I know things that I couldn’t know even ten years ago, five years ago, last week. I keep learning new things, learning new things here about the level of – the value of export markets in – but where does – where do those exported wild fish go? Is it to feed people? Is it food security? Or is it a kind of economic basis that is really fragile, because of the depletion of that so-called freesource that is evaporating? And it may look great today. It’s important to the economy today. It’s not feeding them directly, but indirectly, they buy canned fish or something.

Barbara Best: Yeah. Yeah. No. Forty percent of all the wild fish caught in the world now are ground up to be used as fish meal. And so aquaculture,

primarily for aquaculture, for also for livestock. It has to be reformed, too –

Sylvia Earle: Yeah.

Barbara Best: – because right now, it's not really adding to food security. It can actually be detracting.

Sylvia Earle: Yeah.

Barbara Best: And most of those products do go to developed countries, or more developed countries, from less developed countries, so –

Jerry Glover: I think one of the comments that Sylvia made some time in the past that really impressed me, imagine going through the Serengeti and rounding up all the top predators, grinding them up, and feeding them to cattle, how – I mean, we wouldn't even come close to accepting that. That's so repulsive to us. But yet that's what we do to many of our ocean –

Sylvia Earle: Feeding songbirds to pigs.

Jerry Glover: Yeah.

Sylvia Earle: For example.

Jerry Glover: Just – Bob?

Robert Winterbottom: Just a quick comment, Jerry that relates back to the question about political economy as well as transparency and governance. And I think that certainly we need to do things in terms of drawing people's attention to what needs to stop in the way we're using fisheries and the ocean particularly, but I think we could do a lot, too, to leverage changes in more sustainable production of fish and other food in aquatic ecosystems, fresh water wetlands, and so on.

The case of Bangladesh comes to mind, where historically, a few elites, politically well-connected elites, were able to get leases, and then they'd sublet them, they'd collect all the money, and everybody would try to run out, and the wetlands were overfished and depleted. And the way that they got beyond that was to mandate longer-term leases that would be awarded to community-based organizations, basically resource management organizations of engaged stakeholders that it was in their economic self-interest to sort of invest in protecting the fish sanctuaries that were set up, invest in respecting the fisheries

regulations, and they ended up getting more fish, restoring the biodiversity, and reducing poverty.

There were a whole series of measuring, including – there's a role for transparency there, and saying, you know, these are fish that were certified from the community managed wetland, and so on, and they've been produced sustainably. But you have to break that cycle, where there's a few elites that short term profits, and maximize those to the detriment of the whole resource system and the ecosystem and degrading it, and change the rules of the game, basically, so that we invest more in ecosystem management in a way that reinforces the self-interest of those stewards who are well-placed to invest in the improved management system.

Jerry Glover: All right. Another question?

Rich Wigg: Sure. I'm Rich Wigg with the World Resources Institute also, and thank you all for the panel discussion. I just wanted to respond also to the aquaculture issue as part of what it can do for food security. I mean, one interesting thing about aquaculture in comparison to capture fisheries is that while in capture fisheries we primarily catch high trophic level species, right? Those that feed at the top of the food chain. Eighty percent of aquaculture is of low trophic food – fish species, the carp, the –

Sylvia Earle: Except for salmon.

Rich Wigg: Well, except – so salmon and shrimp plus other carnivorous marine fish make up about 20 percent of global aquaculture. So if you look at it from a global standpoint, if aquaculture's consuming about 20 million metric tons per year, but it's producing about 60, it actually is contributing to food security, particularly those low trophic species, which are primarily produced and consumed in developing countries.

So I think going forward, and this is sort of building on what you were – what you were all talking about, we have to figure out if fish demand is going to keep going up as population keeps going up, how do we get aquaculture right in terms of wild fish use, and in terms of use of land, water, plant-based feeds, energy, you know, everything that sort of terrestrial agriculture has to get right.

Sylvia Earle: Could I comment?

Jerry Glover: Sure.

Sylvia Earle:

I agree, and I agree with respect to let's get it right. It took us 10,000 years or so to winnow out all of the animals and plants on the planet, 250 or so thousand kinds of flowering plants, and think of the 9,000 kinds of birds, while we eat chickens and turkeys and ducks, and not too many others. And the mammals, you know, how many do we actually grow? All of them are naturally grazers. We do not cultivate carnivores to eat. But we do cultivate fish to eat that are carnivores, and I popped in and said, of course, salmon, but it's baffling to me why it isn't just so obvious that we shouldn't be doing that. I mean, we should just say that there – we stopped eating whales, because we value them for reasons other than pounds of meat and barrels of oil. Even for cultivating creatures, there's some that we really just ought not to do that, because the cost is too great, and it's not all that good for us.

Taking large numbers of wild fish like a funnel to put in, and a small number of cultivated fish out the other end, that incorporate all the things that those wild fish have in their systems, we worry about mercury, we worry about the contaminants that go into the ocean that accumulate, the further up the food chain you go, so warnings about eating sharks and tunas and such. But then we really facilitate that by taking lots of wild fish to feed to the cultivated ones, and – anyway, so there's that.

So choosing the right fast growing, low in the food chain, don't mind crowding, hardy, taste good, and you come up with a handful of choices that we've already got, mostly freshwater. And the question is, are you really focusing on feeding people, food security, or food choice? Salmon is a choice. It's not food security. Now raising tilapia and several species of carp that can be done in relatively or entirely closed systems, catfish, too, potentially, more crop per drop, as they say, if you have closed systems, and aquatic life can be an interesting and potentially valuable part of our diet, but only if we do what you're suggesting. You've got to get smart about it.

Instead of aiming to raise tuna, for heaven's sakes, for luxury choice, and you don't care how much it costs, and you don't care about the bite you're taking out of the ocean to have a few little pieces of cultivated tuna, then if the answer is yes, it's worthwhile, go for it. But if – it's not food security. It's not even economic security.

Jerry Glover:

I think we have a question online.

Angelina Gordon:

Yes. And I also wanted to acknowledge that we have about 71 webinar participants joining us online, so hello to all of them, and thank you for joining. They're joining us from around the world,

including Bangladesh, Malaysia, Atlanta, Georgia, here in the States, Tanzania, Costa Rica, Michigan, Spain, and the United Kingdom.

Sylvia Earle: Fantastic.

Angelina Gordon: Indeed. We have a question –

[Crosstalk]

Angelina Gordano: – from Charles Yarish, joining us from University of Connecticut. How do the panelists view integrated multi-trophic aquaculture as developing an ecosystem approach for food production?

Sylvia Earle: You want to take that?

Barbara Best: Yeah. Well, I'll just – I'll start. I guess first of all, I'm a – yes, multi-trophic approaches to aquaculture is fine, but I would not call that an ecosystem-based approach to culture. Ecosystems means something very different than just taking a multi-trophic approach. And I have to agree with Sylvia in this case. The multi-trophic approach I think works very well in enclosed systems. I mean, if we're talking about where we need to go with culture and using different trophic levels, having an enclosed system where you can monitor and you can actually see the inputs and outputs that you're getting through the different trophic levels is the best way to go.

Sylvia Earle: And it has been successfully applied in China for hundreds, maybe thousands of years with pond culture, with several kinds of carp, plant-eating fish, ducks on the surface fertilizing the water, mulberry trees around the ponds, soaking up some of those nutrients and producing silkworms and mulberries. And on the Island School in the Bahamas, a closed system raising tilapia that nutrify the water that goes to a garden that's also – that's a hydroponic garden with vegetables that cleanse the water and send that cleansed water back to the fish, you know, big figure eight configuration, now it's still small scale, but there's no reason why you cannot extract – I mean, there – it seems attractive to think that with a smaller footprint, smaller amount of water, you could get more out of an area by being smart. We need smart aquaculture. We certainly do.

And even if you want to feed luxury tastes, I mean, at James Cook University, they're raising something that they call green caviar. It's actually a kind of algae, green algae, called caulerpa racemosa, like little bunches of grapes that look and even taste salty, a lot like caviar. And it serves a luxury market. It's not feeding starving people.

But, you know, I'll tell you, aquaculture, if you're not thinking food directly, but economy, the aquarium trade is just going gangbusters, raising fish for those who have the option of keeping fish as pets, or in public aquaria, like the Georgia Aquarium, more than half the fish they have in their big, huge tanks are not caught from the wild. They're grown. They really celebrate their cultivated sources.

So even the little *Finding Nemo* fish is cultivated, and corals are being cultivated and sold for high prices. You don't have to keep taking coral from the wild. You can grow them and grow them and grow them, and share the stock, if you will, just as we have with some kinds of birds and cats and dogs and things. So there is a big market there that's not taking a big bite out of the ocean, that could be an economic basis, even in countries that currently are lacking in terms of a source of economic basis, and these sell off their wildlife, and they could be cultivating a handful of species for markets other than food.

Jerry Glover: I know Barton Seaver, another explorer in residence at National Geographic, was developing a – some guidelines for eating appropriate fish. Isn't that right? Maybe I have that wrong, Sylvia?

Sylvia Earle: Yeah, his – I love Barton Seaver, and we have big discussions often, and he – on one hand, he says, well, the way to save the ocean is to eat broccoli, or if you are going to eat from the ocean, make it a celebration. It's okay to have tuna, but make it every once in a while, and light the candles, and get out your best silver, and all of that, because it's not feeding starving people. It's feeding a choice, a luxury choice.

And of course, as a great chef, he would love to have more choices about what he can wield his culinary arts upon, and right now, we eat a lot of wildlife. You don't go to a restaurant and eat elephant and rhinoceros and eagles and owls, but you can see their equivalent right there in many ways.

Jerry Glover: Right.

Sylvia Earle: Do we want to really foster that as an approach to have those choices once in a while? Or can we bite the bullet, instead of biting our way into annihilation?

Jerry Glover: And just say no.

Sylvia Earle: And just say no.

Barbara Best: Can I make a comment?

Jerry Glover: Oh, yes.

Barbara Best: Yeah. Just to make a comment, in terms of the countries where USAID works, many people don't have choices, and they really are strongly dependent upon the local fisheries for food security, for livelihoods, for nutrition. And so we need to look at what are the choices we make here versus what are the options that many people don't have, and how do we really support particularly the wild fisheries management that so many of them depend upon?

Jerry Glover: Yeah. Okay. Over here.

Chu Li: My name is Chu Li. I'm an oceanographer, working at _____. Actually, I have a follow-up question to the last question. I'm working on ___ farming, which is ___, so I'm growing macroalgae, seaweed, with oysters in a farm, so it's kind of integrated, multi-trophic aquaculture, and it's open – open water system, but we treat like ___ closed system, since we have so much nutrients, so we ___ nutrients ___ problem ___. This project is supported by NOAA, and when I started the project, like almost two years, we realize it's not a science question, because it's so easy to grow macroalgae, it has so much nutrients, it's no problem, we grow it, but it's more like a business question, because it's really hard to find a – the farmers macroalgae, what to do with the biomass. There's no market, no value chain in the US. You can't really – if you grow like a second crop, you cannot make money. So it's almost like people pay – really don't care about seaweed in US. So I'd like to hear some comments _____.

Sylvia Earle: I'm not sure I understood all of the question, but about growing macroalgae and what the potential might be in the US, and elsewhere, actually, and most such endeavors are in open ocean, but I have seen, at least on an experimental way, closed system for growing gracilaria, a red alga, but not so much for food, but for the gels that come from the – as products.

[Background voices]

Sylvia Earle: The alginates from the brown algae and the carrageenan and whatever from the red algae. But, you know, the thing is that whatever we occupy in the ocean for our aquaculture, you're displacing somebody. It's true on the land, and I think we just have to be smart, again, about where we choose to go. And I think there is the potential, and maybe you alluded to that, that some of the algae that – the macroalgae can actually soak up some of the nutrients in an area that is otherwise regarded as polluted. I've seen this in China near

Qingdao, where they have laminaria growing. It's actually a Japanese laminaria, but it grows very fast in nutrient-rich, natural – well, supported by nutrients that come from the land.

And the algae soak it up and use it for very rapid growth, and then those blades of algae can be used in various products, for cosmetics, for ice cream, for all the things that we use them – but not for food so much. But there is a market, there is a place for that.

But we should probably avoid disturbing healthy, natural systems in terms of where we put our aquaculture, because they're more valuable doing what they have been doing to maintain the planet – an ocean that works in our favor. I really resist the idea of carving out new mangrove areas, for example, to put in shrimp farms or algae farms or fish farms, but rather go where they've already been removed.

In some cases, you can restore mangroves, but other places, maybe it's better to convert those places into another purpose that can serve us in ways such as generating food or generating products. Now I missed the part about – that you get a crop and then you can't market it? What was – I missed the –

[Background voices]

Chu Li: People are – US like import agar.

Sylvia Earle: Yes.

Chu Li: It's from ____, like \$12.00 a pound. But they prefer to like buy gracilaria like from South Africa, then ship them to China, then make some agar, and then ship the agar back.

Sylvia Earle: And bring it back. Yeah.

Chu Li: So that's basically US, if you grow that – you know, farm, there's no other suppliers or no value chain to support this kind of industry. So that's __ problem.

Sylvia Earle: Right. Well, there is a history of growing gracilaria and hypnea in North Carolina, during the 1940s and '50s. It was partly associated with I think wartime interests, the need for certain products. And in Southern California, the giant kelp is taken even now for products, and even for some elements in food. I think there's potential there, but I think we should be really careful about where we invest.

The Harbor Branch Oceanographic Institution has been looking at algae aquaculture, and maybe other creatures as well. But they're to be done, but I think with care, and it doesn't make sense, you're right, to go the great circle route to acquire things.

Jerry Glover: And I think that's – oh, one more question. One last brief question.

[Background voices]

Gina Green: What I'd like – first of all, I want to thank the panel. I thought it was an incredibly important and much needed discussion today, so thank you, Sylvia __ __.

[Background voices]

Gina Green: Anyway, thanks. Thank you. And I'm Gina Green with Tetra Tech. One thing I'd like to gain a bit of an understanding from the panel are your thinking on the financing of these big ideas. You know, Bob, you talked about feeding sub-Saharan, and how do we bring it together? There's been a lot of discussion, and obviously on carbon credits to protect and manage forests, but what's the equivalent to fisheries and to helping to protect the oceans?

Sylvia Earle: I think we should give carbon credits for keeping fish in the ocean, because they're carbon-based units, too. And they have a long tail of investment in them, and under normal circumstances, you know, it's – carbon stays in the ocean until we remove whatever it is, and then we add to the CO2 problem by extracting whatever it is, 100 million tons or 110 or maybe only 80, depending on which numbers you look at, and in the process, destroy the mechanisms by disrupting the natural systems, the natural mechanisms for capturing and holding carbon.

Whatever else it is that we do going forward with respect to capture fisheries or aquaculture, it should, to be successful, be coupled with an awareness that the ocean, the natural functioning systems, should be given high priority, and protecting them is the key to maintaining wild capture. You have to have large areas, not just little token places, such as we now have. You know, less than three percent with some form of protection, a tiny fraction of one percent where even the fish and clams and lobsters and oysters are truly safe.

We need to think about the ocean and the natural world generally as the cornerstone of what keeps us alive. It's our life support system. We've done so much to destroy the natural systems on the land, forests and grasslands and so on, disrupting water systems, and all the rest. It's only in the last 50 years that we've made serious inroads in

the ocean, and much of it is still in pretty good shape, especially the deep sea.

But there are new concerns on the horizon that have nothing to do directly with fishing or with aquaculture. Deep sea mining, that was a concern back in the 1980s, is reemerging as another factor that is going to impact the capture fishing or the capacity to have aquaculture at any level. And again, its extraction, the various extractive industries, oil, gas, and the now deep sea mining.

It's just that we don't know enough to be able to be sure that we can get away with it. We can't – we're – we have this idea that we can just take and take and take, and everything's going to hold steady, no matter what. That's been what has governed our policies up until right about now. It's only now that we can see that it hasn't been working, and that we're putting at risk everything we care about.

So armed with knowledge, and that's power, we have the potential to say, okay, the high seas, we're – it's half the world. Maybe we just ought to leave it alone as a precaution against our ignorance. We might change our minds later, or not. Australia had this policy of protecting 30 percent of their entire exclusive economic zone. Palau has declared that they're going to stop commercial fishing in their entire exclusive economic zone. No more sharks, no more tuna to be extracted from the little land mass out 200 miles, little island making a big decision about its blue backyard.

And around the world, these ideas are beginning to catch hold, protecting the systems that keep us alive. Can we continue to extract food, wild capture? Well, perhaps some, but not at the level that we're currently trying to impose on the ocean. To do so means that we're going to continue down this decline that has been evident over the last half century. You can see where that's going to lead us.

And therefore, to make a conscious decision to put places in the ocean in the bank where we choose not to fish, we choose not to put aquaculture operations, we choose not to mine, we choose to leave it as the engine that keeps us going, and we want to protect that engine. And it doesn't mean that we stop fishing or stop cultivating or stop doing all the other things we do in the ocean, but we do it knowing the consequences, and make better choices about where and how and how much.

Julie McCartee:

Yes. Thank you all very much for sticking with us, and if you are able to fill out your survey, you can either leave it on your chair or drop it at the front table where you first came in.

[End of Audio]



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The U.S. Government's Global Hunger & Food Security Initiative



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FROM THE AMERICAN PEOPLE

Agrilinks

LINKING THE FATE OF THE OCEANS TO THE FUTURE OF FOOD SECURITY

WEBINAR CHAT TRANSCRIPT

APRIL 22, 2014

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PRESENTER:

Dr. Sylvia Earle, The National Geographic Society

WEBINAR CHAT TRANSCRIPT:

USAID Microlinks: Hello everyone and thanks for joining the seminar today! People are beginning to arrive in the room. If you can hear my audio, please go ahead and introduce yourself in this public chat. We'll get started in about 15 min.

Cornelia Flora: Sorry -- I am in Spain, and came in an hour early. I will come back.

USAID Agrilinks: Hi Cornelia, Yes, please join us at 10am EDT.

Richard Volk: All set here.

USAID Agrilinks: Fantastic. Great to have you in the room Richard.

Richard Meyer: Checking in. I assume there is no audio yet or is my system not working properly?

USAID Agrilinks: No, no audio yet, though I'll get on and say hello shortly

USAID Agrilinks: Welcome all for joining us on Earth Day.

USAID Agrilinks: We're going to get started just before 10 am

USAID Agrilinks: Please feel free to check your audio to ensure you can hear the Earth Day soundtrack we're streaming into the room

USAID Agrilinks: Hope you enjoy!

USAID Agrilinks: Richard, Barbara just arrived and says hello!

KDAD AV Tech: Thanks to all for joining us online! We're getting ready here in the presentation room and will be posting relevant updates as needed.

Richard Meyer: Sorry, which Barbara?

USAID Agrilinks: Barbara Best

Richard Meyer: Great, good morning.

Ellen Mathys: Good morning!

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Sachin Gaur: Yes.

Sachin Gaur: Good morning.

Julie Hambrook Berkman: Hi Julie Hambrook Berkman from Cambridge England where I manage an NGO called Our Spaces which focuses on all the International Spaces including the High Seas, Deep Sea, Antarctica and Outer Spaces. We are delighted to have Sylvia Earle is on our board of directors.

Sachin Gaur: Sachin Gaur from Penang, Malaysia. I work as a Social Media Coordinator for World Fish, a member of the CGIAR consortium.

Ellen Mathys: I am joining the event from Atlanta, GA. I am currently working with the FANTA Project, doing national food security strategies for USAID/FFP.

Sachin Gaur: Same to you, thanks.

Tim Pfeiffer: Good morning from FL!

Osagie Aimiuwu: Osagie Aimiuwu from USAID/Bangladesh

Osagie Aimiuwu: Yes

Tim Pfeiffer: Thanks!

Althea Skinner: Is there a phone number or is audio/visual included here?

Richard Volk: Hi Althea, yes, audio/visual will be up and running a few minutes.

Althea Skinner: Thanks for confirming, Richard.

Charles Yarish: Charlie Yarish from the University of Connecticut is here. I have been working in areas of sustainable aquaculture including integrated multi-trophic aquaculture, nutrient bio extraction and seaweed aquaculture.

Richard Volk: Good morning, Charles. Our host will be with us in a couple minutes.

Ricardo Radulovich: Hi, I am Ricardo Radulovich from Costa Rica.

Richard Volk: Hola Ricardo. We will get started momentarily.

George Kegode: George Kegode joining you from Northwest Missouri State University.

Richard Meyer: Richard Meyer, Ohio State U

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Tim Pfeiffer: Morning Paul!

Nwadiuto Esiobu: HI this is Diuto from Florida Atlantic

Sarah Easter: Strayer University of Minnesota

Anne Spahr: Anne Spahr from Chemonics International in DC

Brian Bartle: USDA Foreign Agricultural Service

Paul Wills: Good Morning Tim and all

KDAD AV Tech: As Angelina said, we're still getting settled in here in the room so we will probably be starting in about five minutes or so...

Jackie Aitken: Jackie from Partners for Development, Silver Spring, MD

Kevin Schaus: Hi, this is Kevin Schaus, Westat, Rockville, MD

KDAD AV Tech: Kindly introduce yourself and your affiliation as you come online and please take a moment to fill out the polls!

Ellen Mathys: Yes.

Evan Walker: Evan Walker, WWF in DC

Charles Yarish: Yes

Diana Rutherford: Diana Rutherford, FHI 360 in DC

Maxwell Mayeaux: Maxwell Mayeaux from USDA National Institute of Food and Agriculture
Good Morning.

Diana McLean: Good morning all. Diana here from the Cornucopia Group in Ontario.

Paul Wills: Hello Paul Wills with Harbor Branch Oceanographic FAU

Charles Yarish: Will you pull down the questionnaire so that the PPT will be full screen?

Jimmiel Mandima: Hello Jimmiel with the African Wildlife Foundation in DC

Cassie O'Connor: Hi. Cassie O'Connor from WWF in DC

Thomas Buck: Tom Buck, with SSG Advisors in Burlington, Vermont

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Paul Hundley: Paul Hundley - Aqua cultural Engineer - HTH engineering - paul.hundley.jr@gmail.com

Morgan Chow: Hello, Morgan Chow from AquaFish Innovation Lab

Nature McGinn: Nature McGinn, AAAS Science & Technology Policy Fellow

Stacey Diaz: Stacey Diaz from Cardno Emerging Markets USA, Ltd.

KDAD AV Tech: Just a couple of last minute tweaks in room here, we'll be starting shortly. Thanks.

Michael McGirr: Good Morning - Mike McGirr with the National Institute of Food and Agriculture

Rhonda Barnes-Kloth: Greetings from Rhonda Barnes-Kloth with WWF in DC.

Stephanie Ichien: Hello, Stephanie Ichien from the Aqua Fish Innovation Lab

Jake Sokol: Hello, Jake Sokol - WWF in DC

Michael Harte: Michael Harte, Oregon State University here

Sukey Stephens: Hello, Sukey Stephens from Heifer International

Ricardo Radulovich: Ricardo Radulovich, my affiliation is University of Costa Rica

Karen Douthwaite: Hi Karen Douthwaite from WWF in DC

USAID Agrilinks: All I hope you're able to hear Julie who's giving us a short intro

USAID Agrilinks: Next we'll have Jerry Glover with an intro to our speaker Dr. Earle

Diana McLean: Sound quality is a little spotty.

USAID Agrilinks: If you're having trouble hearing us, please run the Audio Wizard from the Meeting tab on the toolbar

USAID Agrilinks: Welcome everyone for joining us and Happy Earth Day!

USAID Agrilinks: Speaking is our moderator Jerry Glover

USAID Agrilinks: Is everyone hearing Jerry okay?

Diana McLean: Yes

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Jimmiel Mandima: Yes

USAID Agrilinks: Additionally, please welcome Richard Volk, our guest webinar facilitator

Maxwell Mayeaux: Yes

Charles Yarish: Yes

USAID Agrilinks: He'll be on hand in the room to answer any outstanding questions, help push the conversation forward and offer great technical insights during the presentation and the panel discussion

USAID Agrilinks: Lots of clapping in the house with the lego comment!

Althea Skinner: Althea Skinner, CARE-WWF Alliance

USAID Agrilinks: Welcome Althea and everyone who's joined us in the last few minutes

USAID Agrilinks: Happy Earth Day and welcome to the presentation by the esteemed Dr. Sylvia Earle

USAID Agrilinks: We're happy to have everyone today for this Earth Day celebration

USAID Agrilinks: You'll note that I've changed my color in honor of Earth Day!

USAID Agrilinks: As the presentation moves along, please feel free to include any comments or questions you have here in the chat box

Charles Kome: "Our quality of life depends on the food we eat, the water we drink and the air we breathe and all these depend on soil quality. (Charles E. Kome. 2007) Notre qualité de vie dépend de la nourriture que nous mangeons, l'eau que nous buvons et l'air que nous respirons et toutes celles-ci dépendent de la qualité du sol. (Charles E. Kome. 2007) Nuestra calidad de vida depende de los alimentos que comemos, el agua que bebemos y el aire que respiramos y todos estos dependen de la calidad del suelo. (Charles E. Kome. 2007)"

USAID Agrilinks: Thanks Charles

Hans Muzoora: Hans Muzoora-Independent consultant-Agridev Solutions Inc. Burlington, MA USA.

USAID Agrilinks: Welcome Hans - Happy Earth Day and thanks for joining us

Marisol Pierce-Quinonez: Mari Pierce-Quinonez from the Agrilinks team joining from my desk here in DC. Nice to be on the other side of one of these webinars for once!

USAID Agrilinks: Welcome Mari!

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USAID Agrilinks: Thanks for joining us this morning

USAID Agrilinks: All, if you have comments to Dr. Earle's presentation, please feel free to include them here in the chat

Karen Luz: Good morning, Karen Luz from WWF in DC

USAID Agrilinks: Hello Karen - thanks for joining us

USAID Agrilinks: We're about 10 minutes into the presentation

USAID Agrilinks: Dr. Earle is presenting and we'll have a panel discussion following

Becky Manning: That's a frightening photo

USAID Agrilinks: Richard Volk, our guest web facilitator is also joining us in the room

Richard Volk: Yes, bleached coral to the max...

USAID Agrilinks: Please welcome him and feel free to chime in with any comments or questions

USAID Agrilinks: This is truly a terrifying photo

Richard Volk: A microcosm of the Pacific gyre

USAID Agrilinks: Changing the pollution of the ocean has long-lasting affects -- a powerful statement on this Earth Day

USAID Agrilinks: Shortly before the seminar began, our panelists were discussion the seeming lack of attention Earth Day gets these days

USAID Agrilinks: Do you all agree?

USAID Agrilinks: Is it different in your country or region of the States?

Becky Manning: Yes, definitely a diminished emphasis

Caye Drapcho: Yes, here in South Carolina too. Except among our students at Clemson.

USAID Agrilinks: That's an interesting differentiation

Caye Drapcho: There is a vivid documentation of the plastics in the oceans impact - at Midwayfilm.com

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USAID Agrilinks: Thank you Caye for the link

USAID Agrilinks: I'll add it to the Links pod for the next screen

USAID Agrilinks: Are there any questions for Dr. Earle?

Charles Yarish: I suggest checking out a significant issue of taking out top predators out of the sea, whether it is in the eastern Pacific or the Mediterranean! Zertuche-González, J.A., O. Sosa-Nishizaki, J.G. Vaca Rodriguez, R. del Moral Simanek, C. Yarish and B.A. Costa-Pierce. 2008. Marine Science Assessment of Capture-Based Tuna (*Thunnus orientalis*) Aquaculture in the Ensenada Region of Northern Baja California, Mexico/. Final Report to the David and Lucile Packard Foundation, 300 Second Street, Los Altos, California, USA. 95p. (presented to Packard Foundation, Feb. 19, 2008; full text downloads at: http://digitalcommons.uconn.edu/ecostam_pubs/1 .

Richard Volk: If you haven't seen Chris Jordan's photos, check them out at <http://www.chrisjordan.com/gallery/midway/#CF000313%2018x24>

USAID Agrilinks: Great, thank you Charles

USAID Agrilinks: I'll include this in the links pod as well and add it to the resources page post-event

USAID Agrilinks: Please make sure to check out <http://agrilinks.org/events/linking-fate-oceans-future-food-security> for all the post-event resources

USAID Agrilinks: Sign up and create a profile to join our community

USAID Agrilinks: And continue this conversation

Charles Yarish: We need to put a balance in to our aquaculture! Neori, A., M. Troell, T. Chopin, C. Yarish, A. Critchley, and A.H. Buschmann. 2007. The Need for Ecological Balance in "Blue Revolution" Aquaculture. *Environment* 49 (3): 36-42.

USAID Agrilinks: Thank you Richard and Charles for sharing these resources

USAID Agrilinks: Apologies all, we're having a small issue with the PDF - we'll get back up shortly

Richard Volk: For a good example of what Dr. Earle is speaking about, see the recent guardian article re Senegalese fish meal plants at <http://www.theguardian.com/world/2014/feb/18/overfishing-factory-joal-senegal>

USAID Agrilinks: And we're back!

USAID Agrilinks: Thanks for your patience

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Ricardo Radulovich: Animal production is not true food production (it takes more feed to what is produced), unless produced with feed generated in situ (like green water aquaculture). Only biosynthesis by plants and seaweeds and the like is food production.

USAID Agrilinks: Great point Ricardo!

Caye Drapcho: Yes, agreed

USAID Agrilinks: How do we balance respecting local cultural delicacies versus ensuring the survival of our fish?

USAID Agrilinks: Very profound point Dr. Earle is making now!

USAID Agrilinks: There are lots of nodding heads in the room here

USAID Agrilinks: Dr. Earle's comments are really resonating with our in-person audience

USAID Agrilinks: Are there any questions in the room?

Becky Manning: Sound probs

Richard Volk: Shifting Baselines: The Past and The Future of Ocean Fisheries ... great book!

USAID Agrilinks: Thanks Richard

Michael Harte: Please see www.globalpartnershipforoceans.org/indispensable-ocean for a review of critical ocean issues and human wellbeing

Becky Manning: Ok - that's it for shrimp for me!

USAID Agrilinks: It makes me rethink my affinity for shrimp as well Becky!

Ricardo Radulovich: Seaweed farming

Charles Yarish: Yes, Ricardo!! Marine plant aquaculture production is now about 21 million tons with a value ~\$5.5 billion dollars! The growth rate of this sector is over 8% per year since 1970!!

USAID Agrilinks: It seems the point Dr. Earle is making is - what is the real question here: food choice or food security?

Charles Yarish: See a recent multi-disciplinary report: Browdy, C.L., Hulata, G., Liu, Z., Allan, G.L., Sommerville, C., Passos de Andrade, T., Pereira, R., Yarish, C., Shpigel, M., Chopin, T., Robinson, S., Avnimelech, Y. & Lovatelli, A. 2012. Novel and emerging technologies: can they contribute to improving aquaculture Sustainability. 2012. In R.P. Subasinghe, J.R. Arthur, D.M. Bartley, S.S. De Silva, M. Halwart, N. Hishamunda, C.V. Mohan & P. Sorgeloos, eds. Farming the Waters for People

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and Food. Proceedings of the Global Conference on Aquaculture 2010, Phuket, Thailand. 22–25 September 2010. pp. 149–191. FAO, Rome and NACA, Bangkok.

Becky Manning: "Put them on the balance sheet, as something more than pounds of meat"

USAID Agrilinks: What are the consequences of the industrial-scale extraction of wildlife from aquatic systems? Consider the real costs in terms of habitat destruction, disturbed nutrient cycles, declining populations & biodiversity.

Ricardo Radulovich: But all these concerns are losing relevance as reality shows that irreversible damage has been made. How do we manage this from now on? What are the options for the future. One of them is to boldly use the oceans for eco-friendly food production. Seaweed farming moreover bio remediates waters and promote biodiversity. A whole new approach: managing the pelagic environment.

USAID Agrilinks: Thank you Ricardo - I'm happy to pose this to the panel during Q&A. From where are you joining us?

Ricardo Radulovich: Costa Rica. Please see www.maricultura.net for a booklet (in Spanish) on tropical seaweed cultivation and use as food.

USAID Agrilinks: Great, thanks!

USAID Agrilinks: Are there any other questions or comments?

USAID Agrilinks: Dr. Earle's presentation is quite provocative and garnering a few whispers here in the audience

Charles Yarish: I suggest you all take a look what is happening in Northeast America and seaweed farming that my team has developed. We have had farms from the coastal waters of New York City throughout the Gulf of Maine! See -). See the <http://today.uconn.edu/blog/2013/08/from-the-lab-to-the-dinner-table-kelp/> and "New Handbook for Growing New England Seaweeds: Nursery Culture" published by CT Sea Grant. The handbook is a new 92-page handbook for growing four species of economically and ecologically valuable native seaweeds. Available for free, the handbook may be accessed for download in PDF format at <http://s.uconn.edu/handbook> or through UConn's Digital Commons collection http://digitalcommons.uconn.edu/seagrant_weedcult/1. A companion product, a 6-part close-captioned video playlist, "Seaweed Culture in New England" can be found on YouTube at <http://s.uconn.edu/seaweedplaylist>. Since I am also working with local communities in the US and in Mexico, the videos are very useful in introducing seaweed aqua cult

USAID Agrilinks: We're moving on the panel discussion after a short intro from Jerry Glover

USAID Agrilinks: We will run over a bit later than the advertised end time of 11:30am

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Becky Manning: What does she think about the recent trucking of young salmon in CA to the ocean since the drought has dried up their river access? Futile?

USAID Agrilinks: Thanks Becky

USAID Agrilinks: We'll have a short panel and then Q&A

USAID Agrilinks: I'll include this

Becky Manning: Or not

USAID Agrilinks: Shout out to Richard Volk!

Richard Volk: Thanks!

USAID Agrilinks: Our panelists are taking the stage

USAID Agrilinks: Please post your questions to the chat box and we'll get them in the queue

USAID Agrilinks: Robert Winterbottom is speaking

USAID Agrilinks: Soon we'll have Barbara Best from USAID

USAID Agrilinks: As Jerry mentioned, Robert is from World Resources Institute (WRI)

Julie Hambrook Berkman: As a way of considering how we as a civilization can deal with managing the 64% beyond national boundaries...Has there been progress on Illegal, unreported and unregulated (IUU) fishing is a major contributor to declining fish stocks and marine habitat destruction.

USAID Agrilinks: Becky, kindly remind me from where you're joining us

USAID Agrilinks: Great question Julie

USAID Agrilinks: From where are you joining us?

Julie Hambrook Berkman: Cambridge, UK

USAID Agrilinks: Thanks Julie

Richard Volk: Just as we have so much "sunk capital" in the oil and gas industry (and thus opposition to taking on the global climate change challenges), we have immense sunk capital in the global fishing industry. Is anyone working on the question of how we (as a global community) begin to solve the overcapacity problem given its strong economic roots in already invested capital? Do we adequately consider "political economy" in our fisheries reform programs/efforts?

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Ricardo Radulovich: Fishermen and much of their equipment and facilities are evolving towards aquaculture, or should be encouraged to do so, once we clarify what type of aquaculture we want

USAID Agrilinks: Powerful question Richard

USAID Agrilinks: Can everyone hear okay?

Caye Drapcho: Will the recording for the presentations today be sent out later?

USAID Agrilinks: This is Barbara Best from USAID

USAID Agrilinks: Yes, Caye, we'll have the recording and resources up on the event page on Agrilinks

Caye Drapcho: Thank you!

USAID Agrilinks: No, thank you for joining us

Richard Volk: For a look at the USAID biodiversity policy see:
<http://www.usaid.gov/biodiversity/policy>

Charles Yarish: How do the panelists view integrated multi-trophic aquaculture is developing an ecosystem approach for food production?

Michael Chambers: Here is one possible solution to help fishermen and grow seafood in an environmentally friendly manner.
https://seagrant.unh.edu/sites/seagrant.unh.edu/files/media/pdfs/extension/mc.imta.noaa_gloucester_3.19.14.pdf

USAID Agrilinks: Thank you Michael

Richard Meyer: We have a very long way to go in educating John Q Public. There is an incredible amount of new climate change, food security and ecological sustainability info. It is going to be a huge task for institutions to play a careful role in sorting through the flood of info and objectively identify what is correct from what is junk science and propaganda. Hard to see who will really play that role in an era in which there is so much suspicion of government. Who has an opinion?

USAID Agrilinks: Great comment Richard

Michael Harte: Can anyone comment on the eight Pacific island countries that make up the Parties to the Narau Agreement. They have received over \$100 million in fees per year for access to a well-managed skipjack tuna fishery. This income is supporting health and education spending in Pacific Island Countries -reducing the need for foreign aid.

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Jorge Maldonado: And Colombia

USAID Agrilinks: Hello Jorge!

USAID Agrilinks: Thank you for joining us from Columbia!

USAID Agrilinks: Kindly continue to post your comments and questions here

USAID Agrilinks: We'll be wrapping up shortly

USAID Agrilinks: Thank you to everyone who has stayed on with us a bit past our advertised end time

Richard Volk: Can Dr. Earle comment on her observations of the growing number of marine dead zones in the world over the past few decades, and to what extent these are correlated with poor agricultural practice?

Richard Volk: Great comment Barbara!

Charles Yarish: Most of the Chinese kelp (*Saccharina japonica*) is actually for food production!

Maxwell Mayeaux: What are the panel's views on utilizing microalgae for biofuel production and using co-products for other uses such as a protein source for fish feeds?

USAID Agrilinks: Thanks for your question Maxwell. From where are you joining us?

Maxwell Mayeaux: Washington, DC

USAID Agrilinks: We'll going to wrap up shortly, but do stay tuned for post-event resources on the event page. Additionally, we'll circulate your questions to our panel

USAID Agrilinks: This is the last question

USAID Agrilinks: Great, thanks Maxwell!

USAID Agrilinks: For those of you still with us, please kindly take a minute to fill out our end poll

USAID Agrilinks: We would particularly we interested in your suggestion for future seminars with the Bureau for Food Security or E3

USAID Agrilinks: Thank you for those who are adding your comments to the poll!

Charles Yarish: Along with carbon credits, should be nitrogen credits to deal with the increases of nutrients in coastal waters! So how does one bring the private sector into such ventures?

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USAID Agrilinks: Thank you Charles

USAID Agrilinks: Are there any final questions or comments?

USAID Agrilinks: Thank you all for joining our thought-provoking presentation and panel today. I hope you all join us on the Agrilinks.org website to continue the conversation and comment on the resources posted. Happy Earth Day!

Richard Volk: Just a big thank you to all for your inputs!!

USAID Agrilinks: A special thank you to Richard Volk as well!

Sarah Easter Strayer: Thanks for a very interesting talk.

USAID Agrilinks: Take care all!

Richard Meyer: Great program. Thanks to all.

Tim Pfeiffer: Thank you for the agro-link event

Charles Yarish: Thank you all too!

KDAD AV Tech: Thanks to everyone for joining us, we'll leave this room open for about another five minutes and then will end the meeting.

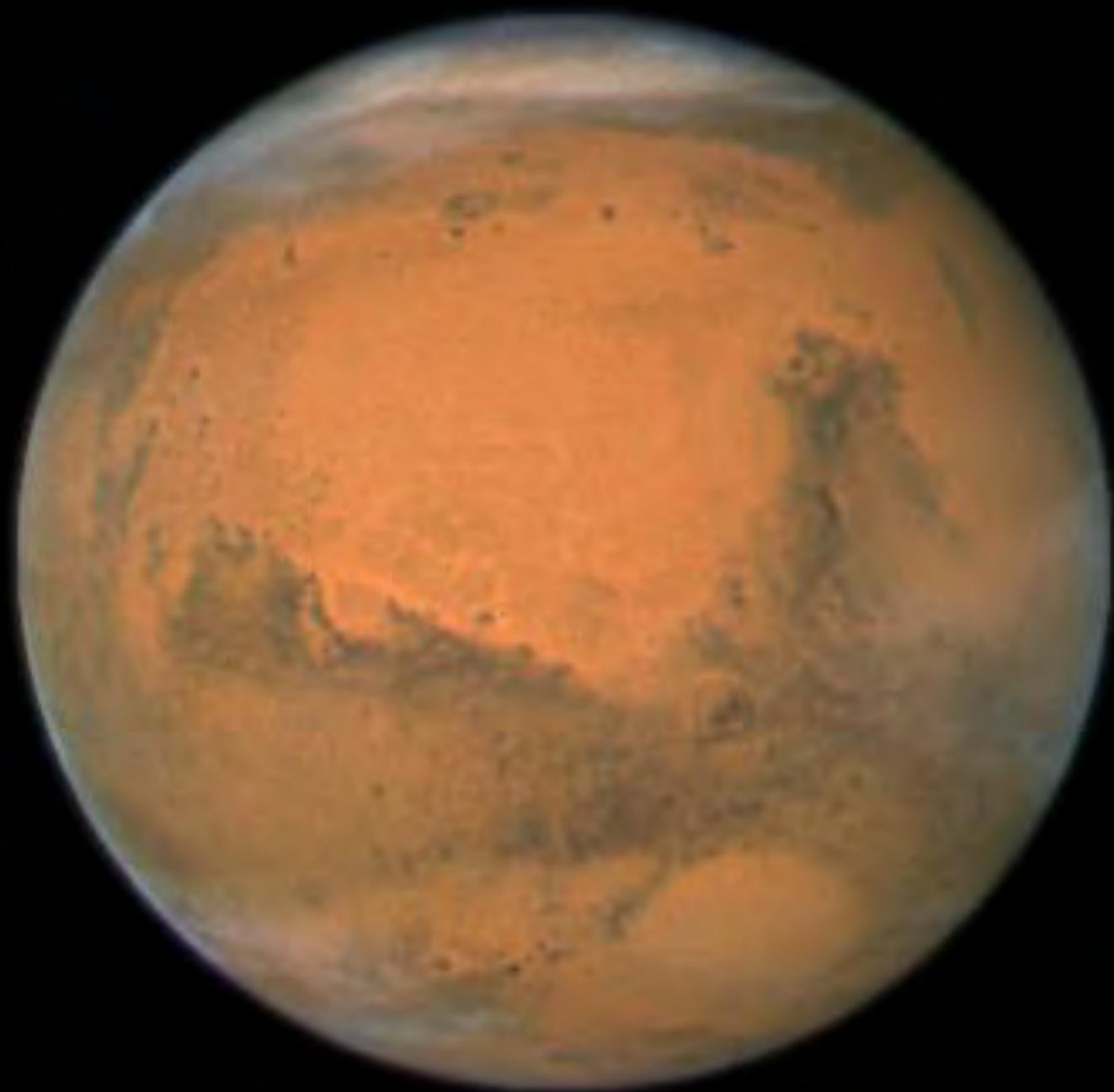
KDAD AV Tech: Have a great Earth Day!

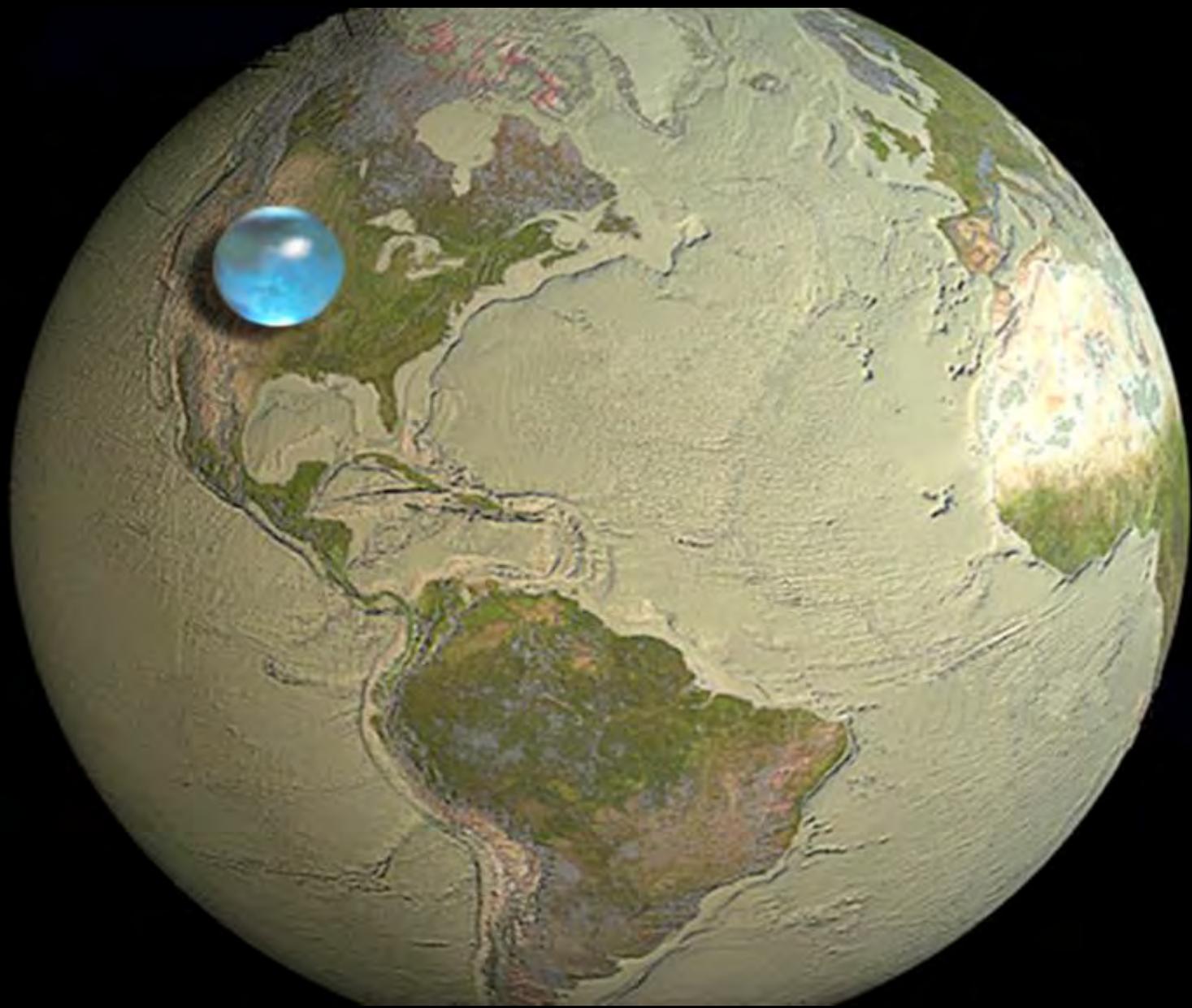
KDAD AV Tech: Thanks again everyone, please turn in tomorrow for our Agrilinks webinar:
<http://agrilinks.org/events/agricultural-research-impact-partnering-feed-future-innovation-labs>

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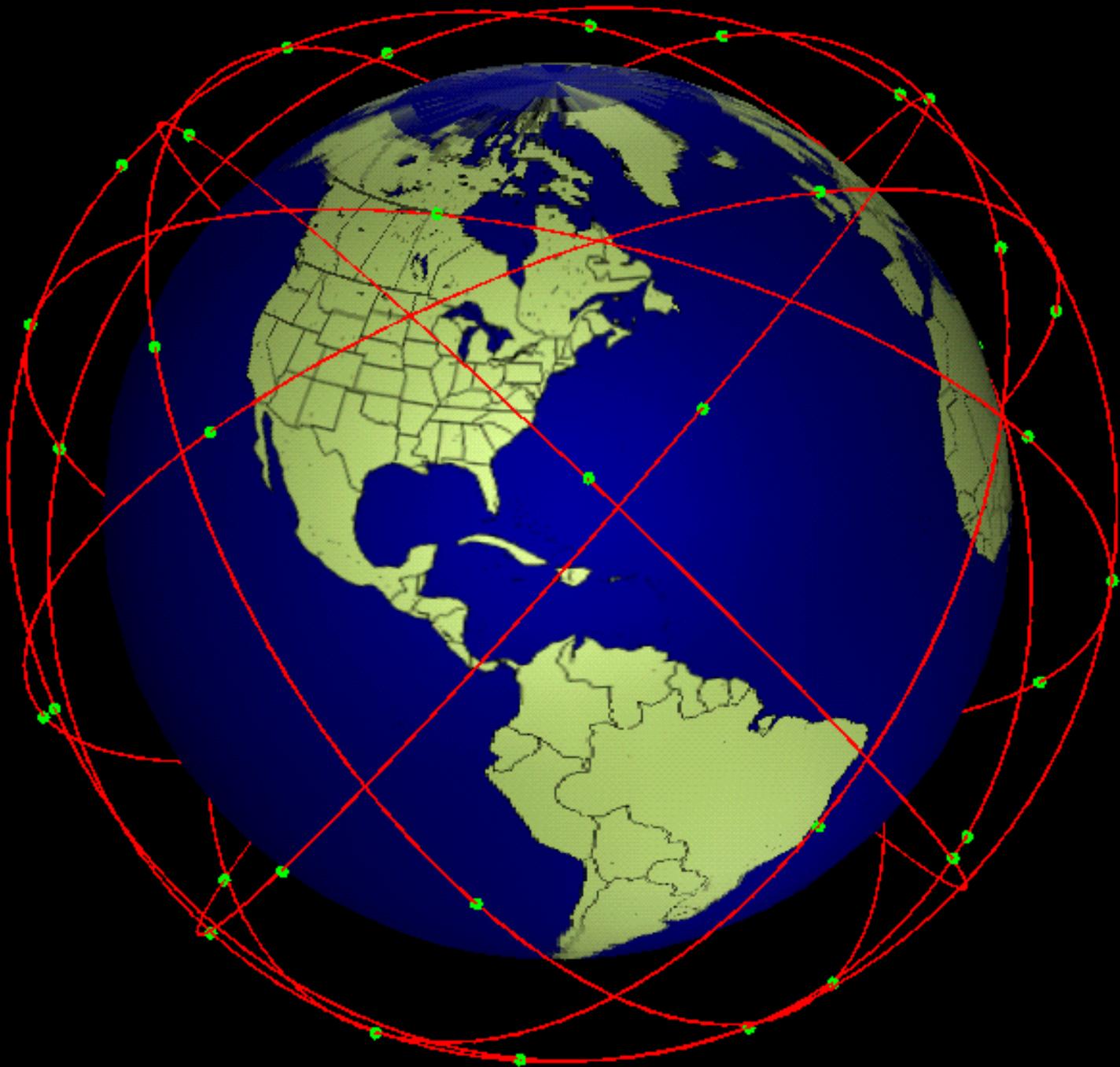






Apollo 11 Moon Launch July 1969













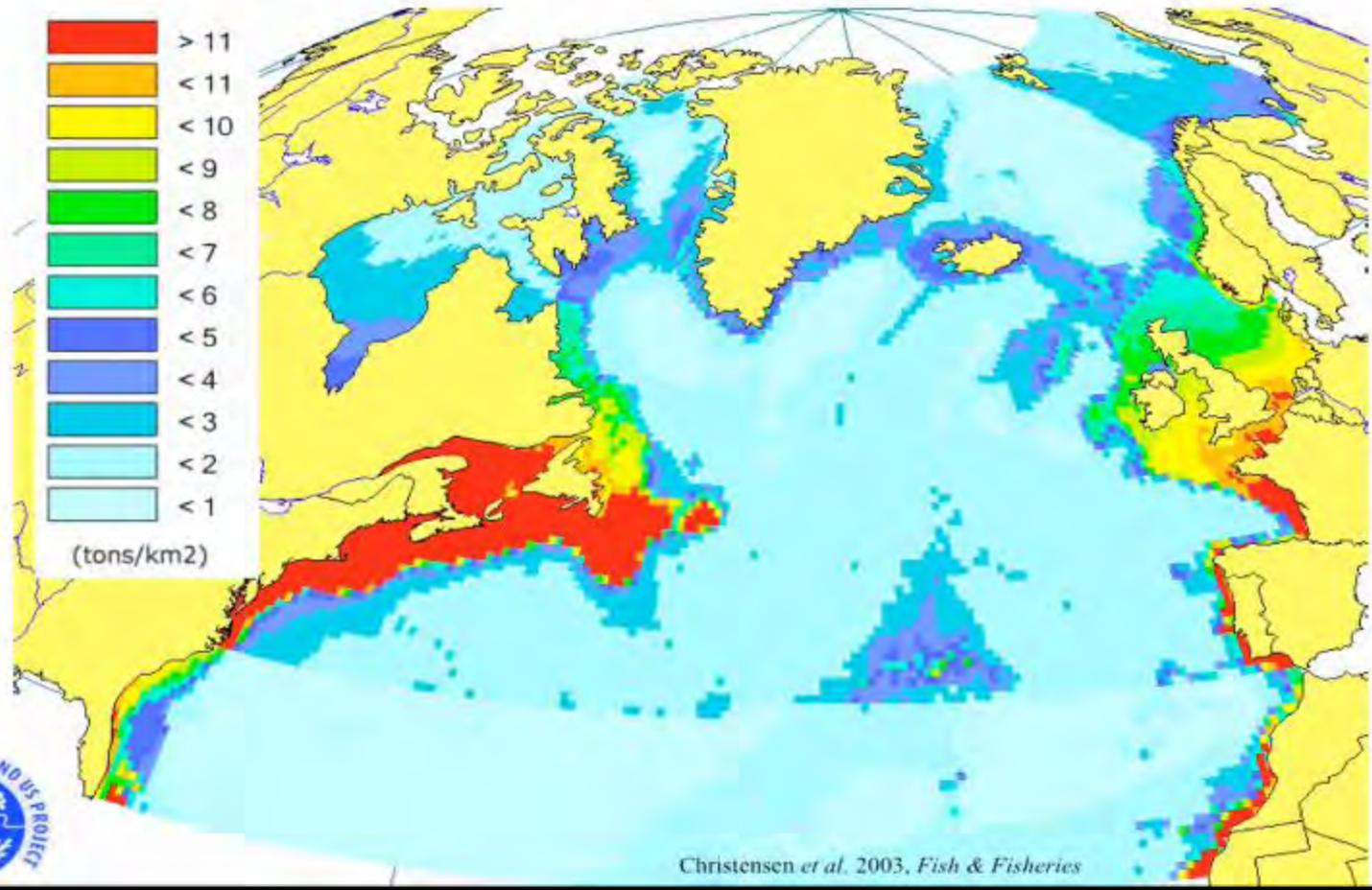






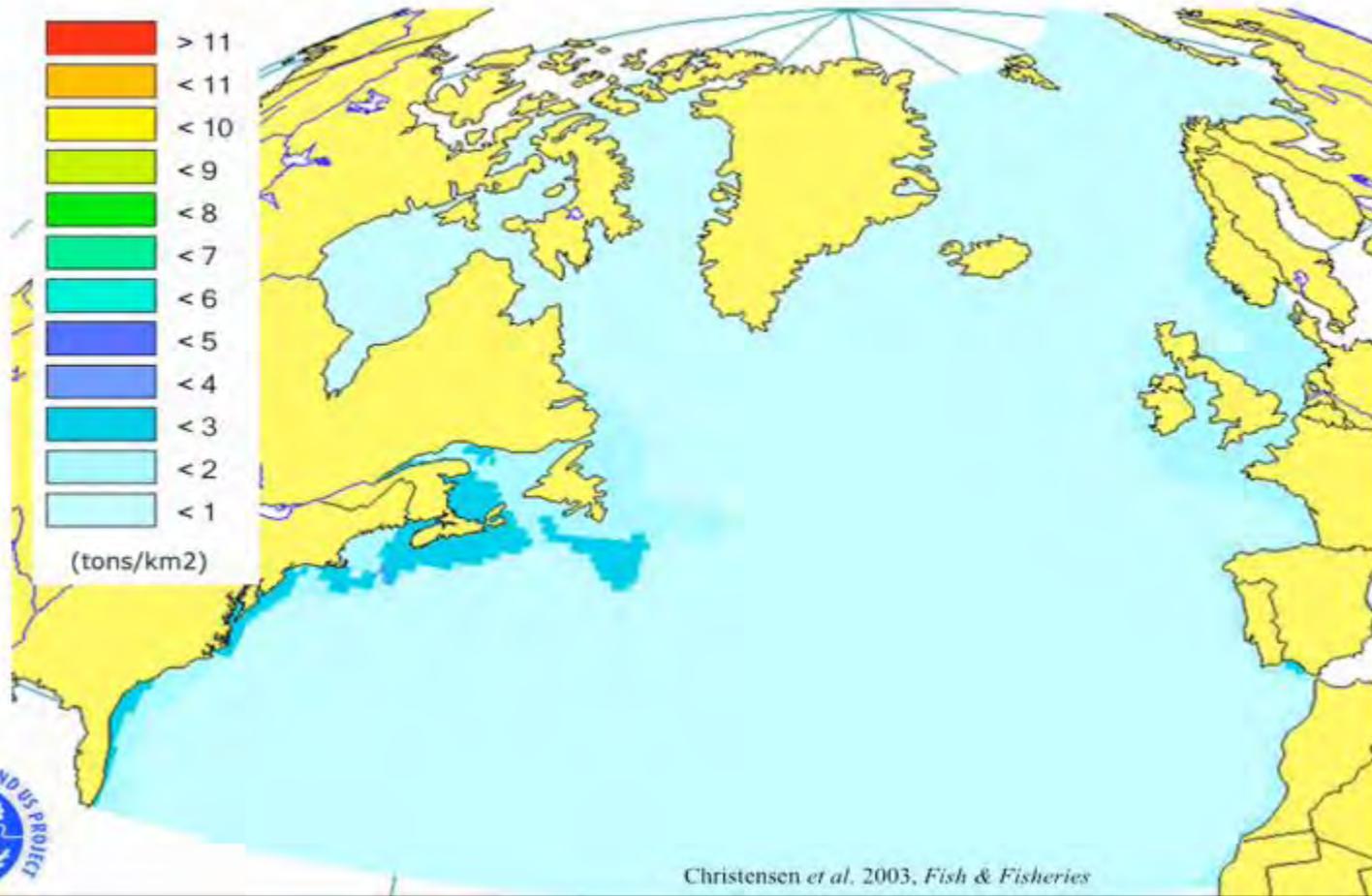


Biomass of table fish 1900



Christensen *et al.* 2003, *Fish & Fisheries*

And in 2000...











© Joachim Plötz/Alfred-Wegener-Institute







Credit: Terry Goss













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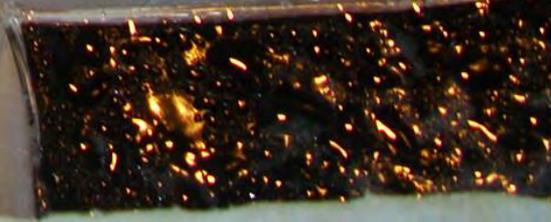
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© From the IMAX film "Volcanoes of the Deep Sea" courtesy Rutgers University





World Population Growth

billions

10

8

6

4

2

0

- Developing regions
- Industrialized regions

1750

1800

1850

1900

1950

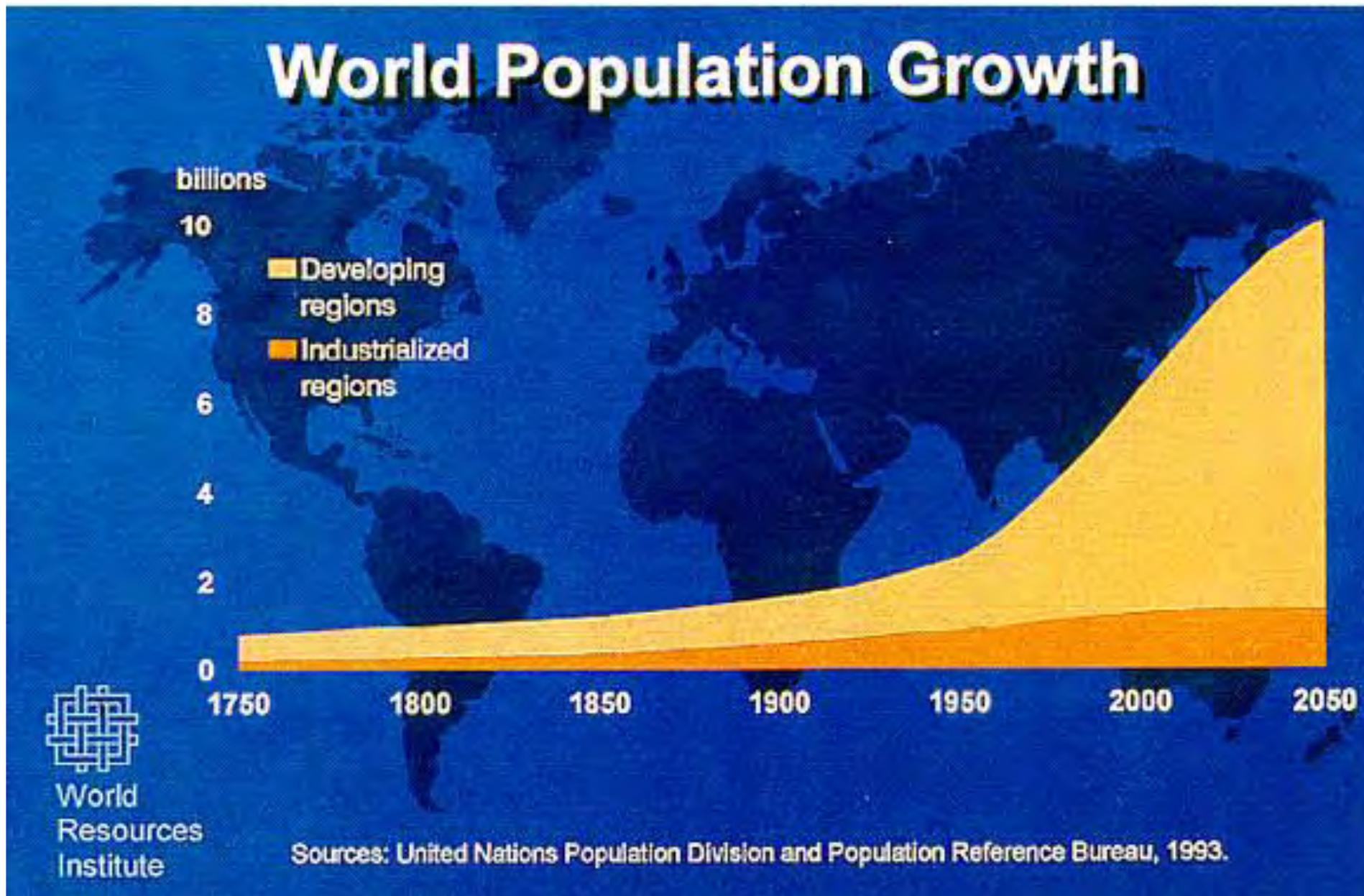
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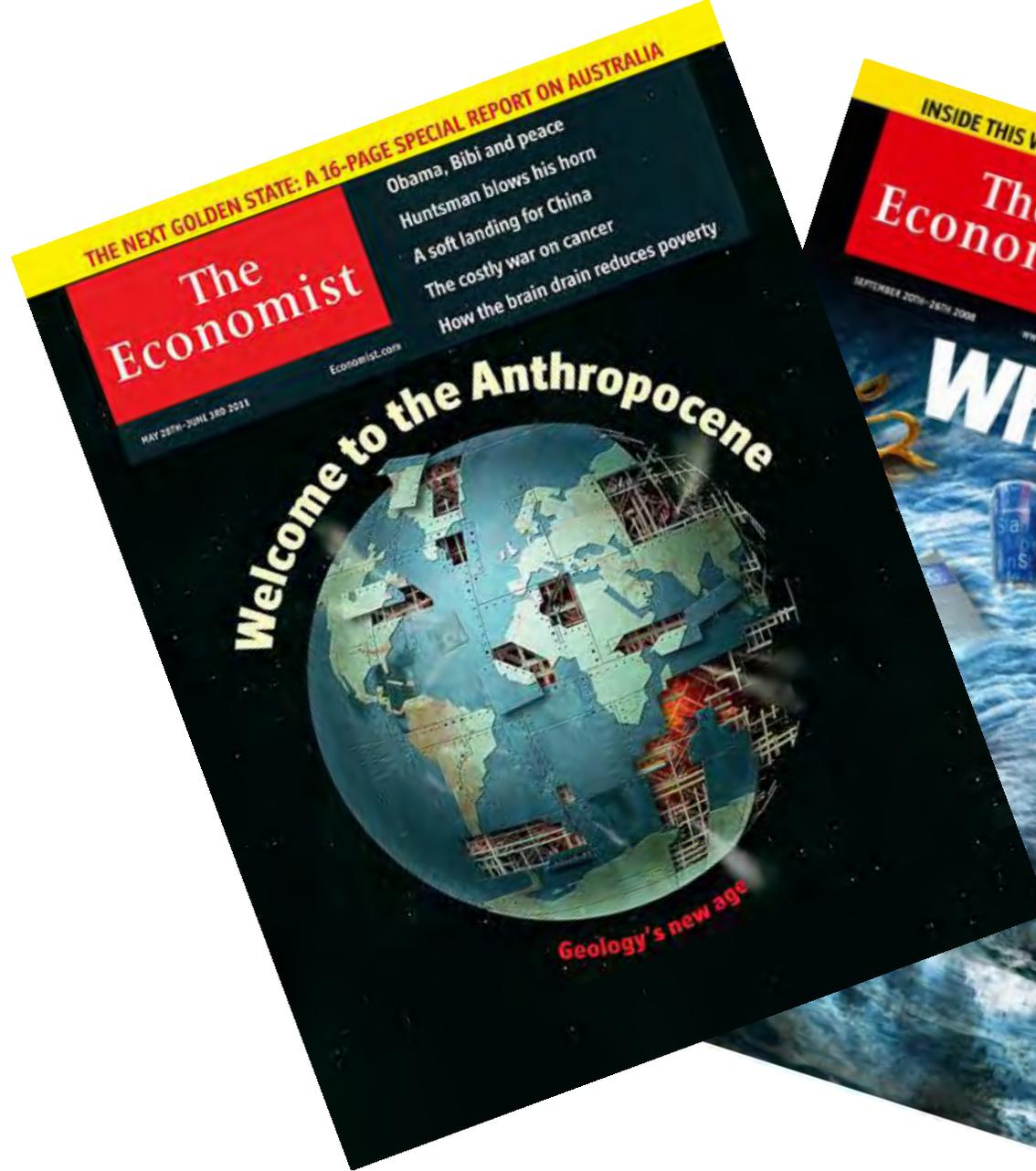
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World
Resources
Institute

Sources: United Nations Population Division and Population Reference Bureau, 1993.







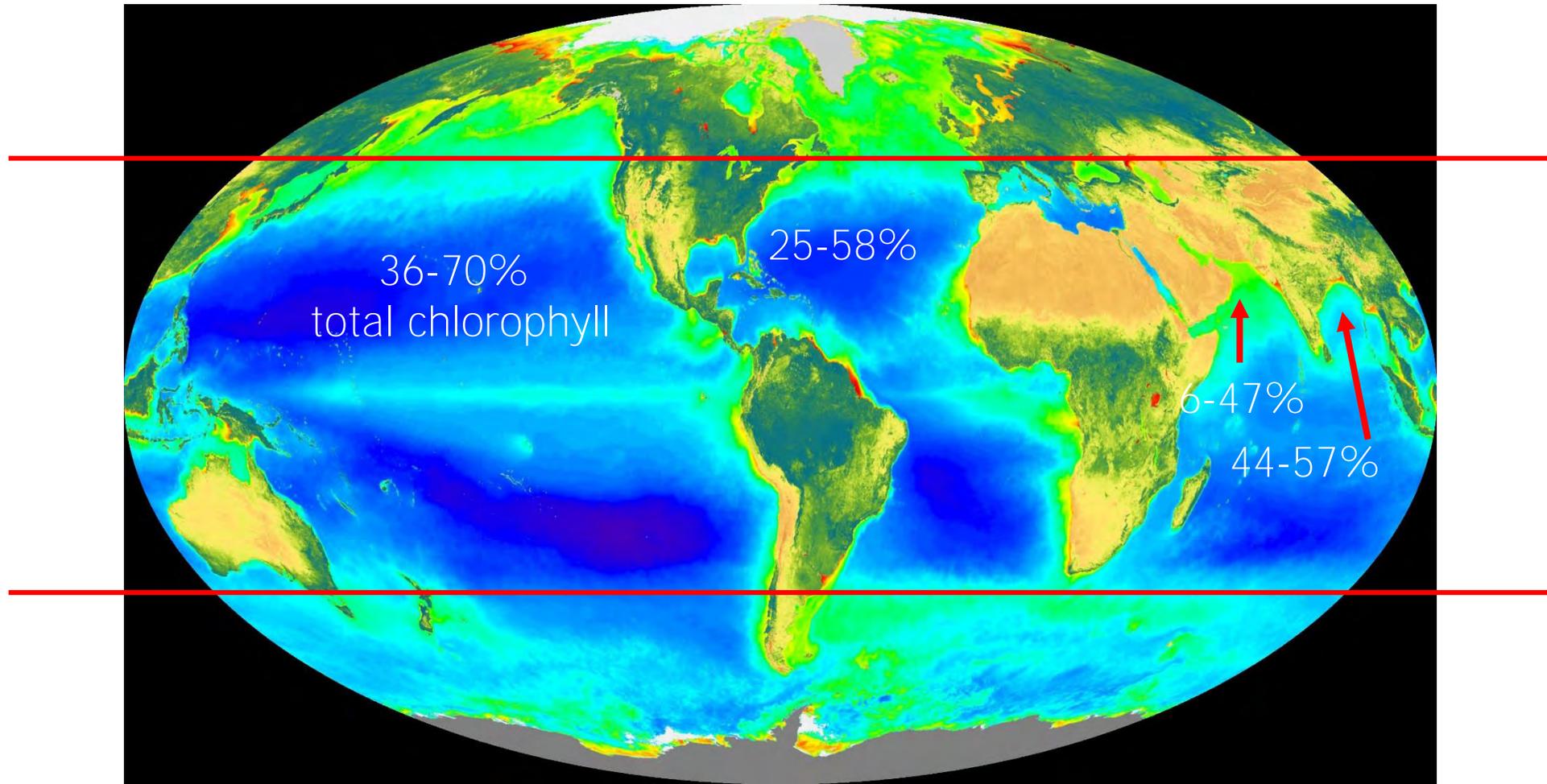






Prochlorococcus contributes a significant fraction of global photosynthesis

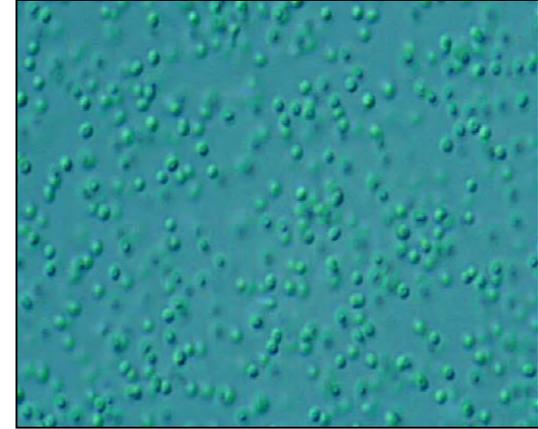
- Half of global photosynthesis is in the oceans
- Sometimes half of that – over vast regions - is done by *Prochlorococcus*



SMALLEST AND MOST ABUNDANT PHOTOSYNTHETIC CELL ON EARTH

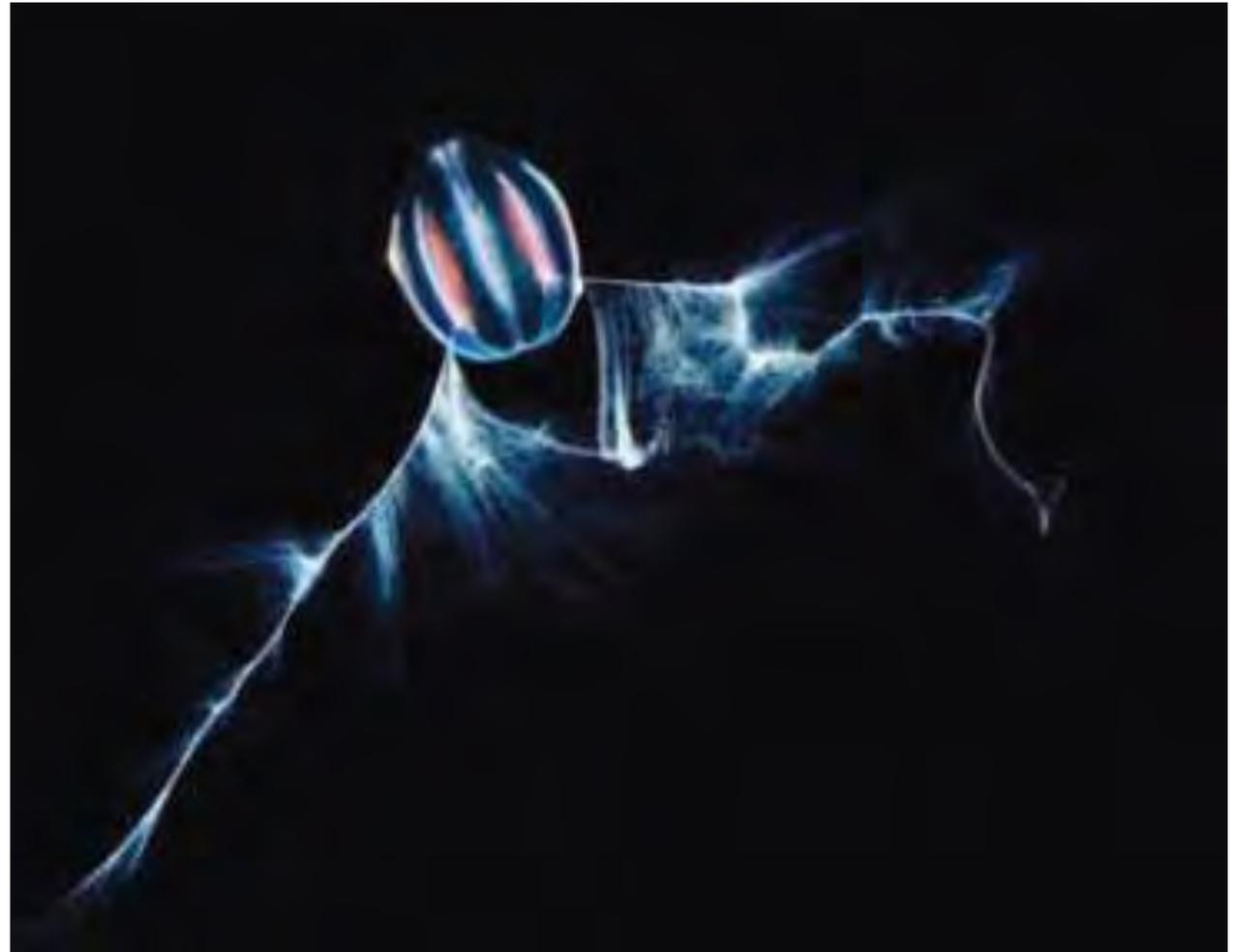


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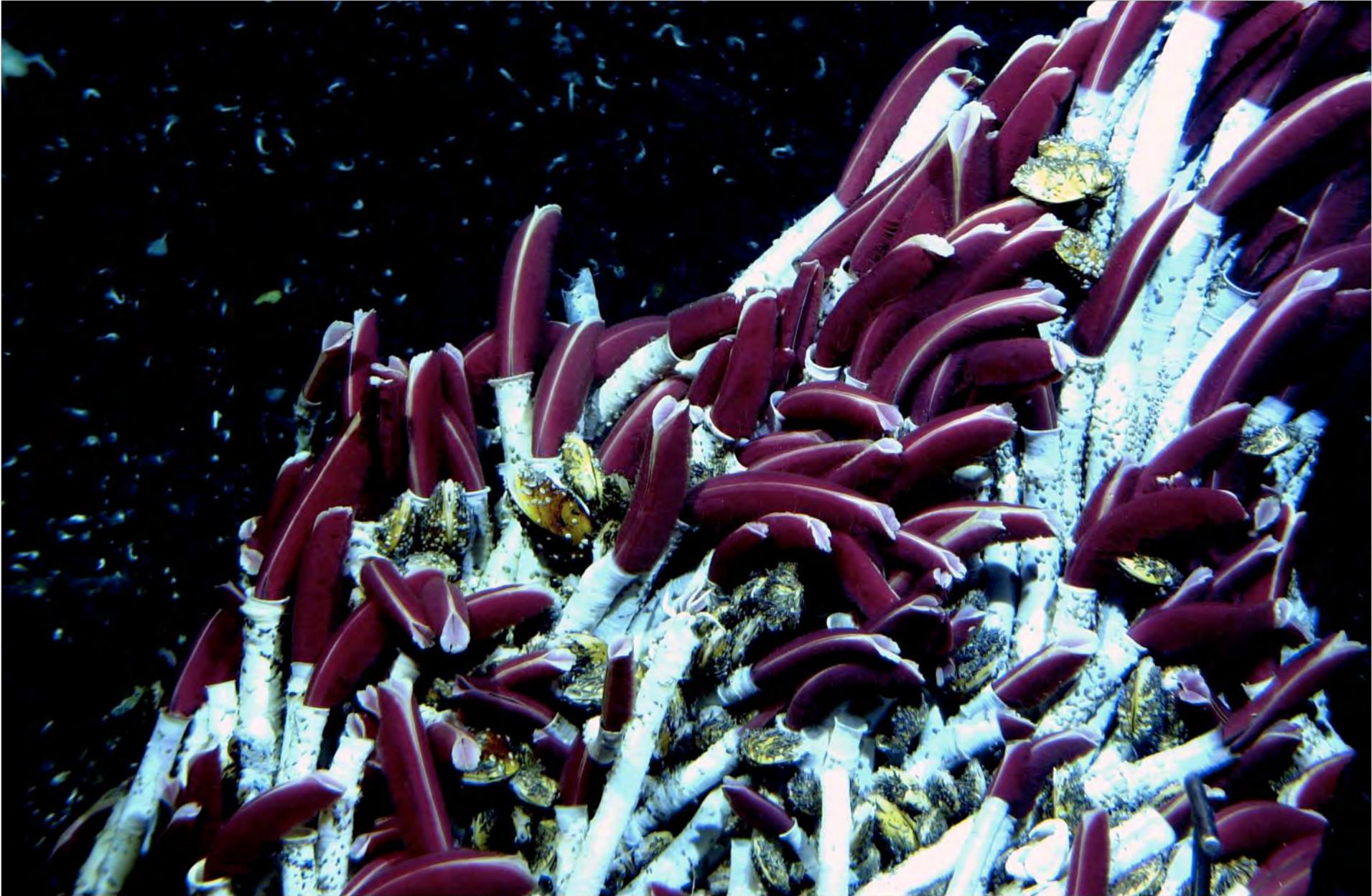


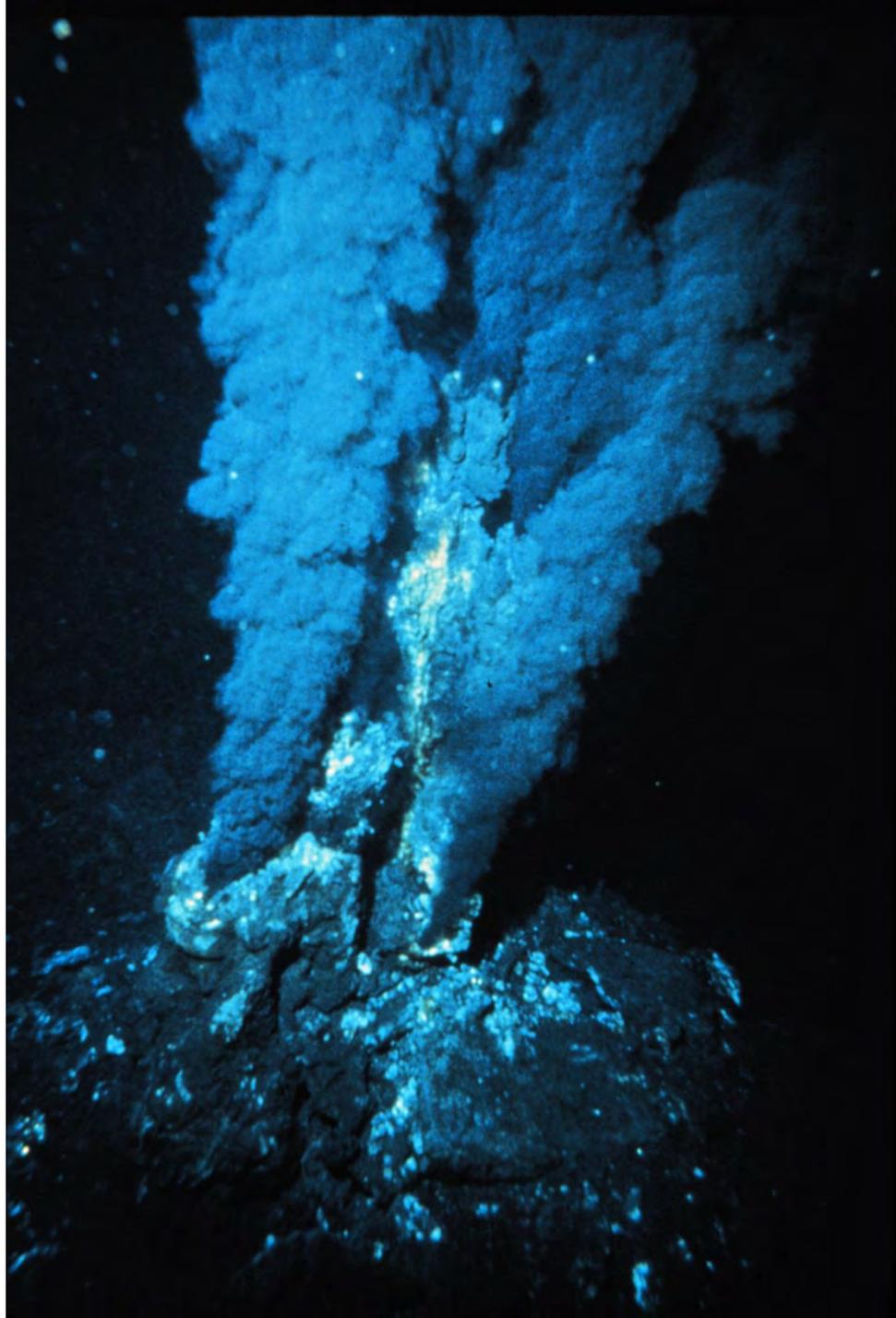
(c) Kip F. Evans - Mission Blue









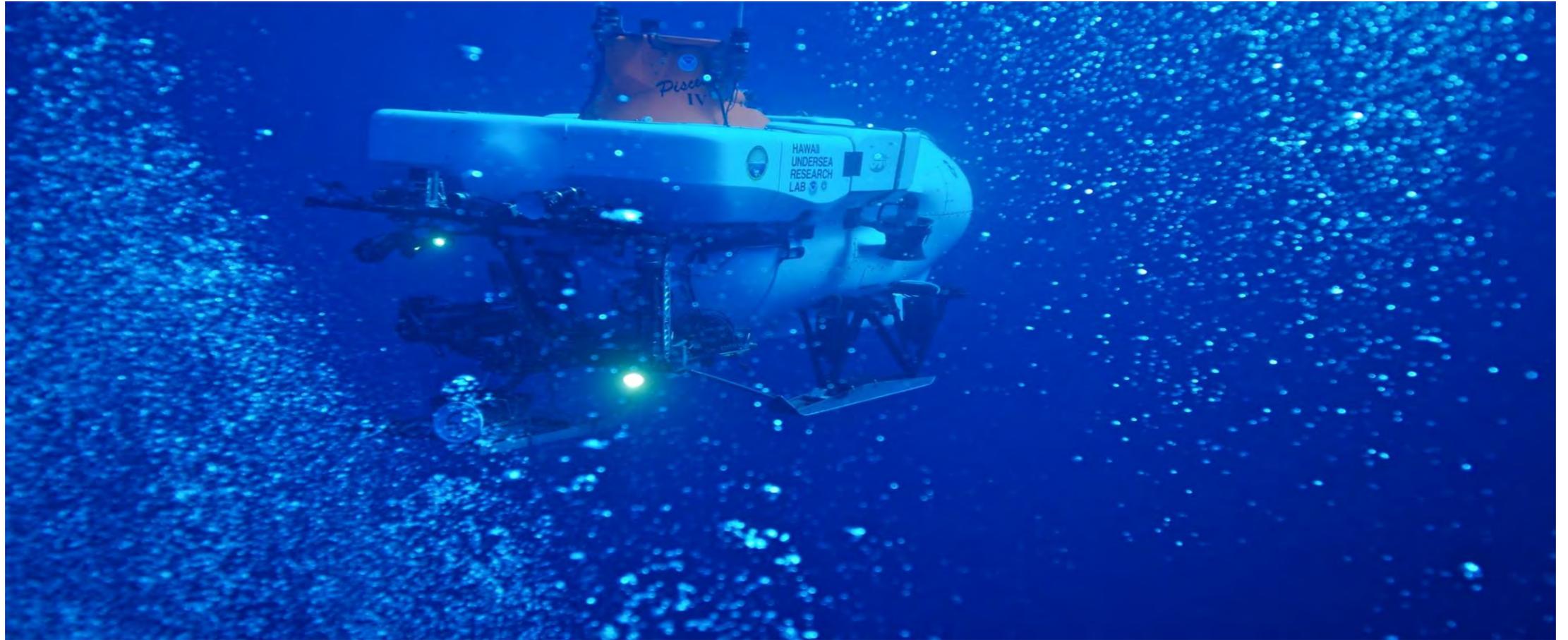


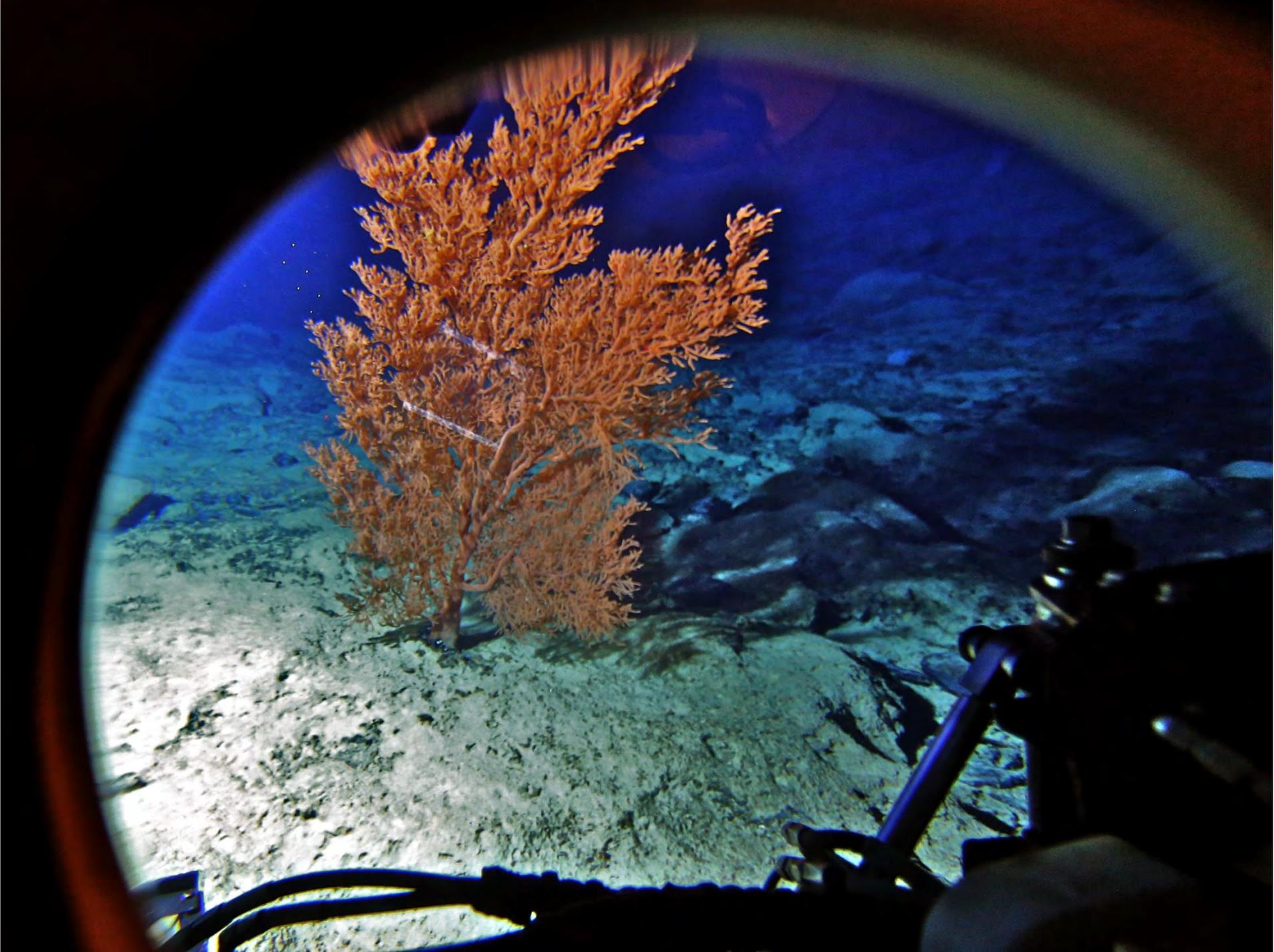


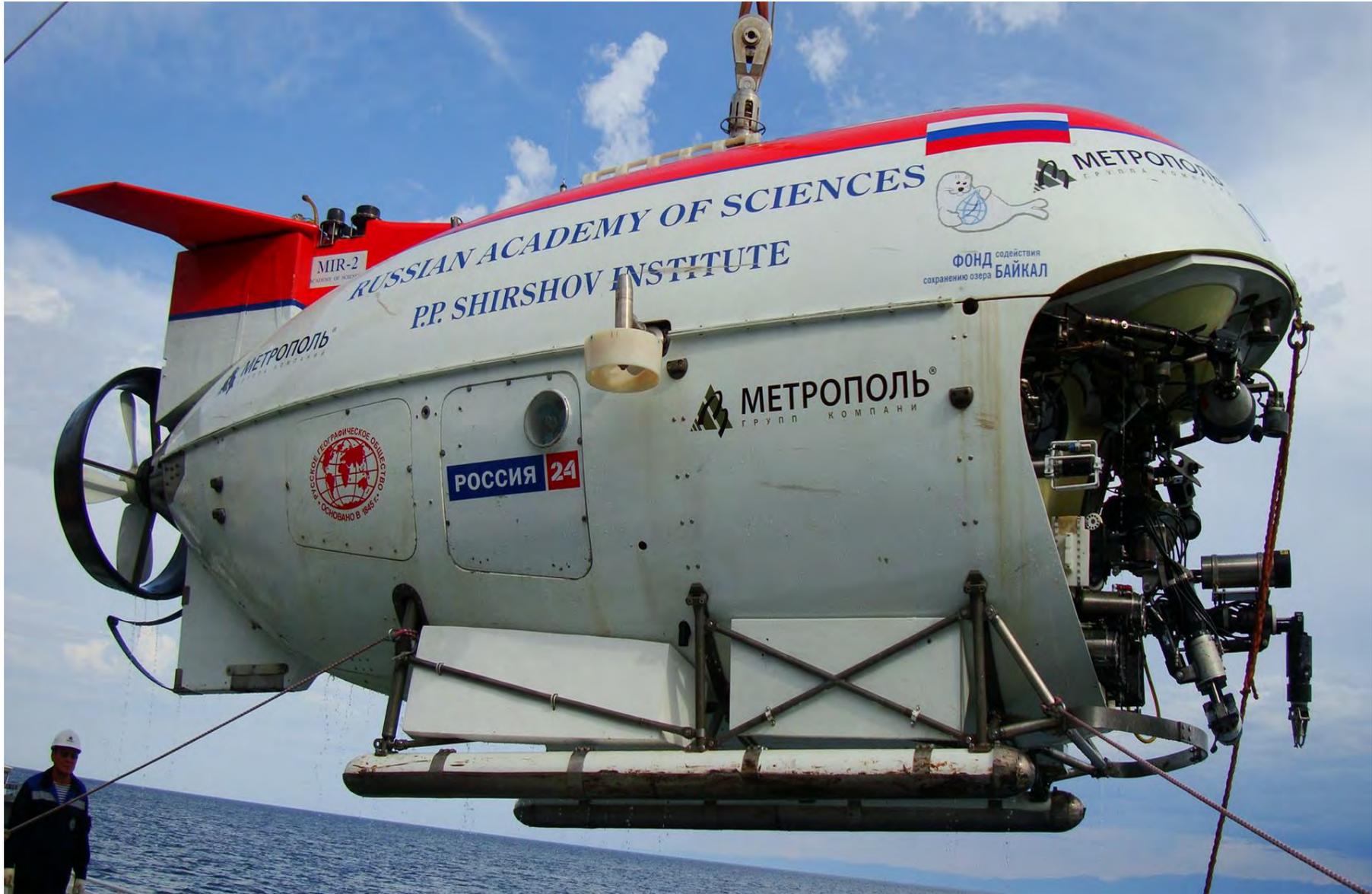
ScienceTimes

The New York Times















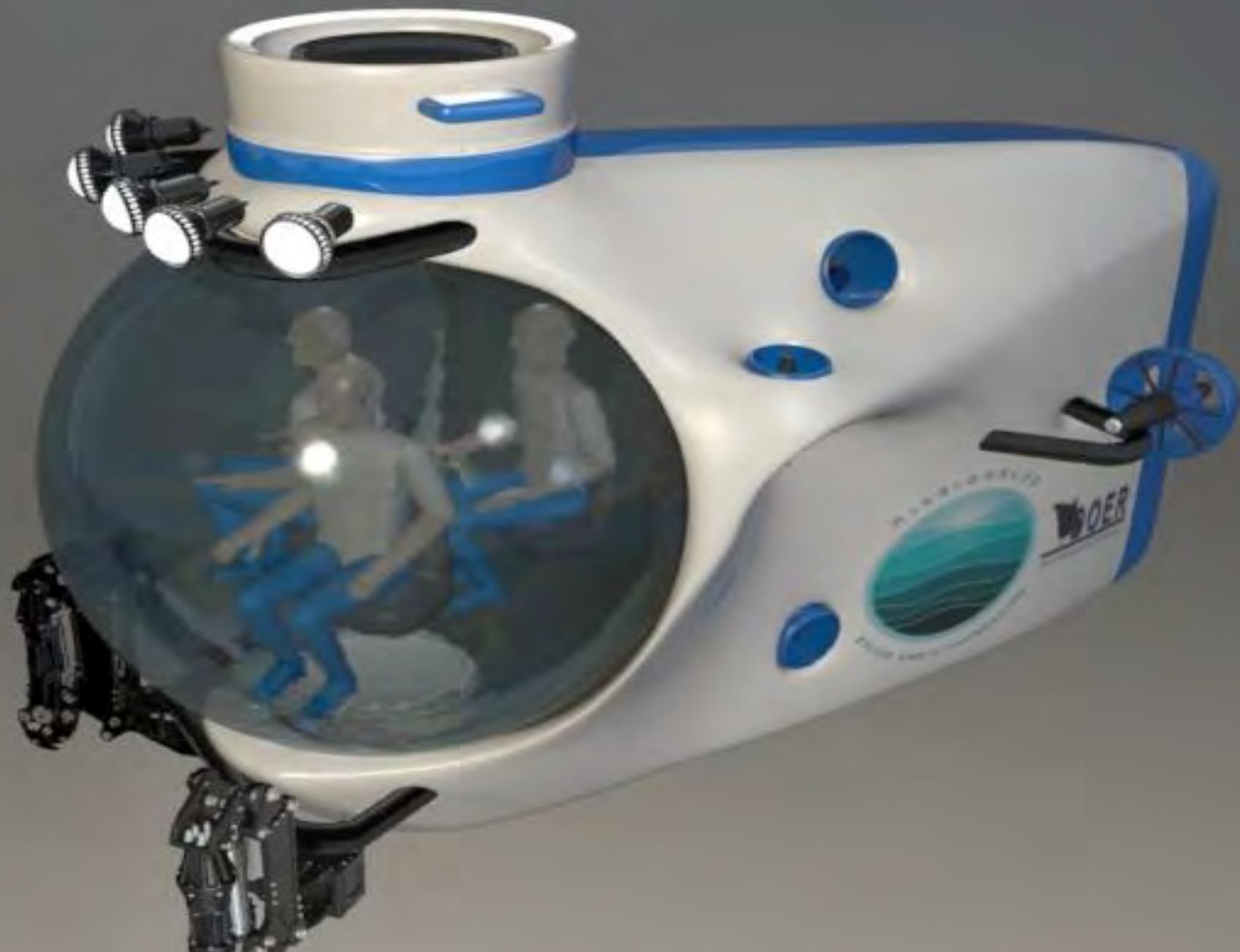




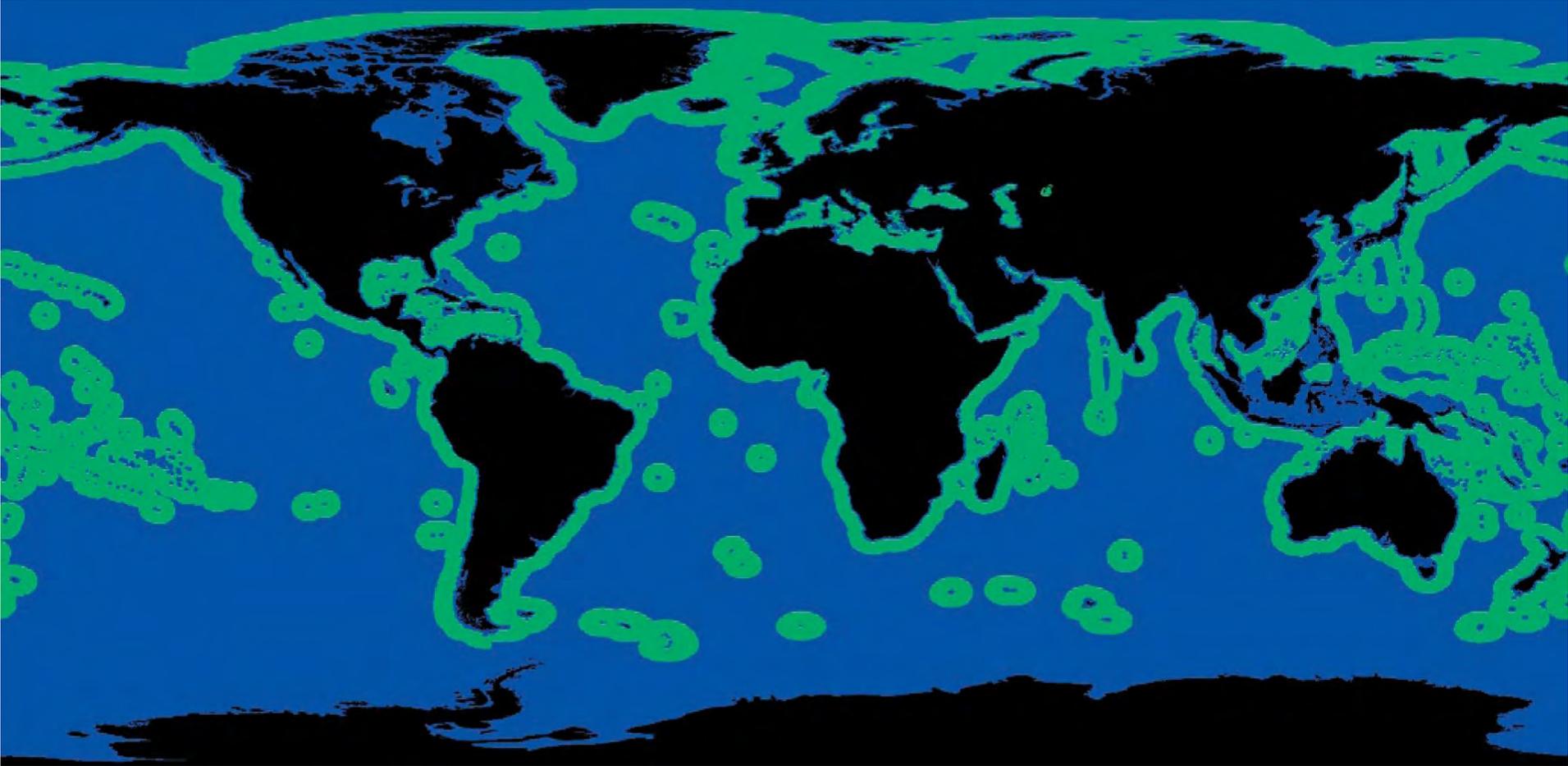








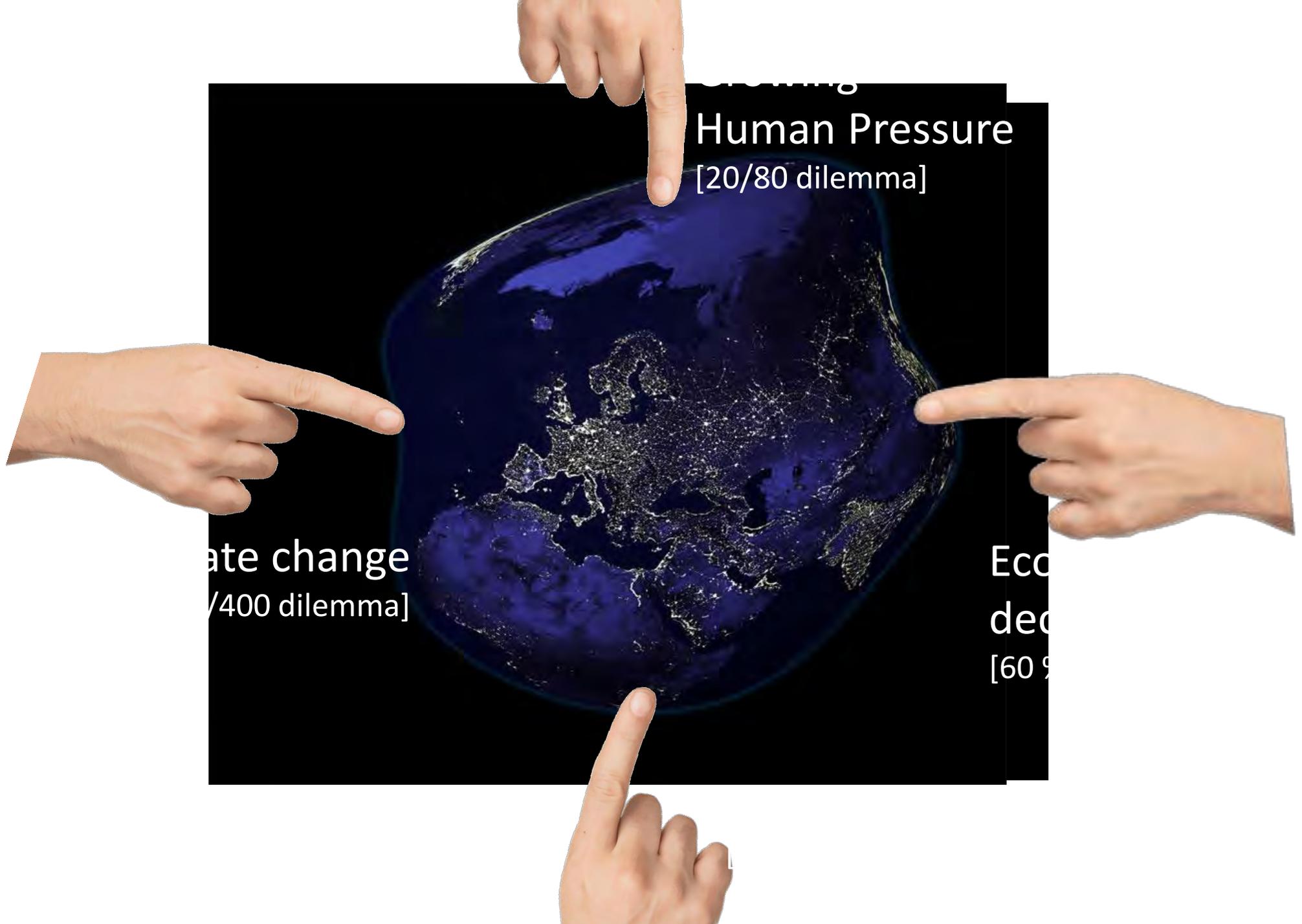


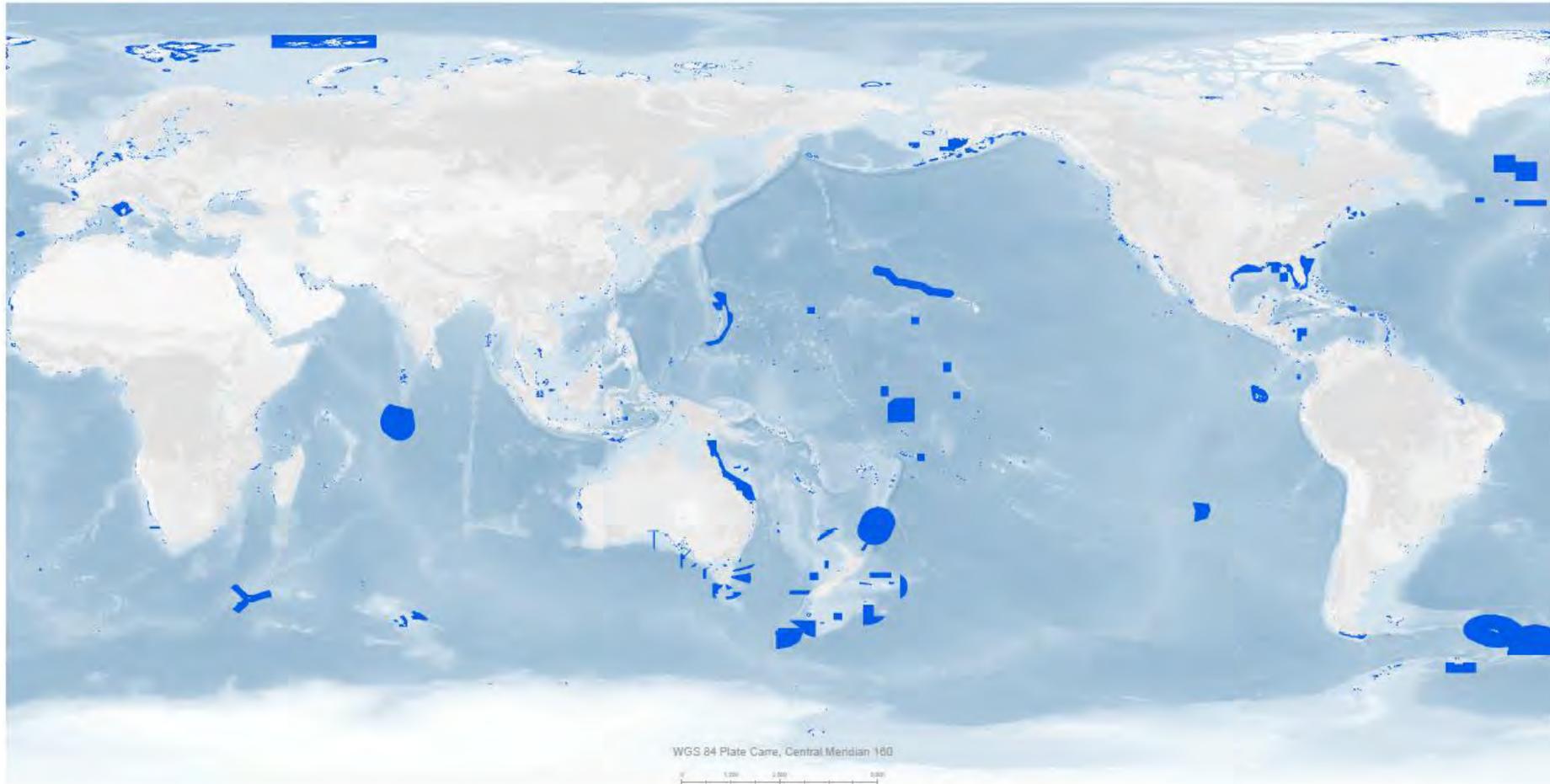


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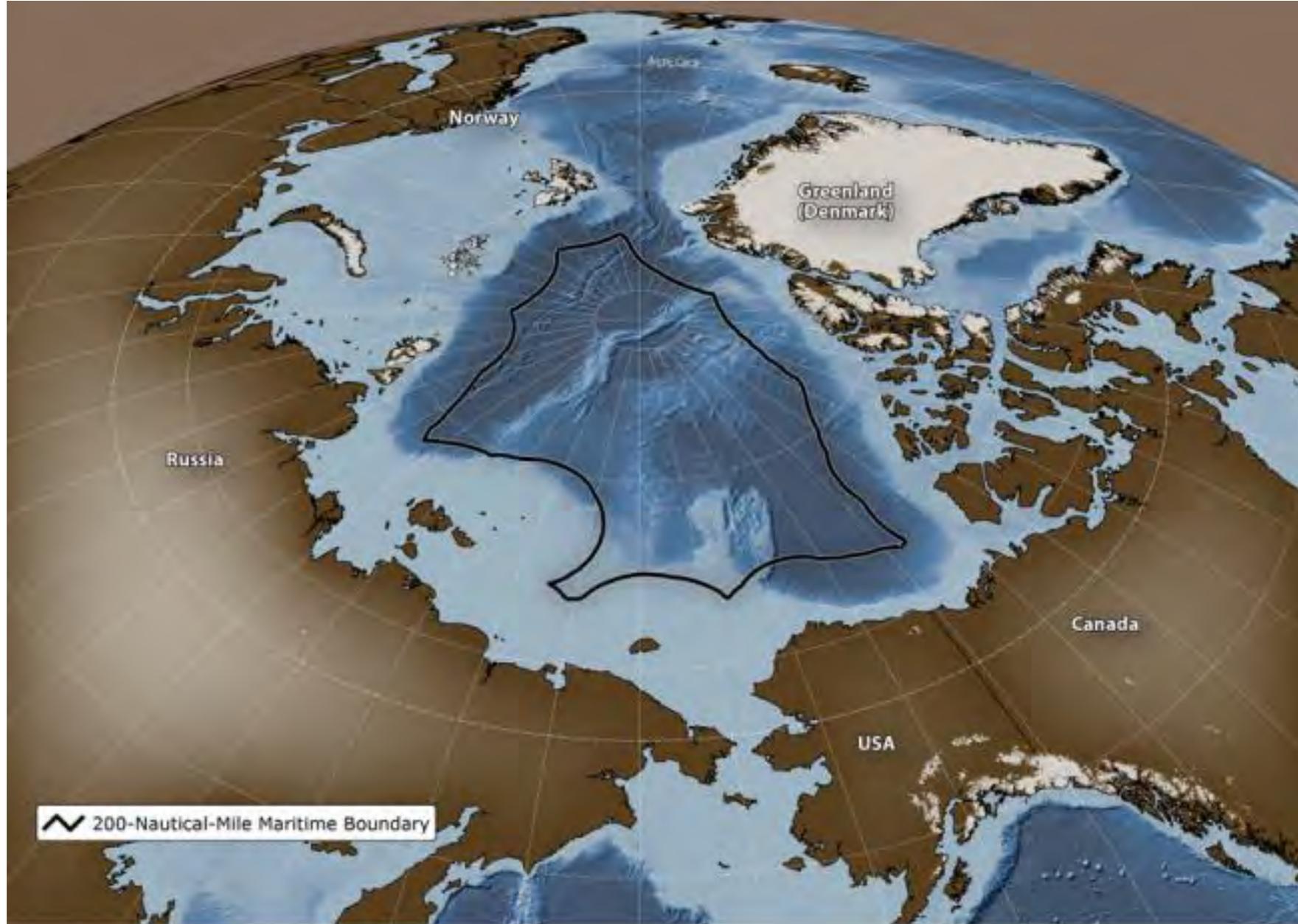
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Protecting 2.2% of the Global Ocean

Source: IUCN and UNEP-WCMC (2013). The World Database on Protected Areas (WDPA) Official Map Series: Marine Protected Areas. Series M01. WDPA October 2013 Release. Map available at: www.protectedplanetocian.org; WDPA available at www.protectedplanet.net.



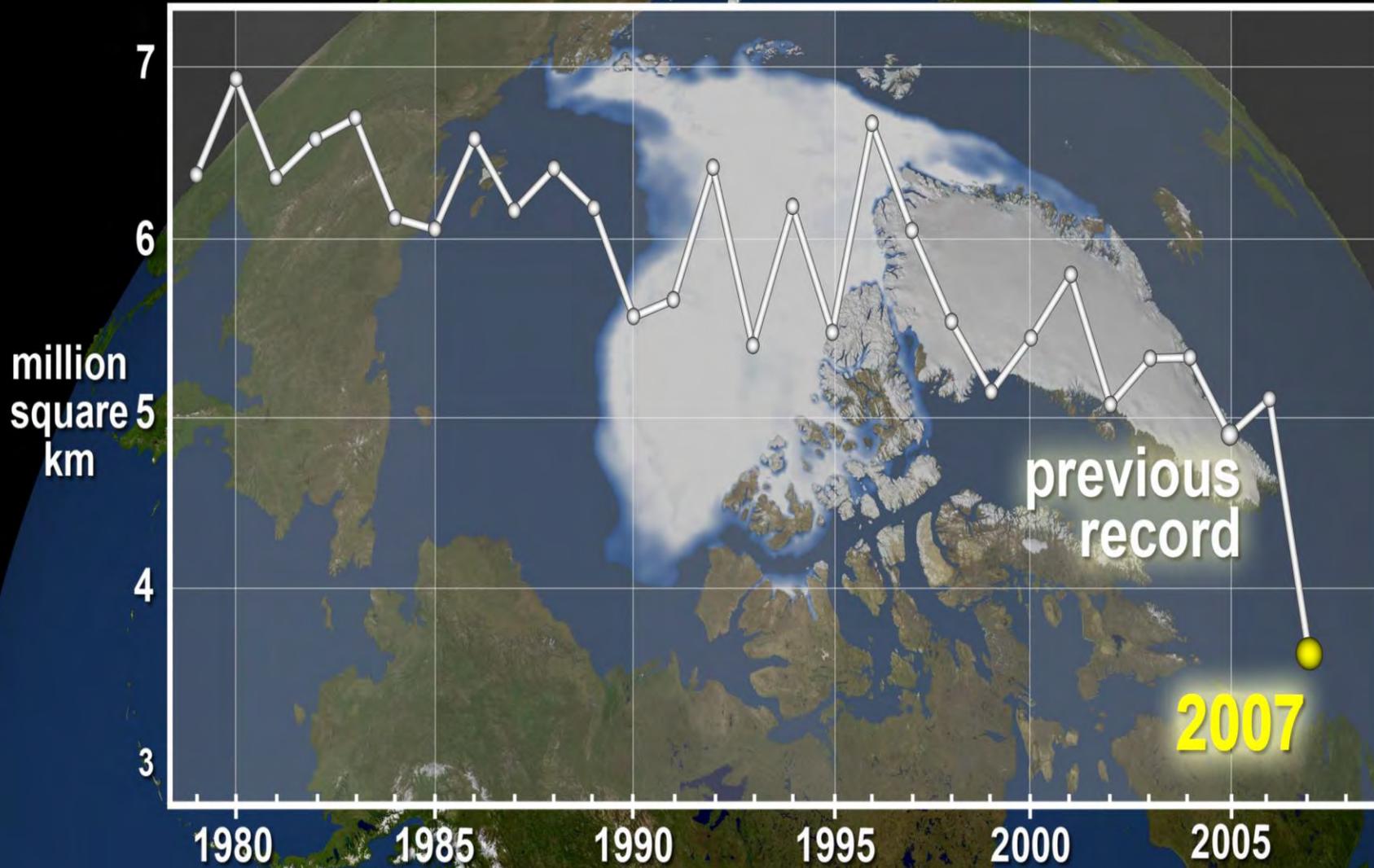
Central Arctic Ocean

© The Pew Charitable Trusts

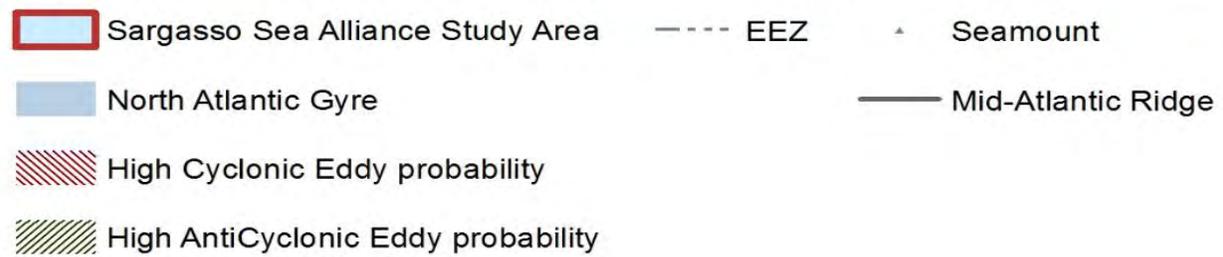
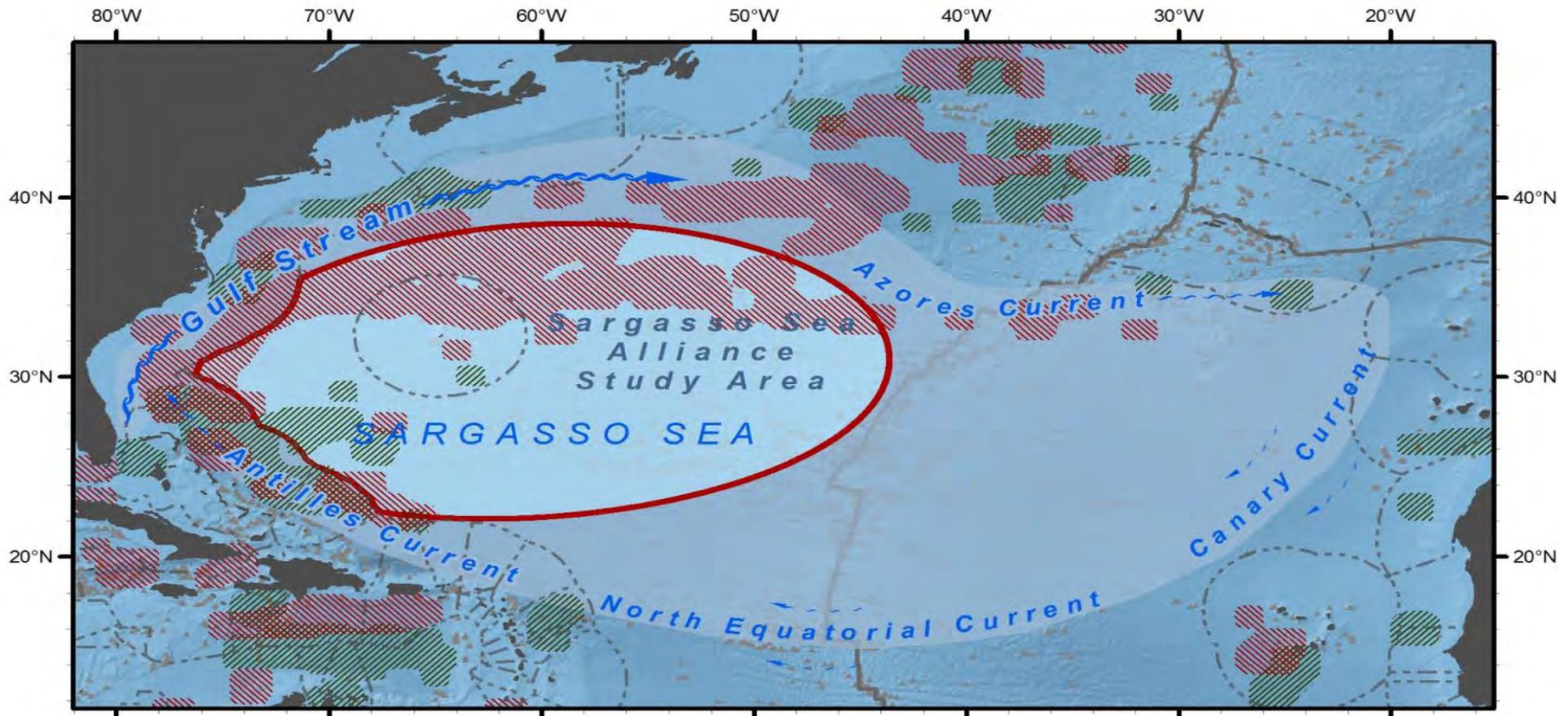


Courtesy NASA/GSFC

Annual Sea Ice Minimum







Map commissioned by SSA from Duke University Marine Geopstial Ecology Lab – Dr Pat Halpin









保護鯊魚！我唔會食









