ALASKA STATE LEGISLATURE
HOUSE SPECIAL COMMITTEE ON FISHERIES
February 13, 2008
8:43 a.m.

MEMBERS PRESENT

Representative Paul Seaton, Chair
Representative Craig Johnson
Representative Gabrielle LeDoux
Representative Peggy Wilson
Representative Bryce Edgmon

MEMBERS ABSENT

Representative Kyle Johansen
Representative Lindsey Holmes

COMMITTEE CALENDAR

OVERVIEW: ALASKA DEPARTMENT OF FISH & GAME CAMERA SLED RESEARCH/HABITAT ASSESSMENT/SEABED MAPPING PROGRAM

- HEARD

PREVIOUS COMMITTEE ACTION

No previous action to record

WITNESS REGISTER

GREGG ROSENKRANZ
Alaska Department of Fish and Game
Kodiak, Alaska
POSITION STATEMENT: Provided an overview of the seabed mapping program.

ACTION NARRATIVE

CHAIR PAUL SEATON called the House Special Committee on Fisheries meeting to order at 8:43:21 AM. Representatives Seaton, LeDoux, Johnson, and Edgmon were present at the call to order. Representative Wilson arrived as the meeting was in progress.

8:43:33 AM

OVERVIEW: Alaska Department of Fish & Game camera sled research/habitat assessment/seabed mapping program

8:45:01 AM

CHAIR SEATON announced the committee would hear a presentation by the Alaska Department of Fish and Game (ADF&G) scallop biometrician, Gregg Rosenkranz, on the camera sled mapping of seafloor habitat and stock assessments. Chair Seaton said he watched the equipment be installed on the vessel in Homer and wanted the entire committee to learn about this cutting edge technology. He then announced the committee would hear an overview on mariculture permitting on Friday and discuss a committee substitute to HB 257. As originally introduced, HB 257 transfers mariculture permitting from ADF&G to the Division of Agriculture in the Department of Natural Resources. The committee substitute removed the transfer but allows the Alaska Grown label to be applied to mariculture products, a major change from the original legislation. He told members to ask questions as the presentation is in progress and asked Mr. Rosenkranz to begin.

8:46:24 AM

GREGG ROSENKRANZ, Biometrician, Division of Commercial Fisheries, Alaska Department of Fish & Game, introduced two people who have also worked on the seabed sled project, Rick Sheppard, an analyst programmer in Kodiak, and Mark Hoffman (ph), a boat officer from Homer.

8:46:57 AM

MR. ROSENKRANZ presented a slide show and told members the following:

> I put this slide up to remind myself to give a little bit of a disclaimer. That is Kodiak there ... Kodiak is a fishing town and I'm an ex-fisherman so a lot of my perspective on these things is influenced by my past experience as a fisherman and I'm liable to say some things that aren't official department policy. I don't have anything to do with official department policy. I'm a researcher so I just wanted to throw that out right from the start.
>
> I'll talk a little bit about the history of this scallop video project. I'm not going to really be

talking a lot about the scallop fishery but a few things will come in. I'm going to describe this new system that we put together that's based on a GigE Vision camera and I will show you with maps where we sample and I'll show you underwater images of what you see, what we see, and I'll talk a little bit about the data analysis and where we're trying to go with this research.

This is the map that shows Alaska weathervane scallop fishing areas and actually the red areas are where fishing has occurred since 1993 when the observer program started. And actually, to make those red polygons visible, I had to make them bigger than they actually are. The footprint of the fishery is fairly small. It's confined to these pretty compact areas and then there's a lot of black. There are a lot of areas that are closed to fishing and a lot of them we know that there are scallops in and that's probably our best conservation measure is the fact that we have all of these closed areas. ... For example, out here we know there are quite a few scallops in and we know there are scallops down here.

I don't know how familiar you folks are with the history of this but a lot of these areas were closed to protect tanner crab habitat and that's really the main reason that you see the closed waters there.

Why imaging for scallop stock assessment? Well, on the left there you see a sampling dredge that ADF&G deploys off of one of their own vessels. It's kind of a smaller model of what is used in the commercial fishery with a liner inside of it so you retain the smaller scallops but these things are very finicky. Sometimes you catch what's there. Sometimes you only catch one-half of it. Sometimes you might only catch one out of ten scallops and it's just about impossible to estimate that efficiency. The sled is also non-intrusive, which is nice in case, say, you want to sample in some closed areas. It provides habitat information ... underwater images do. The dredge does in a way but it integrates it. Basically you bring up the habitat and dump it in a pile on deck, sort through it, and then throw it back over. And then the bottom one, cost effective, that's always a concern for Fish and Game so there is no way that I'd be here

talking about this if what we were doing was not cost effective.

8:50:10 AM

MR. ROSENKRANZ continued:

And this is one reason why this technology can be cost effective is because you don't need as many people at sea. This is a bunch of ADF&G biologists sorting through a dredge catch near Kayak Island where there is some pretty heavy scallop fishing but it's a very labor intensive way to sample.

Factors affecting catch per unit effort – this is sort of my laundry list of reasons why I think that the dredge sampling is not a particularly good way to go and also what makes it difficult to manage fisheries with just catch per unit effort data, which we do a lot of in Fish and Game. If there's no survey there, you'd have fishery data like catch per unit effort and that's what we manage a lot of stuff on. But, there [are] all of these little things that could affect the measure of CPUE like the captain, the vessel, the sea state, the electronics, etcetera and the list goes on and on and there's a similar list for trawl surveys as well. I mean I don't think a trawl is a particularly effective sampling device either. So, for those reasons, we started working on doing some underwater imaging as a possible replacement for dredge surveys back in 2000 and the first thing we had was this little drop camera.

And there's just a little camera pointed straight down right there and there's a recording device inside there and some batteries and we're taking pictures of the bottom. Well, you can't cover very much ground with a drop device like that and so it wasn't too long before we thought well, we need to drag this thing along the bottom so this is what we had in 2001. And, again, there's the little underwater camera and there's just batteries and a camcorder where the data is recorded and a couple of lights pointing down. Oh, and that was when we had the camera pointed forward. We were worried about were the scallops swimming out of the way. Scallops can swim and we noticed that was

a very rare occurrence so we changed to point the camera straight down.

So we kept modifying the sled and towing it around and we did a lot of surveys with it and we got a bigger battery, more lights, we had a little fancier housing with the camcorder in here but still, you're really limited by that battery and you're recording the data on tape so you have to haul this thing back every 15 minutes, which takes a lot of time. And, in fact, you spend most of your time hauling it up, getting the camera out of there, making sure you got data, putting it back down, etcetera. And also there are really some safety issues too. We were setting this over the side on a fairly small boat and you can see how banged up that thing is there. We'd be doing this like 50 miles offshore in the Bering Sea. So I finally – I kind of got tired of it. It wasn't very efficient and it was dangerous and I was like well, we're going to keep doing this. Someone's going to get hurt. That's not going to be good. So, I had to kind of sell the people around the state on the fact that we needed to upgrade. We needed to do something different and the way that we financed it was simply by not going on a survey for one year. I should note that the funds for this particular project have always come from CFEC [Commercial Fisheries Entry Commission] since day one. It's not a large budget but that's the money we used so we took the money we would have used to go to sea one year and saved it up and decided to do this upgrade. That was about the time I met Scott Gallagher. The one semi-smart thing that I did while we were towing that other sled around was I did write a paper on that and got it published in a fisheries journal so people sort of knew who I was and I was able to go to this meeting in Seattle about underwater video stuff and Scott Gallagher was one of the people there talking about his HabCam system. I realized pretty quickly that this technology addressed all of the concerns that I had about what we were doing: one, it had live feed to the surface so you could see what was going on down there; two, much higher resolution than putting a camcorder in a pressure housing and pointing that at the bottom; and three, the lighting – using strobe lights. I just was like oh, wow, that really makes a lot of sense Scott, you're a great guy.

So we went and visited them in November of 2005 and I should note the HabCam is actually a joint project with Woods Hole and the fishing community and these guys are actually ex-fishermen that are also really smart guys and they approached Scott and said hey, we need to do something better here than what's getting down as far as scallop research on George's Bank and that's how the project got started – their project.

And I really think I was delusional looking back on it. But we actually had the basic pieces of the system ... mounted on the old sled, which wasn't very optimal but we had that going that next June and I don't see how we ever did that looking back on it but we did.

So, what are the parts of the system? I should first explain that GigE Vision is a standard from the Automated Imaging Association, which is a machine vision industry trade group. Scott Gallagher was the one who was smart enough to see that in a way towing something along the bottom and emptying the bottom is a lot like machine vision where you basically have a camera pointed at a conveyor belt - is often the scenario in machine vision - where you're inspecting something. So he was able to see the connection and start using technology from the machine vision community in fisheries research. So we had design assistance from the HabCam project. They basically just showed us here's the stuff we use. They didn't say here's how you ought to do it or anything. They said here's how we do it. You could try this.

8:56:26 AM

MR. ROSENKRANZ continued:

Of course we were looking for a low cost approach because we didn't have a lot of money. And it also needed to be pretty simple because we're not Woods Hole. We don't have the technical expertise that those people have there. So really, kind of the subtitle of this whole talk could be taking Woods Hole to the – can Woods Hole technology be used by a state agency? It seems like the answer to that is yes.

So the system components are this GigE Vision camera I'll show you, strobe lighting – and that's really important because when you're towing this thing across the bottom what you really want to do with the data is look at a still image. People will show you some nice video and you'll see a fish swimming along but when they stop that video playback, the still image will always be a little blurred and the reason why is because you traveled a certain distance across the bottom while the shutter was imaging so there's always motion artifacts. Well [with] the strobe lighting you've got about 20 milliseconds of light and you don't travel very far during 20 milliseconds and so you get a much, much sharper image than you'll ever get with video with analog lighting.

The other really nice thing about this system is it uses commercial off-the-shelf Ethernet hardware. It's the same type of stuff they use to wire up the Capitol Building probably, so you all have Internet connectivity at your desks. These are, you know, you can go to 10 different suppliers and buy a lot of the pieces that we use. There is also armored fiber optic tow cable, which isn't widely available, one of the more spendier parts of it, wench with a slip ring and fiber optic rotary joint and I'll show you pictures of this. This oil filled junction box and computers and data storage are on just regular computers and hard drives.

8:58:21 AM

MR. ROSENKRANZ continued:

And I do have to acknowledge the people that helped, Mark Hoffman of the Pandalus and Rick Sheppard. And that was on our recent trip just a couple of weeks ago, we were in Woods Hole and you can see them there checking out the (indisc.). It was really nice. We were very warmly received there. They thought it was great that we were using technology that they've developed there and, surprisingly, not that many people are trying to do it. And then the third person, Mark Blakely, we did hire a consultant to help us with the first – he actually was on contract the first couple of years and he's a local Kodiak guy who

has his own [remotely operated vehicle] ROV and he helped us build some of the components of our system.

So this thing is basically a computer network. That's really the beauty of it and on the top side and the tow vessel you have a few computers and an Ethernet switch, which is a very common Ethernet device.

Then you have the two cables and on the sled there's a bottle that has another Ethernet switch in it, a serial device server, and then the camera connects directly to that switch.

I don't want to go into a lot of detail on that but the single mode fiber is – it's kind of mind boggling because I had to learn how to terminate this stuff. When you get down to the business end of it, it's – I don't want to misstate the – I cannot think of the measurement. It's about one-tenth the size of a human hair is the fiber diameter. And really, with fiber you have – I won't say unlimited bandwidth but compared to what you could do over copper, over coaxial or twisted pair, the old style of "telemetrying" data from an underwater vehicle to the surface, there's just no comparison. That was the big choice, are we going to jump ahead or are we going to be satisfied with 30-year old technology and, I guess at that point in my life I guess I wasn't afraid of failure. I was like well, let's try it. If it doesn't work, what do we have to lose? So we went ahead and tried the new technology rather than investing money in something that is 30 years old.

9:00:27 AM

MR. ROSENKRANZ continued:

There was also good timing with this. This is actually serial number blah, blah, blah zero one of this model of camera. The standard was just coming out when we were starting to put the system together but the main feature of this camera is that right there. It's a regular RJ 45 plug and this attaches directly to a computer network. This camera will run up to 15 frames a second. We run at about four – you don't really need to know about the sensor size. We just have it mounted in a little pressure housing with

a dome fork pointed straight down and this is parts and pieces we had from the old system. And then the strobe lights – it's a machine vision strobe. We just put it in an underwater housing that's made out of a piece of aluminum pipe. The telemetry bottle that fits on the sled has this Ethernet switch in it. I mean this is very simple. That's a power supply, an Ethernet switch, and a serial device server. That's really all that's in the bottle and this is that Ethernet switch and the one difference between this and what you probably have a bunch of around the building here is this. It's a little fiber optic media converter.

Now there are standards to send Ethernet, Internet over fiber optic. So, once again, it's not that expensive. There's one like this, it's also on the topside, one in the bottle. It's a pair that talks back and forth to each other and I think it's like $1,000 or something. It's not hugely expensive whereas if you want to buy a ROV or have some company build you a system to telemeter data from a vehicle to the surface, it will cost you a lot more than that.

We had to get a wench and we had this wench built in Kodiak and it's taken us three years, really. This being the third year, we finally have this thing working really pretty well now. We had some problems with it but we got it for dirt cheap by having a local company build it. If we couldn't have got it for that price, we wouldn't have been able to do the project. But the one piece of hardware in it that's essential is this slip ring and it fits right in the hub of the wench and it allows electrical and fiber signals to pass around. Basically there's a fiber – there's an interface there where two ends of fiber, one is stationary and the other is spinning against it and it transmits the data across there so that's kind of a specialized piece. They're about $6,000.

The junction box – you don't need to know a lot about that but that fits on the end of the telemetry bottle and that's where the actual fiber and electrical terminations occur on the sled end and that's something if you – you know, when we were at Woods Hole, everything they have, they have oil filled

junction boxes on everything. It's something they've used a lot and it works well.

And then on the topside, we have computers. I mean I've literally pulled the computer out from under my desk and taken it to sea for the last few years. I think I might get some dedicated computers now and then the storage, this box, hot swappable array, is not an expensive component. What fits in there are regular hard drives like you have in your computer and we just fill up a lot of them so, you know, it's cheap. It is $75 for a 300 gigabyte hard drive these days so that's not a huge expense.

And, of course, we have our favorite low cost oceanographic platform and that's the Pandalus. And again, if it wasn't for the Pandalus, we wouldn't have done any of this.

9:04:11 AM

MR. ROSENKRANZ continued:

Mark Hoffman basically took it on himself to cut the bulwarks off the stern, get this U-frame built by Bay Welding - they're in Homer. We used a lot of Homer and Kodiak vendors to build most of this stuff. So inside – this is actually a borrowed shack that they use for their ROV that they have there but we put our computers and what-not in there and you can see the sled in there. So, it's kind of an undersized vessel but we've taken this all the way from Cape Fairweather up to the Bering Sea sampling so we have quite a bit of confidence in the boat. I have utmost confidence in Mark Hoffman's skill as a boat operator. It's cheap compared to going out on a larger boat or a real oceanographic vessel. This doesn't really cost very much.

Then we use a four person crew. We maybe could take five but you don't need to have that large group of people to sort through a catch on deck because you're not really getting a catch on deck. So, this is the new sled. We just got this built by Bay Welding in Homer this last spring and used it for the first time last summer and that's right off of Cape Douglas there at the end of Shelikof Straits.

So what does this thing do? Well, it takes four – it streams four 1360 by 1024 mega pixel basically images and writes them on a hard drive on the boat in real time. So the data adds up in a hurry. You get 14,400 images an hour or 56 gigabytes an hour so you fill up one of these hard drives in a matter of five hours. The other really nice thing about it is with the strobe lighting, you can tow faster. I see now the HabCam guys are going to try and go with five frames a second and tow at five knots and that might be what we want to shoot for. But, in the meantime, when we were using our old system we were trying to tow at a knot and a half, which is almost impossible to drive a boat that slowly, plus you don't cover that much ground. But going at four knots you can actually cover a pretty good area during a day, one kind of Alaska invention the Woods Hole guys got a big kick out of. That's our safety release there.

There's a hundred fathoms of quarter inch line in there - that really strong synthetic line and a hard float with a galvanic release so if we ever did break our cable, about 24 hours later that hard float would pop up hopefully to the surface and we'd have a chance to recover the whole sled. And then the one other kind of interesting part, this green cable you see right there is what actually connects the camera to the telemetry bottle and we were the first ones to use that and even the Woods Hole people were actually really impressed with the way that we did that and they are using the exact same thing on a bunch of stuff now. The other thing is our vehicle actually rides on the bottom. The HabCam is towed off the bottom, which has some advantages and also has some problems with it but we have these replaceable wear strips on here. It's a material called Treks that they use like on crab boat deck boards. It's part plastic, part wood. And so on harder bottom, a lot of the bottoms we go on are pretty soft, but on harder bottom sand and stuff it wears it off and you can see how it wore down in the back.

9:07:39 AM

MR. ROSENKRANZ continued:

Well we have a lot of weight in the back of this because it overhangs in the front. The basic idea of this, besides having a clear imaging area in the front, is we wanted something that would go over a crab pot because there are lost crab pots everywhere you go in Alaska and if you get hung up on those, you're going to lose your sled in a hurry. This thing is actually built to go up over it and we've been able to go over a lot of stuff because all of the weight is in the back so the front is kind of light. When we hit rocks and stuff, we just kind of go over them. I've been really happy with the way that worked out. So the first year that we had this in 2006 on the old sled we spent a long time at the dock in Homer getting this all to work but we finally did, steamed over to Yakutat, put it in the water, and were just amazed. It just worked.

It just kept working. The images weren't the greatest but as far as being able to get the data, the network was good. The data storage worked. I was just really happy with the results of it. As long as we were looking at a map I did want to just touch on something that is of interest to this committee, I believe, and that is the difference between state and federal waters in relationship to where scallops get fished.

Now you may not know, but that is the border right there between Central Region and Southeast so these are managed by Central Region while these Yakutat beds are managed out of the Douglas office. That state-federal water line, it runs right through these beds. I mean Kayak Island; people are talking a lot about how Kayak Island might be a good state water fishery but really not that much of where it's fished. Again, there are scallops outside of these red lines. These red lines enclose about 98 percent of effort and harvest since the observer program started in 1993. So I just wanted you to get a little idea of what you're talking about. I mean there is one little area there and one there. These beds are really outside of state waters.

I'm guessing you folks know your Alaska coast a little bit at least. Yakutat Bay is right there so this is from Yakutat up to Cape St. Elias and then between Yakutat down to Fairweather and, of course, Cape

Spencer is right down here, same thing. While there's more – this bed is actually inside state waters. Some of this one, a little of this and then that one is in state waters. So, it's really – it's hard for me to think about trying to have a different fishery going on depending on which side of that line you're on because they're a contiguous biological population and, just to hammer that point home, this is an area boundary between Area D and District 16. That was put there for salmon or some other fishery because it basically bisects a contiguous bed that we know about and it causes all sorts of problems, believe me. That line is actually defined ambiguously in regulation. So, depending on where you read, that line is actually going to move a little bit around and it's enough to confuse the fishermen. So that's Mount St. Elias and actually the beach they surf on is right there, right outside of Yakutat, just so you can see.

So we got this thing in the water and what do we see? Well ... scallops live on a lot of really muddy bottoms in Alaska and suspended sediment is a problem....This is actually a very unusual picture and there's actually a smaller scallop there too but there's four scallops in one frame. Usually, the usual count is zero. Anyway, but that's what we could see and then, of course, we found out that the water isn't always silty.

This is the kind of resolution we were getting with the old sled and it had some very bad lighting problems. There wasn't physically room on the sled to get four lights over our field of view. So, the data was still actually pretty good for manual review but obviously there was a lot of room for improvement. Just to show you some of the other stuff we saw from that survey, that's some skate egg cases on kind of a sandier bottom with shell ash. That is an eel and I don't know if you can see it there but you can actually see the little fin marks. I mean that's the resolution that you get. There are 1360 pixels going across this way and it's just over a meter in width so you have more than a pixel per millimeter on the bottom. So you can really actually talk about millimeter resolution on the bottom or being able to identify things that are 10 to 20 millimeters and on up, depending on the water clarity of course.

So that was the first year. Then we got out and got the better sled built and then this last spring we headed over to Shelikof Strait. What you see here, again, this is a polygon that encloses about 98 percent of the effort since our observer program started in 1993. The blue lines are the tow pass of one vessel during one season.

9:13:14 AM

MR. ROSENKRANZ continued:

What I've shown here is the 100 meter or 50 fathom curve and, in a lot of areas of the state, scallops seem to be concentrated around that depth and you can see how the effort really follows that as well.

Well, let's go ahead and look at some boundaries on that picture. So you had the state-federal water, there's another island, a little rock off of here, with scallops around there but this is the federal-state water line in Shelikof Straits so, obviously, a state water fishery here would be very difficult to enforce. Most of the scallops I think, well, the majority of the scallops are probably in the federal water outside.

Now this is also a statistical area lying here and the way the fisheries managers – actually separate quotas for the north part of the bed and the south part of the bed, so it gets pretty confusing pretty fast when you take these non-natural boundaries and start trying to manage fisheries with them.

Well, so we went over there and last June, I guess that was, we spent five days, not full days, at sea and that's what we were able to cover doing these kinds of zigzag transects over the bed, 82 nautical miles towed and a few hundred thousand images.

9:14:39 AM

MR. ROSENKRANZ continued:

Really, the main thing we've learned so far is that the system is really pretty dependable and works

pretty dang well. A view of Shelikof Straits and, so, this is what the bottom looks like over there. Once again, there are scallops on this really, really sedimentary bottom and you can see right there – maybe you can't – there's a little portion of the shell that doesn't have sediment on it and you kind of see the natural color of the scallops. I was really kind of amazed to realize that these animals live and thrive in such a silty environment. I mean you have the [indisc.] Bay, huge glacial outflow right there, but these animals live there. It's surprising because they are filter feeders and you would think it would be inefficient for them to filter all of this sediment to get some food but that's where they live.

Just to give you an idea, ... we do see other stuff. This is just a little bit shallower water on the side of the bed on the harder bottom and we do see colors down there. A lot of what we see is kind of the color of silt. You can see around the outside we're still working on our optics. We have that dome port lens that we shoot the camera through and it's very difficult to get the whole edges of the field of view into focus with the amount of light we have. So that's something we're working on. Hopefully we'll have it solved by this upcoming season.

And then I mentioned that this is a non-intrusive sampling. Well that's not quite true. In a really soft bottom, that sled weighs about 1,000 pounds and it will penetrate a few inches into the bottom. So that's a sled track that we then cross back over and got a picture of. And these dots here are 10 centimeters apart to give you an idea of the size of stuff in the field of view.

Arrowtooth flounder is something that we just see a lot of down there and an occasional cod, although I think most of the cod are scared away by the sled and we don't see a lot of them. After we worked in Shelikof we went around over to Augustine Island, Kamishak Bay and we're working on a comparative survey there where – they also did a dredge survey and we're going to be able to compare the estimates between the two methods.

9:17:10 AM

MR. ROSENKRANZ continued:

Just to show you the stuff on the sled, there is the tube with the camera pointing straight down. That's sonar that looks ahead. Hopefully if we were going to run into a sunken crabber we would see that. There are four strobe lights arranged around the sides and then the telemetry bottle is right back there and, really, that's about all there is to it.

So we got on to some harder bottoms over there and, low and behold, there are a bunch of scallops on these harder bottoms. I believe these are clams. There has been some dispute about that and it's one of those things that yes, you do sometimes need to get samples in your hand to actually look at and ID but it gives you an idea. These scallops are probably, you know, 20 millimeter shell height so they're pretty dang small and we can see them quite well if the water is clear enough. These six-arm sea stars seem to be a pretty big predator of the scallops over in Kamishak Bay. Just some of the other [indisc.] vertebrates that you see there – there are sea pan (ph), different kinds of sea stars, and one of the animals that we see quite a bit of that people wish there was a lot more are tanner crabs. Well it turns out I'm an old crab researcher from my days in graduate school so I'm very interested in tanner crabs as well. We assess these with trawl nets, which doesn't work particularly well because a lot of them like to get buried down in the mud so it's hard to catch them with the trawl. We do that and I think we're not sure – well for example, I'll show you on a map, but we could image the same crabs twice quite easily on a survey [with] the way that we use the camera sled.

But, I think there's the potential there working with different sampling methods to just try and find the spatial extent of these animals. I think that's the direction we're probably going to want to go over the long term rather than having point estimates of abundance, looking at things in more of a spatial context – ecosystem approaches to management, which I'll talk a little bit more about.

This is another thing that you see this and it just – because I have to tell you, I have been about really the only one that's looked at a lot of this data just because there isn't anyone else to do it. That's a little juvenile tanner crab with some, we call these emergent epifauna.

So you get on these harder bottoms and you see a lot of stuff and it looks to a lot of people like these types of things might be extremely important for young animals of different species: crabs, cod, what have you.

So, I guess just from my own experience of looking at this data, I'm realizing hey, we need to look at the whole picture. We did this because we're interested in scallop stock assessment but it looks like we've got to think about other things besides scallops when we use the data. And there are still a few king crabs over in Kamishak Bay, not very many of them but there are a few and we got a couple of pictures of them. Another kind of interesting thing, there are a lot of flat fish over there and who knew. There are only two in this one. There were some frames that had like five flat fish just lying right next to each other. I didn't know they were that family oriented. Like I said, we managed to go over stuff maybe we shouldn't. This is a big rock we bounced over. An octopus lived right under there obviously. Octopus, they just go out into the scallop beds and find their lunch and then they bring it home, I guess, is the way that they do it but that's definitely an octopus midden.

So I mentioned that I spent a lot of time looking at this data because we're doing this comparative survey so what we did there was – there are 88.1 square nautical mile stations and we just went up one row and down the other. Well that took two days so, you know, like crabs that are pretty mobile, if you saw them here on one day they could be over here the next. That's why I say you could image the same animals twice, a potential problem.

9:21:40 AM

MR. ROSENKRANZ continued:

But this just shows the abundance of scallops. This is just kind of an example of a data product you could get out of this. What I did was looked at the data and then every two-minute clip I would stop and record the count. I didn't have frame accurate review, which is what you should have. You should basically know where exactly each scallop was counted but I just didn't have the time or software to do that yet. So I aggregated on 200 and made this little map and it gives you a really good idea of what's there. I mean you could convert that to a mean weight estimate fairly easily and what it shows is their survey grid there does have the population captured pretty well. You see the black circles around the outside are zero counts so mostly, yea, they did find where the bed was with the dredge and that's where it is.

These are for small scallops less than 50 millimeter shell height. You can see they're not distributed the same at all. They're over here and I have not had time to go ahead and overlay the habitat data but I can tell you that these scallops are very strongly associated with these harder bottoms, more pebbles, more emergent epifauna. And this is the tanner crab results from that same survey and then, again, that's why I said we did this on two different days so I don't know, maybe these tanners that we saw here on day one moved over here by day two and we took their pictures twice. I don't know but you get a really good idea of where they are located in that area with the camera.

Then the last – one of the things that we've been trying to do – well, that I've been trying to do besides just having opportunities to use the sled more, because we're just learning how to use it. Basically it's been a one time a year, though it gets crazy just trying to get everything to work, get out to sea, people have expectations about what needs to get done. Well, Dan Doolittle now is over at the Kachemak Bay Research Reserve and he is a friend because he was in the Kodiak office and he's very technologically oriented so he said hey, how would you like to come over and practice using the sled in Kachemak Bay? I said great. He had this project they're talking about expanding the Homer boat harbor there. ... Army Corps of Engineers funded this and

that's high resolution multibeam data that really shows the bathymetry in excruciating detail and then they had some diver surveys. We came along and in about 20 minutes were able to do all of these transects.

This was literally a stone's throw off the breakwater there. You looked out in the water and it just looks like mud and you're going man, we're never going to see anything down there. Well, actually it was a lens of silty fresh water on top and there was some clear water on the bottom and that's what is right outside of the Homer boat harbor, a lot of eel grass that gets blown or carried in there by tide, sea pens, and sea stars. And there are a few fish. There's a big sculpin there too. After we got done with that we had plenty of time so we went out in front of Homer off of the bluff there and that's just an example of some of the harder bottom habitat. I just love these flat fish, the way they can camouflage themselves with the coloration.

So I just had to say a couple of things about the HabCam project. This is their vehicle and they tow it off the bottom, which we're kind of thinking about doing with ours and then they've also added – this is a second, separate towed vehicle that's just doing acoustics so they're basically trying to widen the swath that they see through acoustics. They have the sled going and then this thing is back farther and it has I guess a couple of different kinds of sonar on it.

9:25:41 AM

MR. ROSENKRANZ continued:

That's sort of the next step that they're taking, which looks like a pretty good one to me. And then notice this is on a commercial scallop vessel and there's their dredge in the water at the same time they're using the sensing imaging and sonar equipment.

This is another slide that's ... lent from Scott Gallagher and this just kind of shows what they are trying to do. These are like real time data products that you could get out of this but really, we are

stuck right up here. We've got down a little bit of manual classification. We haven't even done this step with image processing yet. They're working on that. They're working on automated classification. I was able this year - we were able through our near shore project to get some funding for them, for the HabCam people to work on Alaska data. Well that project is going away so that's one that I see a huge need is to keep helping them. I mean we need to get money for them to look at our data and we need to just keep on their good side because we want to get all of this stuff and they're going to develop this a lot faster and better than anybody else because they are the experts. Believe me, this is a huge job. Talking about being able to display the data in usable forms where some fishery managers could have access to the data without having to look through frame by frame but trying to distill usable data products of it is just another huge challenge that we need to do. And then you get over to okay, what are we going to do? Well, patch dynamics, like looking at the patchiness of different species, habitat, predator/prey multi-species management models, and this is where ecosystem type of thinking would probably come in. Really the hardest challenge for them right, all of this stuff is hard but the biggest challenge from a computer processing point of view right now is this segmentation where you want to extract regions of interest from image and, especially now with our muddy bottom, with not that many scallops it might not be bad, but when you get on a complex bottom, it's hard to get the computer to accurately pick the targets out of it. But they are working on that and not only are they working on it but they are working with the people that are the real experts at Los Alamos National Labs. Well, that's a wonderful thing except they're DOD and it's hard for anybody to do cooperative work with DOD so that's kind of slowed things down and Scott is a little bit frustrated with it but there are a couple of people there that have some ideas and some algorithms that ought to be helpful for this.

So, my "to do" list. I have a big "to do" list. We want to improve the optics and get that whole image into sharp focus and we have some new hardware. We're going to work on that. We're going to shoot through a

flat port rather than a dome. We're building a new deck house here, hopefully within the next month or two since the one we've been using was borrowed.

9:29:18 AM

In June and July we're going to be doing surveys, Kayak Island, Yakutat, and then the Pandalus is going up north to Norton Sound to do a trawl survey up there so I am trying to convince people that we really ought to put the camera on this boat – well we'll still have it on the boat, leave it on there and do some imaging on the way up there as well. Additional sensors – we don't even have a CTD on our sled but we ought to. That and, we've been looking – we recently had a meeting to discuss this acoustics, what acoustics should be added to the package to gather more data at the same time when we're towing it around to get the images. That led us to flying off the bottom. Well most of the acoustic type of things that you would do would be much better off if the vehicle was not hard on the bottom just because you'd have more space below you but also the vibration of bouncing around could be very problematic.

And then, finally, partnerships. People are just starting to find out about this now. The Department of Fisheries and Oceans in Canada wants to build a system and has been calling me up. Someone from NMFS [National Marine Fisheries Service] in Kodiak has called me a couple of times and wanted to talk about the data and ways they might be able to use some of the data. So there's just a huge list of things for me to do and then the thing to remember about, that is I have my job as statewide scallop biometrician as well.

So, really, our biggest need for this project is people and we actually have the people. Rick Sheppard – I can't say enough good things about him. He won the employee of the year award six years ago but he's kind of one of our most valuable players out in Kodiak because he is the database person there. And everybody in Kodiak, every project collects data. Most of it is lying around. Most of it is on a bunch of CDs or in files there. He's the one that's making the data usable. Well, he's also the one that wrote

the code to let our camera talk to our network for our system. He's the one that would be most qualified to start working on ways to display the data, share the data, etcetera, but he is more than fully tasked and, just to let you know, he is an Analyst Programmer 4 and he's been trying to hire an assistant for a couple of years now. They downgraded the position ... it was an Analyst Programmer 3, a 2 and a 1. They finally got one person to apply for it at the 1 level and then that person didn't take the job. So, within Fish and Game the people that do understand technology are very, very few and far between and they are very hard to hire because we do not pay competitive prices. People that know how to do that stuff can go and get a lot of different jobs and the State of Alaska is pretty low on the list. I'm sure that's true in other departments where they need technical expertise - computer networking, database, and etcetera.

9:32:26 AM

MR. ROSENKRANZ continued:

Dan Doolittle has a lot of [autonomous underwater vehicle] AUV experience and he looked at this and said this instrument pod, if you will, basically is attached by 10 bolts. So we're talking about decoupling that, move the telemetry bottle on there, add a tail for stabilization and a different bridle and we might be able to just tow this off the bottom. We're going to hopefully get a chance to experiment with that maybe next fall. It's probably the way we want to go for the future, although having it on the bottom is kind of easier. Then you don't have to worry about it. That's one of the problems with the HabCam is it's always doing this. ... There's an altimeter, an acoustic device that measures height off bottom but it's very difficult to fly it at a truly level height. Ours, where it's on the bottom, one, you don't have to sit there watching it every minute, going oh, I've got to pull in a little cable, oh, I need to let a little bit out because it stays about the same so the way we're doing it is more user friendly from that perspective. It seems to work okay on soft bottoms but if you had it flying up off the bottom, you wouldn't have to worry about, you know, unless you're in pinnacles, you could go over a lot

harder bottoms and it would probably be better for acoustic sensing as well so we're probably going to try that.

And then one of the other "to do" things is just – I keep looking at all of these closed areas. We have not yet deployed the sled in a closed area. Here's an example right here, Unimak Bite. This was closed to protect tanner crab habitat 20 or 30 years ago. No one even knows if that's working. I hear the old scallopers talk about deck loading out there so – here's a tool where you could actually go and look in some closed areas and see what's there, maybe evaluate whether they are an effective tool. With tanner crab, I think it's mostly wishful thinking. There's just a lot less tanner crab around now than there was 20 or 30 years ago. Really, I think for the future we're really going more towards a monitoring type of outlook – I am. I think as far as environmental monitoring, the sled is a much better tool than a trawl or a dredge.

So, here's where I will stick my foot in my mouth a little bit. I guess I didn't mention that after I got done being a commercial fisherman I went to college up in Fairbanks and mostly took math and statistics. The red boxes are kind of the way things get done. You have commercial fishery data, you have trawl and dredge survey data.

9:35:18 AM

MR. ROSENKRANZ continued:

This is an issue that sometimes gets, well often gets overlooked but each species has a different set of catchability and selectivity parameters with each different kind of gear. Basically you cram all of the data you got into a mathematical and statistical model and then what comes out is a number and managers like that and I give the people that have to manage the fisheries a lot of credit because they're the ones that have to answer the phone when irate people call up and want an explanation about the way things are. I mean there are reasons why we do things the way we do and a lot of it is managers want something that they can point at when they're asked why did you set

the quota at this level. So that's basically the way that we do it but the problem is we don't know anything about these recruitment processes, no matter how good your data and your modeling, you really are left with hoping for recruitment because if you don't get any recruitment for a period of years, there is not going to be anything there no matter how conservatively you manage the fishery. So what we're doing here with the camera sled is we're starting to bring spatially explicit direct observation data into the picture. Now how we're going to incorporate that, nobody knows yet. But this is what it is and it's fundamentally different from trawl or dredge data or fishery data because you don't have the catchability and selectivity problems with that type of gear. You see what you see. There are some limitations with water clarity and size but it avoids this problem, which is a huge problem. And then I'm getting the feeling that there's sort of enough of a wow factor with the imaging to call a little more attention to it and get over to these two the fact that we need to look at more oceanographic data and we need to start thinking about ecosystem approaches to management, i.e. looking at the whole picture, using more spatial kind of statistics rather than just taking data, running it through a model, getting out a number and then managing the fishery off of it because really I can't sit here and argue that this is working all that well. There's not a lot of tanner crab around now. There just isn't and I don't care how many surveys you conducted. That's not going to bring more tanner crab back so I think we need to add more data to the picture is probably the best way in my mind to move forward.

That's really all I have thanks to all of those people on that list. I also have some just short clips, i.e. movies of data if you'd like to look at a few of those. Oh, no I don't. Sorry, it's on my computer. I put my presentation on this computer. I could fire this other one up while people could ask me questions, whatever your preference would be.

9:38:43 AM

CHAIR SEATON said he thought members would be interested in seeing the clips. He then asked Mr. Rosenkranz if he has used

an ecosystem management model with habitats of concern in the federal regulations or whether that is a possibility in the future.

MR. ROSENKRANZ said he has not used an ecosystem model. He said this has been frustrating for him because any time one gets involved with council processes, such as the North Pacific Fishery Management Council, it is talked about but nothing further happens. He related his opinion that no one is taking the necessary steps to figure out how to do it. Mr. Rosenkranz commented that oceanographic information is expensive to collect, which is one benefit to the seabed sled. It is a new development to the ecosystem approach of management. The HabCam people are defining the field and, by maintaining a good relationship with them, Alaska will benefit by learning from them.

9:40:45 AM

CHAIR SEATON pointed out that fisheries managers want more data. Alaska is on the forefront of this technology, which is one reason why the committee wanted to hear from Mr. Rosenkranz. He is pleased that ADF&G has taken this initiative.

9:41:28 AM

MR. ROSENKRANZ said he met Scott Gallagher at a meeting in Seattle and when he asked Mr. Gallagher whether anyone else was working on underwater video techniques, the answer was no. He said the technology has come a long way; for example, he opined that people on the East Coast will have fiber optic to their homes in five or ten years. Additionally, hardware is easier to use and getting cheaper.

9:42:28 AM

REPRESENTATIVE EDGMON asked whether funds other than general funds contribute to this effort.

MR. ROSENKRANZ stated that his position is federally funded because the scallop fishery occurs in both state and federal waters. The camera sled project has been funded by the CFEC from the start.

9:43:07 AM

REPRESENTATIVE EDGMON surmised there is no cost recovery component tied into this project.

CHAIR SEATON said not to his knowledge. Alaska's congressional delegation believes Alaska needs to step forward in this arena rather than ask. He opined that the legislature should let the delegation know that the state is doing independent projects with state funds.

9:44:02 AM

REPRESENTATIVE EDGMON remarked that he thoroughly enjoyed the presentation.

9:44:20 AM

CHAIR SEATON, regarding acoustics and mounting different kinds of sonar on sleds using fiber optics to provide enough capacity to get the data through, said avoidance data could be collected in many directions depending upon the orientation of the sonar.

MR. ROSENKRANZ said that is a rapidly developing area and different types of acoustic sonar exist. Right now multibeam sonar provides very accurate depth maps, which show every ripple and contour along the bottom. Side-scan sonar views the side and extends to about 50 meters wide. The potential is big but he does not know the best way to go at this point and he doesn't believe it would be wise to buy an expensive system at this time. He informed the committee that he is cultivating some relationships with people who might allow ADF&G to try their products. He said he is excited about working with Dan Doolittle in Homer because he would like to use that area and the research reserve to help develop more technology. The visitor center could be used for public outreach. He said the bottom line is that he needs help.

9:46:51 AM

MR. ROSENKRANZ showed members his video clips and said the following:

> This is at two frames a second. We record data at four frames a second, twice as fast as this. This is just some hard bottom right there in Kachemak Bay off of the bluff there. There are a bunch of clams, barnacles, things like that in that particular habitat. This is also in the same area where we just

went into shore so we started going over bigger and bigger rocks. That's some kind of steel something there. But this is right off the bluff in Homer.

9:47:53 AM

CHAIR SEATON asked whether the water was clear when the images were taken.

MR. ROSENKRANZ said he did not recall the water clarity for those slides but said in general, freshwater floats on top and it is often silty. He said you never know what you'll find until you put the camera down. However, on softer bottoms in areas like Shelikof Strait, suspended sediment can be seen when the tide runs hard. He noted the current slide was taken in an area of a depth of a few fathoms right off of the Homer breakwater in December. He said the research reserve in Homer will allow research on seasonal changes at the same place. [Mr. Rosenkranz continued to point out marine life in the slides, such as barnacles.]

9:50:41 AM

CHAIR SEATON thanked Mr. Rosenkranz for his presentation.

9:50:50 AM

REPRESENTATIVE JOHNSON asked if the camera could be put on a dredge to look at damage.

MR. ROSENKRANZ said that has been done with some older cameras. Although the purpose was not to look at damage but to observe how many scallops went in and how many did not, he said he has not found that data to be very useful. He said he has been on dredge surveys. The material looks very different when it is in its natural environment than when it is hauled on deck.

9:51:56 AM

ADJOURNMENT

There being no further business before the committee, the House Special Committee on Fisheries meeting was adjourned at 9:52 a.m.