HARNEY COUNTY HISTORY PROJECT

AV-Oral History #147 - Sides A/B

Subject: Malheur Cave - With Ellen Benedict

Place: Malheur Cave

Date: August 14, 1979

Interviewer: Pauline Braymen

...

ELLEN BENEDICT: It wasn't worth the struggle this morning to track it down --- it wasn't where it should have been.

PAULINE BRAYMEN: Does somebody have an extra hand that would be willing to carry that tripod? This thing weighs a ton.

GARY WING: Where do you want to put the ...

ESTHER GRUBER: I was thinking maybe we could --- well it depends. We could take them in on that ---

ELLEN: Yeah, but we don't want to do that right now, because we don't want to fool with it ---

PAULINE: I want to get my tape recorder hooked up to my lamp.

ELLEN: ... It was under that ledge ... We have baby birds in here.

GARY: Barn swallows.

ELLEN: ... cave ecology classes here. The position of the nests in here for several years, so there --- we've found that there --- there's going to be about --- some place between, about fifteen nests of barn swallows every year.

PAULINE: How far back in the cave do they nest?

ELLEN: Just to --- in the daylight zone which goes right to the first turn here. So, it's

about 200 feet into the cave. ... Sometimes they're back this far.

PAULINE: Yeah, there's some up there. Or is that just a rock?

ELLEN: Probably a rock. But anyway, there has been some back on the ledge there.

PAULINE: Uh huh.

GARY: Is that a high water mark ...

ELLEN: That's an interesting question Gary. The two ideas going on --- there is a possibility that during the melting of the pliocene ice in the mountains where this area could have been flooded. There wouldn't have been ice out --- there wouldn't have been --- there wasn't an ice sheet that covered this, but there was montane ice. Okay, the lake level could have been that high, it would have left a watermark. That's one idea. The other idea is that there is actually a difference in the composition of the rock at that level, so you have a more porous rock in the two areas in that that's what leaves the white mark.

GARY: I see.

ELLEN: In any case, it's the deposit of minerals from the weather ... And I'm beginning to sort of favor the idea that it is a water mark, and that maybe because of higher lake levels at one time. Our eyes will get a little bit more accustomed as we go in here a little bit. Somebody might want to put the lamp in the ... they are heavy ... Ah, Pauline, we could set up the temperature pole either in the daylight zone for you, which might be a little easier for pictures back in here. Where would you like it?

PAULINE: Well probably let's go for the best light situation we've got.

ELLEN: All right, let's bring the temperature pole back ... we have to have a ... it's hard to handle the temperature pole with that light on the handle.

PAULINE: Uh huh. Well, that's quite a gadget.

ELLEN: Seventy-five --- some of the speleologists in the area did some really careful surveys of the cave and mapped Malheur Cave and planned a profile and surface map.

PAULINE: Is that that map that you gave me at the ---

ELLEN: Yeah.

PAULINE: --- around '74 and '75.

ELLEN: '75 --- right. And John Palmer did a --- his master's research on the water quality of Malheur Cave, and he's the one that put the temperature gauge in and found that the lake level rises three feet every winter. I don't know if any of our markers are still visible, or whether they've gotten wiped out. We did have stakes in every 50 feet. So, it was possible to very rapidly move from one station to the next station and not have to measure. Initially, we measured with a tape with 50 feet --- there used to be one under the grandstands. Let's see if we can find it. Probably --- We are no longer doing the temperature ---

PAULINE: Here --- is that one? Evidently wasn't one.

ELLEN: I think most of them are gone. What we are doing now is a biotic study. Esther and I basically --- and we're looking, we're trying to identify all of the species of invertebrates and vertebrates that live in the cave. You will probably want to go up on the other side, it's slippery. I was just looking to see if our stake is still there ---

PAULINE: Is that a stake right there?

ELLEN: No. There has been quite a little water in the cave this year. It's pretty damp. Let's see, there's a stream that's going --- Esther ---

ESTHER: What?

ELLEN: Notice this little meandering stream that is coming back. There has been a lot of water input from the surface this year. Look at that. See, pretty high water in here.

GARY: What's that shiny stuff?

ELLEN: Okay. That is a combination of bacteria and the salts that have weathered through the basalt. It's most --- it's like the salts that you see on the surface, mostly

calcium and magnesium. And then it's called cave slime. And the --- it has a bacterial component --- Dr. Stacey at the University of Washington analyzed cave slimes from some other lava tubes --- and some of the organisms like springtails, which are primitive wingless insect feed upon bacteria.

PAULINE: Is this the shiny stuff?

ELLEN: Yeah. This is the cave slime. And part of the shine are water droplets on the surface there. So you have water droplet, which shines silver --- like a silver mirror. And then there is the salts like you see precipitated all over the ground outside, calcium and magnesium salts. And then there is bacteria that is in it too. It's named cave slime.

GARY: Is the bacteria specific to different caves?

ELLEN: No, it's just a generalized heterotrophic bacteria that apparently materials sort of filter through from the surface, in the cracks and help ...

GARY: Do the Masons drive vehicles back in here?

ELLEN: Yeah.

WOMAN: Yeah, look at those tire tracks.

ELLEN: Oh, yeah.

GARY: How is the carbon monoxide?

ELLEN: Probably not too serious, because there's exceedingly good circulation in this cave. Unusually good circulation. You will notice that the ceiling is high, for example right in this spot it is 18 feet. We've measured it, so I know. This is our 600-foot station where we're standing, and it's 18 feet up there from floor to ceiling. So you have good air circulation. It's probably not the absolute best thing for people to do, but they do it. Okay, it's a little less slippery on this side.

PAULINE: It's much wetter than I remember it being the last time I was in here. In fact ---

ELLEN: When we have been taking micro climate data once a month in the cave, we

usually try to pick up the beer bottles and cart them off, and kind of clean it up a little bit.

PAULINE: How far back do you find the beer bottles, I suppose all the way to the water.

ELLEN: Right. And then there is always somebody that thinks that there is going to be some arrow points to find and they dig, so there is always a fresh hole someplace. And we are, try to care-fully avoid --- It's really interesting, because Malheur Cave looks pretty plain and uninteresting in terms of formations. But, if you look at the walls carefully you will notice all of this lava drip material.

PAULINE: Uh huh.

ELLEN: And I feel that Malheur Cave could of at one time been a very highly decorated lava tube. Have a lot of formations because this is sort of the evidence for it. See the lines of drip?

PAULINE: Uh huh.

ELLEN: And when you get back on the lake, you actually see some of those formations. Like that, was at one time longer and it was a lava straw. And you see things like this could have been a little bit bigger. The cave has been pretty badly worn. Further evidence for the fact that it was at one time maybe pretty highly decorated is such things as this, which I show almost no one.

PAULINE: Yeah.

ELLEN: You don't need to mention where they are, but you can mention the fact that I did show you some lava formations. It looks like a little garden. And it is something that photographs fairly well, if you want to take a picture of it. But they are really pretty nice. It's actually, when I say bacteria, there's an ... component also.

PAULINE: Now this is called cave sporo.

ELLEN: Sporo. It's really pretty. It makes staking pictures exceedingly interesting; because the colored slides it will flash silver. It's just gorgeous --- but it --- it's kind of real

looking. Let's see, somebody found a 750-foot stake?

GARY: There was 700 on that.

ELLEN: Okay, well let's see, Pauline. These are the markers that we put in. They are just the stakes that we felt we could remove easily when this study is over. So, we are now 700 feet from the entrance. And these were, when we were taking temperatures every

--- temperatures for relative humidity every month. We had stakes like this every 50 feet.

We're still doing a biotic study. We did the microclimate study for 5 years. We're still doing the biotic study, because now that we know that this case is unusual in it's microclimate. We are trying to now find out what the --- as complete a idea of the animal populations as we can.

PAULINE: Uh huh.

ELLEN: Boy it is really damp here. There is a lot of water in here earlier.

PAULINE: It's been years since I've been in here, but I don't remember it ever being this wet.

ELLEN: No, there was a late, there was a late May surge of water apparently. You can see the difference in the ceiling parts ... it's absolutely necessary to have an adjustable temperature pole. And the pole is the --- an old movie screen.

Now the survey that we made, the mapping, we found that the lowest point in the cave is 70 feet below the entrance --- the floor of the entrance. And the term for this is vertical extend, is 70 feet. Which means that the lowest part of the tube is 70 feet below the floor of the entrance. And the cave has a mapped length, which is the transfer slope from the entrance to the lowest point of 3,137 feet. The deepest part of the cave, the greatest lake depth that we have ever measured is 23 feet. And the water rises 3 feet annually.

Let's see, what else, oh yeah, in November 1974, we both measured the distance from the surface of the water to the ceiling, and from the surface of the water to the bottom of the lake. And the greatest height of the two from the floor of the lake, to the ceiling was 32 feet. Now there may be some place that it is greater than that, because maybe some place the lake dips, but at least in the places we've measured that's the case.

PAULINE: How far does the lake extend from the --- to the back?

ELLEN: Okay, the lake is 3,000 feet, the end where the cave ceiling, the lakes surface meets the cave ceiling is 3,000 feet from the entrance. And scuba divers have told us that it goes back another 500 feet.

PAULINE: But they do, but they do, the scuba divers reach a point where they can go no further.

ELLEN: Yeah, they come to a lava seal where the tube just seals off. But that's maybe misleading, because the scuba divers that so far have gone back there are inexperienced in terms of cave diving, and it tends to be kind of a scary thing. And they might over-estimate the distance.

PAULINE: Uh huh.

ELLEN: It might seem ---

PAULINE: Seem further than it really is.

ELLEN: Right. In doing surface surveys where we have taken the compass bearings and the measurements, and we traced the route of the cave on the surface, there is enough space to get another 500 feet of cave in. And there wouldn't be space to get 800 feet into the land conformations. It's possible that it does.

GARY: How far are we from the surface?

ELLEN: How far are we from the --- Okay, I'm not sure at this exact place, but the term

for the rock and soil above us is overburden. And the surveys shows that the overburden varies from 23 feet to 6 feet. Six feet out at the entrance and then 23 feet at it's thickest. We are not --- that ceiling right in here may not be 23 feet, but it is back farther. The land also slopes down, so while the vertical extends 70 feet, that we don't ever ... later. Okay, I mentioned the cave ferrules; if you look under rocks like these you will see some more. And you will see there are places where they are not ---

PAULINE: Oh, yeah.

ELLEN: --- where people have ... And again, that's one of the reasons I think this might have been a fairly decorated cave.

PAULINE: Well, if the Indians, and there's evidence that they --- certainly used it for many, you know, who know how many thousands of years.

ELLEN: Now this is a very interesting feature of the cave. It's a pressure ridge ... now on down this way. And the explanation that is normally given for this type of thing is that the floor--- that there was a flow that came in along the floor, and then more magma flowed in under the floor, and this material was slightly plasticated, it just started to crust, and the material came in under, and it raised up and cracked.

PAULINE: Uh huh.

ELLEN: Getting this nice feature. And one of the more fun picture that you could try --- standing down there and pointing your strobe up this way --- I'm not sure what we could do in terms of --- Esther ---

ESTHER: Yeah.

ELLEN: --- why don't we look at a rock and pose for Pauline.

PAULINE: Yeah.

... (Inaudible)

PAULINE: Are you ready? I can't see what I'm taking so I'm hoping --- okay. It will be fun

to see how these turn out anyway.

... (Inaudible)

PAULINE: Okay, let me get this on the tape here. What did you say?

ELLEN: All right, Ken Christenson of Cornell University in Iowa, has identified six species in five families ---

PAULINE: The ---

ELLEN: --- of springtails, or collembola, is the other word. C O L L E M B O L A, collembola, or springtail. They are a primitive wingless insect. Okay. What we have done is, we have identified --- we have found the various animals and sent them to specialists in the field. Like I am a specialist on pseudo-scorpions. So I --- Dave Malcolm of Pacific University and I --- Dr. David Malcolm --- M A L C O L M and I scientifically described the pseudoscorpion for Malheur Cave. And then we have sent the other organisms to other specialists. And Ken Christenson is a specialist that works on caves collembola. He's a major specialist in the United States.

We have sent the flat worm to Robert Mitchell of Texas Tech University --- Dr. Robert Mitchell. We have sent the isopods --- and there are two different species and a terrestrial isopod and aquatic isopod --- to --- gad --- what's his name. Ah, shoot --- Jerry Lewis. And --- who is in Indiana and is an isopod specialist? Now there is a new undescribed species of isopod from the cave, it hasn't yet been described. There is an arthropod that Carl Hubbs found in 1934, and he is --- it has been described, and it was named for him, so it's stupobromus hubseei (sp.?) species was named for him. And the person that works on that particular species is Dr. John Holesinger from Old Dominion University in Norfolk, Virginia. So the way the biotic study goes is that we --- our --- find the animals, and these are organisms that are, oh, between one and six millimeters in body length. And send them to the specialists that ---

PAULINE: Now this particular one was on this piece of wood that has been carried in here.

ELLEN: Right.

PAULINE: Would it be found here if it weren't for the ---

ELLEN: Yes, these are --- these specialists are able to say that they are endemic species to the cave. Which means that they are restricted. Okay, one of the questions that Esther and I are also asking is, are the species that we are finding in the cave also--- do they also occur on the surface. And so what we're doing ---

PAULINE: Oh, neat.

ELLEN: Don't pick it. ... No, the other people --- there you are apochthonius malheuri.

PAULINE: Is that malheuri?

ELLEN: Uh huh.

WOMAN: Is that the endemic ...

SIDE B

PAULINE: I found it helpful when Bruce ---

ELLEN: Bruce --- absolutely.

PAULINE: I was able to ---

ELLEN: That's why you got the ... exactly.

PAULINE: Okay, I was at the end of the tape, and I want the name of the scorpion again.

ELLEN: All right, pseudo.

PAULINE: Pseudoscorpion, and it is two millimeters long.

ELLEN: In body length.

PAULINE: In body length.

ELLEN: And the pedipalps with the pinchers on the end are another millimeter in length.

PAULINE: It's reddish in color.

ELLEN: Right, pinkish-red.

PAULINE: And this is only the third ---

ELLEN: --- living specimen that I have ever seen of it. All right, David Malcolm, and the spelling of that again is M A L C O L M, was the man that started the field station. And I scientific-ally described this in 1973, the species name is spelled A P O C H T H O N I U S. Malheuri --- and it's Malheur with a small "m"

--- M A L H E U R I, malheuri, so it's pronounced apochthonius malheuri. Okay. And it's the discovery of this pseudoscorpion in this cave that started me doing cave studies. And at the present time --- I just came back from the National Speleological Convention, which was held in Pittsfield, Massachusetts. I flew in Friday --- Saturday as a matter of fact, after being gone 11 days. And I am now the executive secretary of the biology section of the NSS. So --- the implications of having discovered the pseudoscorpion ---

PAULINE: Really ---

ELLEN: --- snowballed. Right.

PAULINE: Your field has been environmental ecology all along.

ELLEN: Right, right. My PhD Degree is from Portland State University in Environmental Sciences-Biology. And this was not my doctoral research, this was a side project, my recreation, you see. When I got too tired of plugging away at other studies, why I would come over and we would do the microclimate studies of Malheur Cave. My dissertation happens to be on pseudoscorpions. I worked out the habitats and distribution of 50 species of pseudoscorpions in Oregon. Okay, when we were discussing earlier whether --- say the pseudoscorpion also occurs on the surface. And I have taken more than 300 leaf-litter samples, like sagebrush samples and so on in Harney County. And I have never found this pseudoscorpion in any of the other samples. So we feel that it is an

endemic species in the cave. We have found all three neutral stages --- pseudo-scorpions have three immature stages. We found all three of them in the cave. We know it reproduces in the cave. And when you compare --- it belongs to the genus that is the most common leaf-litter species in western genus in Western Oregon. And when you compare the body measurements and shape of this one to the leaf-litter species in Western Oregon, this one shows the cave adaptations which are pale pigmentation. See this is pinkish-red; it's pale in color. The pedipalps and legs are watercolor, basically they are pallid. It's elongate, very, very long and slender. The body size is longer. This is gigantism than the ones in Western Oregon. And it only has one pair of very weak eyes, as opposed to two pairs of very developed eyes. Okay, these are all cave adaptations. What else should I say about it? Okay, where have we found it in the cave? We found it from between 650 feet, which is right behind the grandstands, to 1250 feet. We are now standing a 1000 feet from the entrance. So it lives in the leaf-litter, and that type of stuff --- the rotted wood chips. I shouldn't say leaf-litter, rotted wood chips and debris that washes back to this part of the cave.

PAULINE: That was what --- my question was going to be what it fed on.

ELLEN: Okay.

PAULINE: This is how debris gets in, washes in.

ELLEN: Right. Okay, it feeds on such things as the springtails. It's a predator and it feeds on springtails, mites, and other such creepy crawlys.

Now Esther last November, last October, found a very unusual arachnid. Pseudoscorpions are arachnids, like spiders are, and harvest ... and daddy long legs. She found a very unusual one, which is called a micro-whip scorpion. And she found it farther back in the cave. And it is the first record of the order in Oregon. It is a very unusual one. and it's absolutely amazing that it's here. This cave is probably biologically

the most significant cave in Oregon.

PAULINE: That's exciting.

ELLEN: Very exciting.

ESTHER: He is less than two millimeters, and the little tail --- when I collected him his tail came off. And I was talking to Thomas Briggs ---

ELLEN: The California Academy of Sciences at San Francisco ---

ESTHER: --- and he said they're like lizards, when they get caught they lose --- everything except, I think it's the last three segments.

PAULINE: Oh, for heavens sakes. And then it grows back.

ESTHER: I don't know ---

PAULINE: Don't lizards grow their tails back?

ELLEN: Right, right.

WOMAN: So small anyway ...

ESTHER: I think he is less than two millimeters.

ELLEN: Yeah, the body length is about two millimeters.

PAULINE: How do you collect them? What kind of ---

ELLEN: Awkwardly.

PAULINE: Awkwardly.

ESTHER: You know how I collected the first one? I think I had my hair in braids, and I dipped --- no I had a hairbrush, I mean a paint brush.

ELLEN: Right.

ESTHER: I dipped it in alcohol and then killed him with it, dipping it, and then dipped him into the little vial of alcohol. But the brush was too coarse, that's why his tail fell off. And the real way you do is take a couple of your hairs and put it on a little stick and use that. That's much finer, yeah.

PAULINE: A little alcohol does him in and then you're able to pick him ---

ELLEN: You got the correct spelling of her name?

PAULINE: Well, I'm not sure; she gave it to me ---

ELLEN: Esther Gruber.

PAULINE: Gruber.

ELLEN: Spell it for her.

ESTHER: E S T H E R G R U B E R.

PAULINE: Uh huh, okay, yeah. I thought I did, but I wasn't sure.

ELLEN: Right, I just wanted to check.

ESTHER: I'm going to try to find some more, because I only have one specimen. It's really difficult to go out and look for ---

PAULINE: Something two millimeters long.

ELLEN: Well, you see how tiny they are, and where they ---

ESTHER: And it's quick, it's much faster moving than those little pseudoscorpions, like a spider. And when I found it, it was running around this log I turned over, down a ways. But, you know, I have no idea how I'm ever going to find another one.

PAULINE: Yeah.

ELLEN: It appears that there are at least ten species of invertebrates that are endemic to the cave.

WOMAN: Only ten, huh.

ESTHER: I thought there was ---

ELLEN: I know, but it's beginning to look like that.

ESTHER: Oh, that's what ---

ELLEN: Some of the prolimba may be ---

ESTHER: Yeah, we found pseudoscorpion that is endemic to the cave.

ELLEN: Apochthonius malheuri.

WOMAN: So cute.

ELLEN: ... the Malheur Cave projects since 1974, and has been on almost every trip since then. Since 1960, we have made more that 60 separate trips from Portland.

PAULINE: Is this part of Portland State's ---

ELLEN: Well, not ---

PAULINE: --- research. Or is it something that you're doing on your own, or ---

ELLEN: Well, let's see, how shall I put this delicately. All right, if you're quoting me, yes it is. All right. Portland State has supplied some travel money, some equipment, and some logistic support. So yes, they have, they have supplied equipment and some money for transportation, not all of it. I also have gotten two grants, which were small, from the National Speleological Society. The most recent one was this spring, and for a biological studies. The field station has been very supportive, because they have supplied us with equipment, and we have always been able to stay there. We've paid use fees but, having a place here to stay has helped immensely. The way we count the number of trips is --- we've been --- we've made more than 60 trips to the caves since 1960, from Portland. During any one of these trips we may have visited the cave four or five times, going back to the field station. ... What? Oh, they're like --- they sort of grope around blindly, so it's thought.

ESTHER: ... to kind of movement ---

ELLEN: Yeah, they --- the --- they have very long --- okay, the moveable finger of the chela --- C H E L A, has four long hairs, and the fixed finger has eight. And cave adapted pseudoscorpions have super long hairs. They are called tactile seta. S E T A. And they sort of wave around and sense vibrations. They're --- each hair is in a cup like this, and so when the cup, when the hair moves around, there's a nerve at the base of the cup, and

can some-how sense movement. And it sort of wanders around, moving its pedipalps over the surface. ... got that one.

GARY: Do you think sagebrush and stuff washed down in there?

ELLEN: Yeah, I do. Okay. Every time I talk about Malheur Cave, which is what I did at the NSS Convention in Pittsfield, Massachusetts a week ago, I'm always asked when I show pictures, and I talk about the Masons putting wood chips in, whether I think they're introducing exotic species into the cave. And my usual answer is I suspect they're not, because it appears that their wood chips are pretty clean. There is a possibility that they could introduce a species if they introduced some really old sawdust that had been around for a while, that a good predator that would eat all of the stuff that was endemic in the cave. But I think it's probably okay.

GARY: Wouldn't the species have to be pretty well adapted to live down here?

ELLEN: Yeah, I think they'd tend to die out. I think, there is some evidence that the --- some of the species from the outside are living in the entrance zone, but you'd expect that, daylight zone. And then --- I think this far back that what the wood chips are doing basically is washing back here whenever there is really high water, as there has been this spring, and gradually providing the nutrient source for the cave life that is adapted. And it is probably a fairly delicate balance.

Now it's possible, the Masons have held meetings here every --- annually ever since 1938, and they have been putting wood chips in here. Pauline, you could find out how often, but my --- but what I've observed, is that they don't put them in every year. They put it in about every three or four years, a load of sawdust. And it's probably just enough to increase the food supply of the cave, which would even be somewhat beneficial. Ah, one of the cave system is a very energy poor system, and the only nutrition that is available is that which is washed in from the surface. Now in caves

that are --- limestone caves of the East which have a running stream, there is material washed in from the surface, and this triggers the reproductive cycles. The spring floods --- a lot of the reproductive cycles are triggered to this influx of energy. All right, it's possible that actually the sawdust, which washes back rots, and gradually moves back into the lake --- as could be beneficial. On the other hand it could be very harmful if the wrong thing got introduced. At this point in time, the Masons have been in putting materials for significant years that probably any harm that would have been done, has already been done. And there is a fairly good balance that has been reached. There is very strong evidence that Malheur Cave was used by bats prior to 1938. Bailey, for example, lists a bat colony, an August bat colony in the --- there at the first bend of the cave, 200 feet in the cave. A 1920, record of this. We have seen an occasional bat in the cave. There are some, but they're very, very limited use --- by bats.

PAULINE: That's something you'd expect.

ELLEN: Yeah.

PAULINE: Is there some good reason ---

ELLEN: Bats do not, hesitate to use the word like, but they do not like people. And so this cave is a very heavily visited cave. One Memorial Day weekend --- one Memorial Day we were down here taking temperature measurements in 1974, and we just kept a tally of the number of people that walked past us, and there were 50 people in six hours that we were here. This is very heavily visited. And under such circumstances, bat colonies tend to move out. This is what, one of the reasons that Diamond Craters has such an important bat refuge. Is that there are cracks and crevices that are basically not visited by humans. And there is

--- and there are lots of bats that use Diamond Craters.

PAULINE: They use our barn too.

ESTHER: They do?

PAULINE: Yeah, it's really neat.

ELLEN: ... the number of tons of insects that bats eat annually. My mind is very bad at ... They are fairly dark brown, and this one is just a pale pink.

WOMAN: ... 'cause parts of it ... back.

ELLEN: Yep.

PAULINE: Well there is some of the leaf ...

ESTHER: This doesn't look like a good ...

ELLEN: ... find however, because there are only three species that are known in the United States. And they have only been found in Texas and California, and ---

PAULINE: This is the one that Esther found?

ELLEN: Right, and finding a micro-whip scorpion in Malheur Cave is a --- one of the workers that looked at it said that it is probably the most significant arachnid find in the century. It's tremendously important. ... and at the convention in Pittsfield, the NSS Convention, the biologists got really excited about this. ... the answer to your question is to whether Malheur Cave was going to become a --- they called it a natural cave laboratory, because they feel that it is such a significant cave. And if the time ever comes that the Masons do not want their cave, that's what probably should happen to it. You know they probably want it for a while. If the time ever comes why --- ...

Should make a comment on collecting too, that we do a very minimal amount of collecting of organisms from the cave. We only collect one or two of each species. And most of the time we do what we are doing now and we look and try to determine location in the cave of a particular species and the numbers. And we leave them. We put the rock or the piece of wood back in place as we found it, and try to create as little disturbance as possible. Because cave populations are limited in number, tend to be fairly low. And so

we are trying to avoid wiping out any of the species by over collecting. And this is a real danger if people say, "Ah ha, there's a certain species, let's go collect it."

And then anything that we collected we also make sure that it goes to a specialist that was studying that particular group so that the maximum amount of information can be gained. Now the arthropod that lives in the cave lake was listed in 19--- April of 1975, on the rare and endangered species list by the Fish and Wildlife Service. And at that time, there was so little information known about it, that the listing was dropped. But it is possible that it should be again listed.

PAULINE: Added again.

ELLEN: ... checked out the species that the arthropods and the surface waters, and so far this arthropod, which is the one that was listed in 1975, on the rare and endangered species list, has not been found in the surface waters. Now our two species of arthropods that live in the reservoir that they are entirely different. They are not even in the same genus. And this one is stubobromus hubcia (sp.?), which is named after Carl Hubbs. Carl Hubbs is the biologist that has done so much work on the great basin fish. He came to Malheur Cave in 1934, to look for a cave adapted fish, because even as early as 1889, in the West Shore article, it mentioned a cavefish. And so he came and looked for this, and never found it. But, he found these invertebrates.

And Carl Bond of Oregon State University has looked at the minnow that is pretty common in the cave lake, and has identified it as rhinichthys osculous caringtonie (sp.?), and I can't spell it for you. But, it is a --- according to Carl Bond, the fish that is in Malheur Cave, also lives on the surface. And we have seen it on numerous occasions. And it has two very well developed eyes, it is not blind. Anyway, this is the fish that Carl Hubbs is looking for, and he found instead some of the creepy crawlys.

... was basically, was a lava river flowing down and some banks built up, called

trenches. And then ultimately a flow came through that roofed the entire cave, and the molten rock flowed out inside --- on --- see it's going downhill slope, so the --- you had then the crust over the top, and then successive surges of melted rock flowed inside of the tube, and at such a level that they coated the ceiling. So this cave has several ceiling linings in addition to floor linings. And the evidence for this --- let's see, right here --- you have places where the ceiling lava doesn't quite --- you can follow a line of lava all the way around, but it doesn't quite reach the floor. See there is a line there.

PAULINE: Uh huh.

ELLEN: We're not in the best place for showing ceiling linings. Back a ways is better, but about right here ... But it was such an unusual looking thing, and we had seen a picture of it. And we were able to identify it from that. And then we sent it to a specialist --- Esther took it down to San Francisco and showed it to a --- Tom Briggs of the California Academy of Sciences, who had seen a micro-whip scorpion from Texas, and had identified it positively as one.

PAULINE: Well Esther, there's got to be --- if this is a ... there has to be another one.

ELLEN: Right.

PAULINE: Sure, there had to be two.

ESTHER: Here is another board right here.

ELLEN: Yes, well maybe it's still --- they're semi-terrestrial, so it still may be a little wet for it. ... B E R L E S E funnel, and this is a funnel that has a screen on it. We put the leaf-litter or the soil on the funnel, and it has another funnel on top of it that has a light bulb in it, and the heat from the light dries out the soil, or the leaf-litter. And the organisms then crawls down, down the lower funnel into a bottle of alcohol. So they are separated by heat and dryness from the soil. Okay, that's a berlese funnel. So we have been --- and we have a bank of 21 of them at the station, and we take surface samples back there and

put them in the berlese funnel and they dry for four days. And from that type of thing we can find out what is living above the cave. We have taken litter samples, soil samples from any number of locations in Harney County. I have been doing this since 1971, so I'm beginning to get an idea of what is here and --- Since I've mentioned that I've been studying pseudoscorpions since 1965, we're beginning to also find out how many pseudoscorpion species are in Oregon, in Harney County especially. Because I've done a lot of samples in this area. ... Looking for more than just pseudoscorpions, we --- I sort out the pseudoscorpions from the materials, and then we send the rest of the animals to specialists that are interested in such things as springtails, mites, beetles, any of the small organisms. And there have been one of the --- William Shear who works on millipedes whose --- in Florida, says that leaf-litter samples from Oregon are like Christmas in a gold mine, all wrapped up in one since there are so many undescribed species, from the West that some of the Eastern workers are delighted to get them.

... The answer is no. This lake is coming from ground water. There may be some surface water, like runs in from snow melt, and that type of thing. But essentially it is from ground waters. John had a water gauge in the reservoir, and in the lake and the levels of the reservoir and the lake rose and fell differently. Also, the 1889 article from West Shore, and articles in the 1900, in the "Oregonian" mention a very large "half-mile long lake" in the back of Malheur Cave. The reservoir is supposed to have been, the best information I can get, and it might be inaccurate, but some time in the mid '50's.

PAULINE: Oh, yes.

ELLEN: Yeah, very late. And so this lake has been here many, many years prior to the building of the dam. ... Bond thinks the fish come in from deep sub-terrainium track --- cracks.

WOMAN: They can really do that?

ELLEN: Well they ---

WOMAN: --- they got lost ...

ELLEN: Yeah, they are really tiny, they are little minnow size.

WOMAN: Wow.

ELLEN: The --- let's see, what's the common name of it. Daces--- speckled daces.

WOMAN: Oh, the speckled daces.

PAULINE: Well, the other possibility is that the lakeshore rose, since I remember being able to see the back of the cave. Probably was down further, and we went further back in.

ELLEN: Yeah. Probably which you were actually not --- you weren't seeing the back of the cave, you were probably seeing just a --- where it turns.

PAULINE: Well that could be.

ELLEN: So it looks like it. When were you in here last?

PAULINE: Oh golly, it's been --- it was in the '50's sometime, I'm sure. It's been a long time.

ELLEN: The --- in terms of finding ... find flat worms or anything like that, which we do not collect at the present time. We don't collect any arthropods, or any flat worms because there have been enough of them collected for scientific identifications. And we do not want to lower the populations unduly. The isopod is still --- there is still need of further work on it, and we're trying to find a male isopod.

ESTHER: A male isopod.

ELLEN: Male isopod, its one millimeter in body length, and it's colorless.

PAULINE: Sounds like --- worse than the needle in the haystack.

ELLEN: That's exactly right. There was one male isopod found by myself in 1973, and I sent it to the specialist working on isopods and he put it on a microscope slide and he ruined it. And since then I have found about ten female isopods, no more males. Esther,

John Holesinger stressed the utter necessity of finding male isopods.

ESTHER: You tell him how we are really looking for them?

ELLEN: Yes. He said that the ---

ESTHER: Did you tell him about ...

ELLEN: Yeah. He said that --- he is an arthropod, isopod worker, so he is much more interested in the isopod.

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