KODIAK DAILY MIRROR 67 YEARS June 15, 1940

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STORY

Ocean acidification creeps up on marine ecosystem in cooler, northern waters

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Bristol Bay Under Siege

Article published on Tuesday, April 15th, 2008
By RALPH GIBBS
Mirror Writer

Bristol Bay Under Siege is a three-part series that examines environmental and industry factors affecting Bristol Bay. Parts 2 and 3 focus on oil exploration and the Pebble Mine project.

Bristol Bay doesn't look like a battleground; there are no obvious battle scars — yet. And there is little development on the shores surrounding the bay that attracts fishermen, hunters, naturalists, environmentalists, photographers and others wanting to visit the area's state and national parks.

Every summer, the largest run of salmon in the world rushes up its pristine, unspoiled waters into more than a half dozen rivers to spawn.

Bristol Bay is also home to dozens of marine mammal species and one of the world's largest concentrations of seabird colonies. The endangered Steller sea lion and North Pacific right whale call the bay home.

A study completed for Trout Unlimited says evidence indicates "Bristol Bay has been continuously inhabited by humans at least since the end of the last major glacial period, about 10,000 years ago."

Its constant high winds, high seas and floating ice make it a harsh environment.

Now, the area is under siege.

Participants in the war include politicians, the oil industry, mine developers, commercial fishermen and environmentalists.

The oil industry wants to develop what they believe to be large pockets of oil and natural gas. The mining industry wants to develop what they believe is one of the largest mineral mines in the world, and the fishing industry just wants to fish in the unspoiled waters for its cut of the $2 billion fishery derived annually from the bay.

Looming over everybody like the Four Horsemen of the Apocalypse is one of the side effects of global warming, ocean acidification — and it

threatens to be worse then all other perceived threats.

Ocean acidification

Just a few short decades ago, global warming was an uncertain science. Now, its effects are disputed by only a handful. Last week, the Wal-Mart in Kodiak had a display of films for sale featuring environmental documentaries produced by actor Leonardo DiCaprio, former vice president Al Gore, CNN and HBO.

However, there is another side effect of global warming just now coming to light — a more insidious side effect called ocean acidification. And because cold waters will be affected first, Bristol Bay will be one of the first to see its potential detrimental effects.

Science 101

Oxygen may be the breath of life, but there is a price.

Every time a person or creature breaths, it releases carbon dioxide into the atmosphere. In heavy concentrations, carbon dioxide can kill. Plants have always been able to keep carbon dioxide levels in balance by absorbing gas and releasing oxygen.

That is only a fraction of what is referred to as the carbon cycle.

Then came the industrial revolution and the balance was tilted in carbon dioxide's favor.

What many of us didn't learn in high school science classes or have forgotten is that the ocean plays an important part to reduce carbon dioxide levels on earth.

Oceans are a natural absorber of carbon dioxide. In the past 200 years, the oceans have absorbed more than 500 billion tons of carbon dioxide.

"Forty percent of all the carbon that we pull out of the earth goes up into the atmosphere," Robert Foy, research director of the National Oceanic and Atmospheric Administration research center in Kodiak, said during a workshop at ComFish in March. "Thirty-five percent is a terrestrial sink. It comes back. Trees have to grow. So a lot of that carbon is going right back down into the earth."

The ocean absorbs the rest.

"Up until now, we've been pretty excited about that," Foy said. "It is what has kept us, since the industrial revolution, pretty steady in terms of the earth's ability to absorb the impact of humans putting more carbon into the atmosphere."

Until recently, scientists weren't sure what effect carbon absorption was having on oceans. Slowly, through experiments, scientists have come to understand and are alarmed about the future of the oceans. The waters off Alaska will be the first to feel those effects.

"Has it impacted us up until now?" Foy said. "Not extremely. This issue is about what it's going to do (to the oceans) in the future."

A simple formula

"We call it ocean acidification, meaning the ocean is becoming more acidic," Foy said. "We probably shouldn't. We should probably call it removal of carbonate, which is really the issue biologically."

If you're not a science major, the actual formula may seem complicated, but the simple version is, if you combine carbon dioxide

with water it dissolves into hydrogen ions and bicarbonate ions. That release of ions causes another chemical reaction that removes carbonates and leaves an excess of hydrogen. That excess of hydrogen causes the ocean to become more acidic by decreasing the ocean's pH level.The lower the pH level, the more acidic water is.

"In the last 200 years, the ocean has decreased its pH by 0.1 pH unit (because of carbon dioxide absorption)," Foy said. "You might think, so what? That's the difference between milk and water or a Coke. It turns out, biologically, that a pH change by that amount is actually quite large."

Higher acidification levels can dissolve shells that creatures use for protection.

"A simple example," Foy said. "Take a can of Coke. Take a shell or piece of chalk or something that is made out of calcium carbonate and stick it in that glass of coke. It'll dissolve right in front of you."

Creatures great and small

Pteropod sounds like some sort of huge dinosaur. It's the opposite. A pteropod, or as they are more often called, sea butterflies, are snail-like creatures and one of the smallest animals in the ocean. They float freely in the water and are carried in currents as they feed on plankton.

There are about 100 different species of the sea butterfly and they are almost at the bottom of the food chain, described by biologist researcher Gretchen Hofmann as the "potato chip of the ocean."

These sea butterflies use carbonate to build shells.

The Alaska Marine Conservation Council reported that in recent experiments exposing live pteropods to certain carbon emissions, the pteropods showed evidence of damage within 48 hours.

That damage may lead to mass mortality.

If acidity levels continue to increase and pteropods are removed from the food chain, researchers agree it will have a devastating effect on the ecosystem.

Foy said a 10 percent decrease in the sea butterfly would result in a 20 percent drop in mature salmon body weight.

"Pteropods make up 45 percent of the diet of salmon," Foy said.

Researchers also say that crabs, which use carbonate to build shells, will also be affected.

The May-July 2007 Alaska Fisheries Science Center quarterly report published by the National Marine Fisheries Service states research indicates lower pH levels hurt survival and growth.

It won't happen overnight.

"Crabs and corals aren't just going to dissolve one day," Foy said. "What's going to happen long before that is their physiology is going to change. They're not going to be able to grow. We'll have recruitment failures."

Foy said fish that end up living in a carbon dioxide-rich layer will most likely not grow as large as before. This will affect their commercial value.

However ocean acidification ends up affecting the oceans, it will affect

colder regions first.

According to the quarterly report, "The fishery resources managed by NMFS in the North Pacific are among the most vulnerable to the effects of ocean acidification. The North Pacific has conditions less favorable for calcification due to the increased solubility of calcium carbonate at lower temperatures and the inflow of carbon dioxide-rich waters from deep ocean basins."

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STORY

Politicians, oil industry reps, environmentalists play tug-of-war over development

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Bristol Bay Under Siege

Article published on Wednesday, April 16th, 2008
By RALPH GIBBS
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Bristol Bay Under Siege is a three-part series that examines environmental and industry factors affecting Bristol Bay. Part 1 took a closer look at ocean acidification. Part 3 will focus on the Pebble Mine project.

In the aftermath of the Exxon Valdez oil spill, Congress, concerned the same disaster may happen in the violent waters of Bristol Bay, barred oil exploration in this fish-rich environment. Under pressure to curb increasing oil prices, in 2003, Congress, at the urging of Sen. Ted Kennedy, reversed its decision.

Still, drilling didn't take place because of a moratorium signed by President Bill Clinton in 1998.

In January 2007, that too was overturned when President George W. Bush lifted the ban. Shortly after lifting the moratorium, Interior Secretary Dirk Kempthorne said the administration would open the area for oil and natural gas exploration under a five-year lease plan. Opening the area to offshore drilling will enhance America's energy security by improving opportunities for domestic energy production, Kempthorne said.

Environmental groups have slammed the Bush administration's action.

"This decision borders on irresponsible from our perspective," said Eric Siy, executive of the Alaska Marine Conservation Council, after last year's decision.

But the oil industry is going ahead with plans to develop the area, as estimates indicate up to $150 billion in oil and natural gas may be under Bristol Bay.

Last week, the first step in that five-year process began when the Minerals Management Service issued a notice of intent to prepare an environmental impact statement.

Environmental groups plan to fight the government every step of the way.

The Alaska Marine Conservation Council published pamphlets stating that offshore drilling in Bristol Bay would further threaten a number of endangered species, "including the world's most endangered whale – the North Pacific right whale – whose population is estimated to number less than 100 individuals."

Gregg Nady, an employee of Shell Oil, said at a meeting in Kodiak during ComFish in March that the industry is sensitive to the concerns of fishermen and environmentalists and that every precaution will be taken.

Nady said it is not known if there is any oil and gas out there. However, most oil exploration supports this belief.

"We're sort of the eternal optimist," Nady said. "This is what we think is out there: 9 trillion cubic feet of gas is the mean estimate and 750 million barrels of oil. This is sort of a gut feeling that there is oil and natural gas in the area."

Nady said scientists believe the majority of the resources in the bay are natural gas because of the natural hot springs in the area. Therefore, he said, even if there was a spill of natural gas, it would dissipate into the atmosphere leaving the area untouched.

Nady said despite that, before they even start drilling, they'll have all their protections in place.

"If we find natural gas, the plan would be to liquefy the gas, to basically take it by pipeline, put it through a refrigeration plant and you cool the gas down to -100 degrees centigrade. It then becomes a liquid and you can put it on a tanker," Nady said. "LNG has been shipped around the world for 35 years, starting in Cook Inlet, actually, in 1969 and there's never been a spill."

The opposition

On the same day, Minerals Management Service published its notice of intent to start the oil exploration environmental impact statement process, another agency of the federal government announced a new federal rule designating a large portion of the Bering Sea a North Pacific right whale critical habitat.

The decision gives weight to a lawsuit filed by the Center for Biological Diversity to stop the oil and gas leasing plan. Brandon Cummings, oceans program director for the Center for Biological Diversity, said they plan to fight the leasing plan every step of the way.

"Oil development on federal waters on the outer continental shelf requires a four-step process," he said. "There's the five-year plan. We're suing over that. There's the lease sale stage. If that is ultimately completed, I can't imagine us not suing over that."

After that will be the exploration stage and Cummings said if it gets that far, they'll sue over that, as well as over drilling stage.

"Up in the Beaufort Sea, Shell has reached the exploration stage and last year we filed suit over it, and we currently have an injunction against them," Cumming said.

Conservation groups say it is too dangerous to drill for oil in that region with its high winds, high seas and floating ice.

Nady said oil developers are taking precautions.

"Because there is ice occasionally out there, the actual well bores

themselves will go down inside the legs of the platform, which are probably about 24 foot in diameter," he said. (The platform) is secured to the seabed by a number of pylons. These pylons are typically 7 to 8 feet in diameter and they go 100 to 300 feet into the seabed. It's a pretty significant structure."

Oil release is another issue.

Nady said that oil drilling has advanced far from the days when oil came shooting out of the ground after a strike. He said that was usually caused by drilling in a high-pressure area. He said now they use seismic surveys and other information to avoid the high-pressure areas.

"In Alaska, unlike the Gulf of Mexico, the Minerals Management Service has someone else on the rig looking over our shoulder making sure that anything unusual isn't happening," Nady said.

"(There have been) 13,500 wells drilled in offshore federal waters in the U.S.," Nady said. "That's exploration and appraisal wells since 1956. There have only been four that have released oil in the ocean, and the biggest spill was 200 barrels.

The Alaska Marine Conservation Council says that's not the only problem.

"Environmental studies by the Minerals Management Service in the Gulf of Mexico showed zones around the oil platforms had sediments with higher levels of contaminants and toxicity, reduced levels of abundance, species diversity, genetic diversity and reproductive success," AMCC said. "Heavy metals such as mercury were amongst the contaminants found in the area's sediments and were also found in elevated levels in the tissues of fish and shrimp near the platforms."

Environmental groups also say drilling isn't the only concern. Seismic surveys used in the exploration phase have the potential to harm marine life.

Nady said they have some underwater two-dimensional maps from the 1980s, but they will need to do some seismic surveys to fill in the gaps.

"The boat goes over (an area) and drags hydrophones over it and shoots a sound source into the ground and then they map the reflection as the sound source goes through the rock layers," Nady said.

Alaska Marine Conservation Council said that the noise produced by seismic surveys can cause physical damage to fish and mammals.

According to Alaska Marine Conservation Council documents, "One recent study showed that fall-migrating bowhead whales in the Beaufort Sea were displaced from an area within 12 miles of the seismic source and began to show signs of avoidance behavior up to 21 miles away.

That avoidance behavior concerns Cummings.

"Drilling in Bristol Bay would be drilling through the heart of the most important habitat of the most endangered whale on the planet," he said. "If the North Pacific right whale is to have any chance of survival, we must protect its critical habitat, not auction it off to oil companies.

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Will new environmental regulations protect world's largest salmon run if Pebble Mine develops near bay?

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Bristol Bay Under Siege is a three-part series that examines environmental and industry factors affecting Bristol Bay. Part 1 took a closer look at ocean acidification, and Part 2 focused on oil exploration.

A project of concern to environmentalists, Alaska residents and fishermen is the Pebble Mine. Although not technically in Bristol Bay, but upstream, the mine has the potential to affect the bay as much, if not more than the oil industry. Like the oil industry, Pebble Mine officials say they are willing to take whatever precautions are necessary to safely develop the area.

The mine has the potential to generate approximately $300 billion.

Background

Cominco Alaska Explorations started explorations in 1986. After detecting color anomalies from aircraft, Cominco started test drilling and discovered what became Pebble West in 1988. Initial estimates placed the range of minerals at about 3 million tons of copper and 11 million ounces of gold.

In 2001, a new company, Northern Dynasty Minerals, bought the property and restarted exploration.

In 2002, Northern Dynasty upped its estimate of the ore deposit to 4.1 billion tons of minerals.

Another mineral deposit was discovered in 2006, called Pebble East, and extensive drilling is ongoing to discover the extent of minerals on the site.

The players

Northern Dynasty Minerals has no history as a mining company. The company was formed shortly before it acquired Pebble Mine.

"It was created originally as a shell company whose only assets were cash, and it began looking around the world for a promising mineral property," said Sean Magee, a company spokesman.

Northern Dynasty doesn't have a history, but its umbrella company, Hunter Dickerson, does.

"What Hunter Dickerson does ... is establish these public companies with feed capital, looks around the world to find mineral properties and then advances them," Magee said. "In every case, it's a single public company with a single project."

Other companies under the umbrella of Hunter Dickerson include Amarc Resources, Anooraq Resources Corp. in South Africa; Continental Minerals Corp. in Tibet; China, Detour Gold Corp. in Ontario, Canada; Farallon Resources Ltd., in Guerrero, Mexico; Rockwell Diamonds Inc., in South Africa and Taseko Mines Ltd., in British Columbia.

In July 2007, Northern Dynasty sold 50 percent of the mine to another mining company, Anglo American creating what is called the Pebble Partnership.

Anglo American was founded in 1917 in South Africa.

Rio Tinto, another mining company and Mitsubishi Corp have also purchased shares in the Pebble Mine partnership.

"Those companies are not actively involved in the management of the company, but they are significant shareholders," Magee said.

However, Magee said Rio Tinto does have one person on the Northern Dynasty board.

He said he is unsure if Rio Tinto will have an active role in the development of the mine later on.

"Who knows what could happen in the future, but the current partnership is just between North Dynasty and Anglo American," Magee said.

Mining development

Currently, the Pebble partnership is still in the exploration phase of development and mining officials don't expect any development to take place until after 2010.

If it is developed, two areas are expected to be mined. Pebble West will probably be developed as an open pit similar to one in Montana. Pebble East will likely be a pit mine similar to the coal mines of West Virginia.

The idea of development in an area that is home to one of the world's largest salmon runs has commercial fishermen and environmental groups around the globe bristling.

Even some members of the cooking industry are getting behind the anti-pebble mine initiative.

While attending ComFish in March, chef Jack Amon of the Marx Bros. Café in Anchorage, said you have to make good decisions now for the future of Alaskans. He said statewide, salmon is worth approximately $200 million annually.

He said 67 percent of all seafood sold in this country is bought by restaurants.

"You want the message to be, 'If it comes from Alaska, it's good,'" he said. "If something messes that up, it affects every bit of seafood in Alaska."

Having the potential to "mess that up" are the heavy metals that will be produced by the mine, former federal fisheries biologist Carol Woody said during the same conference.

Woody is one of the foremost experts on salmon and holds a doctorate in fishery science and is the author of "Sockeye Salmon: Evolution, Ecology and Management." Woody runs a fishery and consulting firm.

She said development of the mine risks seriously damaging Bristol Bay salmon stocks.

"The main reason for endangerment is the loss of habitat or habitat degradation," she said.

Because Pebble Mine lies adjacent to Iliamna Lake, Woody said that a real danger exists and she points to the mining industry's track record.

The mining record

It's easy to see why Woody, commercial fishermen and environmentalists are concerned.

Mines developed throughout the 20th century have poisoned rivers and lakes and caused untold environmental damage.

Opponents like to point to the Berkeley Pit in Butte, Mont., as a prime example of what can go wrong with an open pit mine.

Established in 1955, the Berkeley Pit was developed as a copper mine. It is about half a mile wide and 1,780 feet deep. At the bottom of this mine is about 900 feet of contaminated water.

In 1995, a flock of more than 300 migrating snow geese landed in the water and died. Lab tests indicated the poisoned water killed the geese.

The Leviathan Mine on the eastern slope of the Sierra Nevada in Markleeville, Calif., is another example.

According to a report from the Department of Health and Human Services minerals from the mine that was created in 1863 and mined again in the 1950s and 1960s has "caused significant contamination and ecological impact to Leviathan, Aspan, Bryant creeks, as well as the River Ranch and irrigation channel. Elevated concentrations of aluminum, arsenic, cadmium, iron, manganese, nickel and thallium have been detected in surface water and sediment downstream from the mine."

Magee doesn't dispute this or that other mines in the United States have had similar effects, but he points to their age.

"Many of the mines you see our critics talk about are ones that were developed last century in the middle and in some cases the earlier part of last century, when there simply was not the engineering capabilities or environmental regulations that are now in place," Magee said. "Unfortunately, that's the legacy of mining in the western United States."

He said to see some good examples, just look around the states.

"Twenty-five years ago, the issues around acid mine drainage was not even understood and there wasn't regulations that would guard against it," he said. "At the same time, mining regulations and environmental standards have gone through changes."

Magee said that despite the already rigorous regulations, he sees

Pebble establishing new standards in mine safety.

"It's going to be an interesting case study for mining in the United States," Magee said. "I think the proponents are willing to — and the project will allow — the very highest in environmental standards and the very best science and technology to be applied. We're going to be designing this project over many years."

Magee said the understanding is clear on maintaining clean water and making sure the mines are operated safe and reliably.

Woody remains dubious and said it won't take much for fishing stocks to be affected.

"Salmon have really complex life cycles," Woody said.

In Bristol Bay, salmon start their life cycles in the headwaters of the rivers and streams throughout the area. They then make their way to Iliamna Lake and remain for a few years before making their way to the ocean. Most of their growth happens at sea and they spend several years there before returning to spawn.

"When the sockeye are moving down into the lake and when they move out to the ocean, they go through a process called imprinting where they memorize a map of chemical smells," she said. "That map helps them find their way home to their spawning grounds when they complete their life cycle. They are adapted to the specific habitats where they came from."

The problem is that heavy metal runoff into the waters could alter that chemistry map and keep the salmon from finding their way home and spawning. She said hard data shows that if salmon can't get home, they will die without spawning.

She said that's only the tip of the iceberg.

"What level of risk are we willing to take?" Woody asked.

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