

Another perspective

## Global climate change: Doom or opportunity?



**C**all it what you will – global warming, climate change, alarmism, bunk – parts of our environment don't look like they did only 20 years ago. Those changes will accelerate. Most news reports dwell on the horrid sideshows of this climate swing. For smart Pacific Fishing skippers, however, such change may mean new opportunities, but only if they think and plan ahead. That's why we've asked an experienced environment writer, Jennifer Hawks, to contact experts around the Pacific Rim and forecast the effect of climate change on your fishing grounds. This is the first in a series that will run into next year – only in Pacific Fishing.

Though the causes for it are still up for debate, global warming isn't just a theory anymore.

Rising ocean temperatures are affecting creatures beneath the surface, and consequently, those who rely on them – people like you.

Science hasn't fully understood the ramifications of climate change, yet it's clear that species once plentiful are now disappearing, while others are flourishing, and some have remained the same.

However, there may be good news in

all of this for the commercial fleet. The melting Arctic permanent ice pack is providing unprecedented access to new fishing grounds. It doesn't hurt that several species of fish are moving northward into increasingly warm waters, joining several species that are booming in these favorable conditions. If the warming trend continues, modern fishing boats may soon be harvesting waters previously known mostly to whalers in the late 19th and early 20th centuries.

The obvious question becomes: Are the Arctic Ocean and Bering Sea poised to become like another Barents Sea, with

warm waters that make for plentiful fishing grounds? If so, then the following anomalies may be harbingers of great things to come, as species shift locations, adapt, and compete for new territories:

§In various areas of Bristol Bay, the size of returning individual sockeye has varied greatly. This year, the average size was the smallest in three decades. Even stranger, last year's sockeye sizes were unusually large.

§During 2004, Pacific cod in the Gulf of Alaska and Bering Sea/Aleutian Islands comprised 12.5 percent of Alaska's commercial bottom fish catch. This was sec-

### We want to talk to the expert — you

**YOU'RE ON THE WATER** more than oceanographers. You've developed deep wisdom about biology and weather. You know how fish populations are reflected in your paycheck.

We want you to tell us what you've seen on the grounds and what you expect in the future. If you have ideas, reports of strange phenomenon, or suggestions on what you'd like to see us cover, let us know. Also, let us know if you have questions.

We may not be able to provide the answers, but at the very least we can scratch our heads together. Contact Don McManman at [editor@pacificfishing.com](mailto:editor@pacificfishing.com) or at (206) 709-1840, ext. 255.

ond only to walleye pollock. Pacific cod in those areas are healthy and aren't even close to being over-fished. By comparison, Pacific cod stocks in other locations to the south are considered low.

§Herring naturally migrate toward warmer waters. Over the last two decades, Bristol Bay (Togiak) herring catches have increased. Though commercial fisheries continue to harvest record numbers of herring, the population remains healthy and sustainable.

§Skates are particularly vulnerable to over-fishing, though their numbers are increasing in the eastern Bering Sea. Little is known about them, and scientists are studying newly identified skate nurseries in the Bering Sea in an effort to develop fishery management plans.

§Ornithologists estimate that 40–50 million seabirds inhabit the eastern Bering Sea. Another 30 million birds migrate to that area every summer. Since 2000, seabirds have begun nesting sooner than in previous years. While some species of birds have been reproducing at the same rate, others have been reproducing more heavily.

§Beginning around 1980, in the eastern Bering Sea shelf, flathead sole, Atka mackerel, Pacific ocean perch, arrowtooth flounder, and rock sole have increased in population, while numbers of other flatfish, including Greenland turbot, have decreased.

§As opposed to crab, and most bottom fish, pollock thrive in warmer waters, and their numbers have been steadily increasing in the Bering Sea. Animals such as the fur seal, which have traditionally relied on crab and bottom fish as food sources, are experiencing a noted decrease in population.

§Massive numbers of Dungeness crab are dying in an oxygen-depleted dead zone of the Pacific close to the Oregon Coast. Fish normally found in that area have disappeared. Meanwhile, sport crab fishermen are making record catches of crab in Yaquina Bay at Newport. Experts speculate that additional dead zones may be forming off the Washington coast.

§As the number of sharks in the Gulf of California dramatically decreases, giant Humboldt squid continue to thrive to the north. Though originally found only in the waters off Peru, they have recently been

## Climate change a possibility

### Scientists investigate growing Oregon 'dead zone'

**DUNGENESS CRAB ARE DYING** by the untold thousands off the Oregon Coast, and some research points to significant climate changes as the culprit.

A black wall of low-oxygen water has risen from the Pacific's depths, bringing many nutrients but little oxygen. Fish species were able to get away. Crabs, too slow, suffocated, and their shells litter broad swaths of ocean bottom off the mid-coast.

Blame the richness of the ocean. Upwellings of nutrient-dense water normally nurtures huge masses of fish. Old water from the abyss sloshes onto the continental shelf, bringing elemental minerals that feed plankton. In turn, plankton feed larger marine organisms. The wildly prolific waters off Namibia, Peru, and the Northwest coast rely upon deep-ocean upwelling.

But, to nurture life, nutrients must be mixed with shallower,

oxygenated water. Such mixing has declined off the Oregon Coast for several years, but 2006 was the worst yet, according to Jane Lubchenco, a professor at Oregon State University and a leader of the team investigating the phenomenon.

Global warming? "It certainly is a possibility. That's what we're investigating right now," said Lubchenco.

"Scientists are not sure why this dead zone has appeared in recent years. They suspect that there have been fundamental changes in ocean conditions off the Oregon Coast. These changes may include either oceanic or atmospheric changes, or both," says a fact sheet Lubchenco helped prepare.

In a nutshell: Strong wind from the southwest usually mixes the ocean off the Northwest Coast. Those winds have been absent or weakened, replaced by no wind or wind from the north, which doesn't churn the water significantly.

The result: a carpet of dead crab very near to shore. The photo above was taken at about 165 feet deep, only about a mile off Cape Perpetua.

Scientists found no remains of fin fishes in the dead zone. The fish, presumably, had time to swim away when the dead water arrived. This rebound effect has resulted in strange phenomena:

- Commercial fishermen trolling for salmon have caught halibut more than 100 feet higher in the water column – and above the dead water – than normal.
- Sport crab fishermen have seen tremendous catches in Yaquina Bay at Newport, possibly a refuge for crab that escaped the dead water.

Such dead zones have been noticed for the past several years, while record commercial crab catches have been recorded. However, this buildup of dead water is greater than ever recorded.

Low oxygen water has spread to an area four times as large as in years past. At 165 feet off Newport, instruments showed deadly low oxygen for 80 percent of the water column. In addition, dead water has never been measured so close to shore. North, off the Washington Coast, large numbers of dead wildlife have washed ashore, leading to speculation about a dead zone phenomenon there.

Some areas off Cape Perpetua have been measured to be nearly "anoxic," or completely lacking oxygen.

What does it mean for the crab harvest to come on the coast?

"It is also clear that there are an exceptionally large number of live crabs in Yaquina Bay in the last few weeks, suggesting that many crabs may have escaped the low-oxygen water and found refuge. ... The impacts on rockfish are unclear. ... Surveys in the Cape Perpetua region indicate no fish at all in places where they usually are abundant," according to the scientists' fact sheet. ■



**THE REMAINS OF** Dungeness crab litter the ocean bottom only about one mile off Cape Perpetua. Photo courtesy of the Oregon Department of Fish and Wildlife and Oregon State University.

Climate change = resource change?



The Petersburg-based limit-seiner F/V Kathi hauls its nets – with few salmon – outside Eliza Harbor on Admiralty Island during the Southeast Alaska pink salmon fishery in August. The pinks that were supposed to be there weren't. The chum that weren't supposed to be there were. Meanwhile, the Kodiak pink run broke records. Why? Biologists and fishermen are still wondering. Klas Stolpe photo.

spotted off the shores of Alaska. Unlike sharks, squid can survive in oxygen-depleted waters, which in the future may offer them additional refuges in northern waters.

§In 2004, the Maine lobster catch was 70.9 million pounds, up from 38.9 in 1994.

During that same period, the sea level and temperature have increased, creating more abundant food resources. But, experts fear that if the temperature warms too much, lobsters will stop reproducing altogether.

- Mortality rates of pre-spawning sock-

eye salmon returning to British Columbia's Fraser River are steadily increasing. In the last several years, millions of the fish have died before they reached their spawning grounds.

- Overall, Arctic ice has shrunk by 3 percent every 10 years. It's 40 percent thinner too, and that's just over the past 20 years, according to the U.S. Navy, which has a proprietary interest in an ocean it has traveled often as a crossroads during the Cold War.

Do increasing water and air temperatures explain all of these anomalies?

Many experts believe that what we're seeing is a direct result of global warming. Kate Myers, a faculty researcher in the School of Aquatic & Fishery Sciences at the University of Washington who specializes in high-seas salmon, is convinced that the warming trend has a direct influence on fish stocks.

"The Bering Sea is a highly productive area for feeding salmon," says Myers. "When the Bering Sea is warming, it usually results in better survival rates for salmon. At least temporarily, a warming of the Bering Sea is beneficial for northern stocks, particularly Alaskan and Russian salmon. It has the opposite effect on Pacific Northwest stocks."

When the ocean temperature increases further south, it becomes too warm, leading to poor feeding conditions and more predators. If the temperature continues to increase, it could become lethal for returning adult salmon and result in even higher mortality rates.

Could the warming trend reverse itself, bringing cooler temperatures to the area and a return to previous conditions? Possibly, though among other things, a temperature reversal would require significant reductions in planetary CO2 emissions, a prospect that seems unlikely for the near future. And even if the trend can be reversed, results would be mixed and the recovery of species would likely take years.

Assuming that global warming continues into the near future, which fish species are likely to thrive over the next several years, and which ones are destined to struggle for survival? What are the prospects for commercial fisheries, and how will the changing species populations affect them? We'll be examining all of that in the remainder of this series on global warming and its impact on fish species. ■

**NEXT MONTH: Cod banks of the north**

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