

Scientists scrutinize carbon in crustaceans

Studies focus on Dungeness crab

By PHUONG LE
Associated Press

MUKILTEO, Wash. — Millions of pounds of Dungeness crab are pulled from Pacific Northwest waters each year in a more than century-old ritual for commercial and recreational fishermen.

But as marine waters absorb more carbon dioxide in the atmosphere, federal scientists are worried that the ocean's changing chemistry may threaten the sweet-flavored crustaceans.

So scientists with the NOAA Fisheries' Northwest Fisheries Science Center are exposing tiny crab larvae to acidic seawater in laboratory experiments to understand how ocean acidification might affect one of the West Coast's most lucrative fisheries.

Research published this year found that Dungeness crab eggs and larvae collected from Puget Sound and exposed to higher levels of carbon dioxide — which increases ocean



AP Photo/Elaine Thompson

Paul McElhany, a research ecologist with NOAA's Northwest Fisheries Science Center, pilots a boat to retrieve Dungeness crab larvae from light-catching traps set out the day before in the marine waters outside of the center's station in Mukilteo, Wash., in July. The crabs, found from central California to the Aleutian Islands, Alaska, play an important role in the ocean's ecosystem.

acidity — grew more slowly and larvae were more likely to die than those in less corrosive seawater.

A step further

Now, researchers are taking the experiments a step further to study how the crabs respond to multiple stressors during various growth stages. They also plan to analyze the sublethal effects: Even if the crabs don't

die, are they affected in physiological or other ways by ocean acidification?

"They're so economically and ecologically important here on the West Coast," said Paul McElhany, a research ecologist with the Northwest Fisheries Science Center north of Seattle, who is leading the current experiments.

Crab larvae are valuable food for small salmon and for-

age fish like herring that are eaten by salmon. Dungeness crabs are also the top revenue-fetching fishery in Washington and Oregon. In 2014, nearly \$200 million worth of crabs were harvested along the West Coast.

Previous research has found that levels of ocean acidification expected within a century are likely to impact red king crab and Tanner crabs, two commercially important species in Alaska. One long-term experiment found that both crab species grew slower in acidified waters and survival decreased.

In Puget Sound, McElhany and Audrey Djunaedi set out in a boat one morning over the summer to retrieve crab larvae from light-catching traps.

Once back in the lab with their catch, Djunaedi and others readied equipment so each crab could be reared separately in different treatment containers.

An intricate complex of tubes, pipes and sensors control the levels of CO₂, temperature and oxygen in each container. High carbon dioxide and low oxygen create the most stressful conditions, while low carbon dioxide and high oxygen

simulates more benign environments, in addition to other combinations.

The experiments simulate current conditions as well as what can be expected in the future as the seas absorb more carbon dioxide.

"We don't see them outright dying in the experiment, but there are still some physiological cost to being reared in these high CO₂, low oxygen conditions," McElhany said. After the crabs molt, they're frozen and researchers will analyze their chemical changes to understand those impacts.

"There's some sort of metabolic cost, there's some sort of physiological cost for them in trying to maintain their internal pH in the presence of this lower pH in the external envi-

ronment," he added, referring to the measure of acidity in the water.

Upwelling

Because Puget Sound has naturally higher CO₂ levels from upwelling — events that bring water higher in carbon dioxide up from the deep ocean — one worry is that adding more human-caused carbon emissions will make conditions even worse.

Not all species of crabs may be affected by ocean acidification in the same way. And the broad range of habitats that Dungeness crabs occupy along the West Coast gives McElhany hope that the crustaceans can do well in some environments even if they don't survive in others.

Coast Guard rescues woman from Saddle Mountain

The Daily Astorian

HAMLET — The U.S. Coast Guard rescued a 75-year-old woman with a broken ankle off the summit side of Saddle Mountain Wednesday night.

The Air Force Rescue Coordination Center, responsible for inland search and rescue, contacted the Coast Guard just before 7 p.m. Wednesday, requesting a helicopter evacuation of the woman. A ground crew from the Hamlet Rural Fire Protection District had hiked up the mountain to treat the woman. By 8 p.m., a Coast Guard MH-60 Jayhawk helicopter had hoisted the woman and headed back to Air Station Astoria, where she was trans-

ferred to awaiting medical services.

"Our air crews are trained for various kinds of inland search and rescue and we always stand ready to assist

the Air Force and our state emergency coordinators as needed," said Petty Officer 1st Class Starr Franklin, an operations unit leader with Sector Columbia River's com-

mand center. "Inland rescue is unique to our area of responsibility where we are often the closest search and rescue asset that can rescue someone from steep terrain."

Dawn McIntosh rejoins Campbell & Popkin



Dawn McIntosh

Judge-elect Dawn McIntosh has rejoined Campbell & Popkin to work closely with Chris Palmer, in whom she has great confidence. Dawn and Chris are both well-known for skillfully representing clients in divorce, separation, custody and other family law matters. Campbell & Popkin also provides services in business law, litigation, real estate, estate planning and probate. Dawn and Chris are both taking new clients.



www.campbellpopkin.com



Chris Palmer

503-738-8400 • 1580 N. Roosevelt Drive, Seaside

Congratulations

Jerry & Donna Hendryx
on your
60th Anniversary
From the
4-T's and Their Families

GARY M. MAURO

AUGUST 6, 1961-SEPTEMBER 10, 2016

Order my steps in thy word: and let not iniquity have dominion over me. Ps. 119:133.

Gary M. Mauro of Point Ellice, Washington, died Saturday, September 10, 2016, the victim of a traffic accident. Mauro, 55, was born in Astoria, Oregon on August 6, 1961. He was the youngest child of Anna M. Perciaccanto Mauro and Albert M. Mauro, Sr., transplants from New York. Mr. Mauro Sr. was the longtime butcher for Astoria's Safeway store, and for three decades coached local American Legion baseball.

During the last month or so, Gary had relished watching the humpback whales feeding and frolicking in the Columbia River, just downhill from his front yard.

Gary grew up playing baseball, football, wrestling and fishing. He occasionally worked as a commercial fisherman, going after salmon, sturgeon, and crab. As a sports fisherman, his ability to catch crab and particularly razor clams was a wonder to his friends. He worked in surf above his knees, shoveling out the unsuspecting bivalves.

Gary graduated from the Astoria school system, going on to Portland State University where he received his undergraduate degree. He then went to Arizona State University on a baseball scholarship: he was a walk-on who earned the position of catcher, the team member who is on the receiving end of a 90 mph fast ball and an even faster foul ball. He received his MBA in Business Administration from the University of Phoenix in Sacramento, completing his studies while working in Korea.

Mauro's profession was that of private contractor providing auxiliary construction services to the military. His first posting was to South Korea in the late 1990s where he helped construct a nuclear plant; he next served in Sao Paulo, Brazil. Since 9/11, Gary served perhaps eight tours of duty in Iraq and Afghanistan, including Baghdad, Basrah, Mosul, and Kabul where he helped build the U.S. Embassy. Sometimes that service was under fire by which he was at least once injured.

Gary's friends relish what they call "Gary Stories." One day, he and a friend were discussing the redeeming nutritional value of Twinkie snack bars—Gary was noted for his love of sugar. At the conclusion of the conversation they nailed a Twinkie to an Astoria fish packing plant just to see how it would age. When they checked on it a year later, it was still there, an uneaten somewhat smaller version of its younger self. "Even the seagulls wouldn't eat it," his friend remembers.

Gary Mauro was a man of deep and knowledgeable Christian faith. His faith perhaps best described by something he recently wrote:

*"The Gospel Truth. * Moreover, brethren, I declare unto you the gospel which I preached unto you, which also ye have received, and wherein ye stand; By which also ye are saved, if ye keep in memory what I preached unto you, unless ye have believed in vain.*

'For I delivered unto you first of all that which I also received, how that Christ died for our sins according to the scriptures; And that He was buried, and that He rose again the third day according to the scriptures...'

"Although out of favor, increasingly unpopular and disregarded today, the Gospel of Truth, which is the Gospel of Jesus Christ, remains entirely relevant, for truth of any sort stands independent of culture and time. There are absolutes. And this Truth can still save your never-dying soul (what happens after I die?) if you accept it.

"Saved from what, you might ask? THE WRATH OF GOD and ETERNITY IN HELL."

"(Find out what is meant by 'according to the scriptures.')

**1 Corinthians 15:1-4 was written by Paul the Apostle circa 40-66 A.D. The text above is quoted from the Authorized Version of the Holy Scriptures."*

Gary was a member of the Ocean View Baptist Church of Long Beach, WA. At his request, no funeral or memorial service will be held. Donations may be made to the charity of the donor's choice.

This courageous man of character, a "force to be reckoned with," his survivors say, leaves behind many beloved people: his wife Paula; his nephew Alexander "Mac" Mac Donald; his friend Frans Honl; his stepsons Ethan and Johnathan Hanson; his grandchildren Michael, Christopher, and Kaitlan Elizabeth; his sister Janice Perciano; and a large and extended family including his uncles Mario Mauro, Tony Stramiello, Sr., nieces, nephews, cousins, and close friends. He also leaves four cats who take the tragedy of this life cut short with feline equanimity.

Requiescat in pace, Gary.